

**PRESENTATION ABSTRACTS**  
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**AMERICAN FISHERIES SOCIETY**



*“Quantifying angler behavior: current practices and emerging methods”*

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# PLENARY

## **What Can We Learn From The New York Statewide Angler Survey?**

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Abstract: Since 1973 the New York State Department of Environmental Conservation, Bureau of Fisheries has conducted statewide angler surveys about every 10 years, with the most recent one in 2007. These large surveys, usually with an initial sample size of 17,000 or more, were designed primarily to provide fishery managers with information about angler effort on water bodies throughout the state. Having data on trends in fishing effort has been a particularly valuable outcome of these surveys. Efforts to improve the estimates of days fished have taken the form of several methods experiments conducted in conjunction with the statewide survey, including the use of angler diaries and reducing the recall period. Over the years additional questions have been added to the questionnaires to gauge angler opinions on various management issues, angler preferences for different types of fishing opportunities, level of satisfaction with the management agency, and angler awareness and knowledge of sport fish consumption advisories. However, because of the infrequent nature of the surveys they have not been particularly effective at providing feedback to managers from anglers on current or pressing management issues, other than at (or near) the actual year the statewide survey is conducted. To address this concern, we have begun conducting smaller-scale surveys on selected management topics in the intervening years to better inform management considerations.

## **Using human dimensions research to reduce implementation uncertainty in recreational fisheries management**

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Abstract: Objectives for recreational fisheries management are difficult to realize because fishers respond to management actions in surprising ways and/or because unstated social objectives influence the selection of management actions. These parts of implementation uncertainty imply that human dimensions research is essential for effective recreational fisheries management. Building from social-ecological systems (SES) and management strategy evaluation frameworks, two examples are provided of how human dimensions research might reduce implementation uncertainty. The first case involved a SES model for a spatially-structured walleye fishery in northern Ontario, Canada. The results from simulations within the SES model by varying numbers, harvesting efficiencies, and mobility levels of fishers revealed some surprises that question the generality of established hypotheses about social and ecological outcomes from similar fisheries. The second case examined whether suspected opposition by recreational fishers to lake trout rehabilitation activities for Lake Huron was present. The results suggested that the suspected level of opposition was generally over stated. Thus, managing the Lake Huron

recreational fishery without understanding this difference between expected and realized opposition could have encouraged managers to select actions to favor non-native fish species over lake trout. The two examples cut across two parts of implementation uncertainty. The examples also illustrate the importance of conducting human dimensions research through both disciplinary specific and interdisciplinary research lenses.

### **Angler Creel Surveys: Conventions, Choices and Potential Cheats**

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Creel surveys can provide invaluable information on fishing effort, catch and harvest rates. Management goals frequently take the form of target catch rates, and creel surveys serve as the sole way to evaluate effectiveness of management actions in these cases. Similarly, knowledge of trends in effort and harvest can alert managers to the need for management action, particularly when fishery sustainability is sensitive to variations in harvest rate. However, detailed creel surveys can be costly, and resources must be allocated efficiently to achieve survey objectives within the modern framework of limited resources. Survey design conventions are well-covered in the literature, and include potential biases associated with different survey types, but in the field comparisons of results using different survey approaches are uncommon. On Oneida Lake, we compared effort estimates based on instantaneous and progressive angler counts conducted on the same days. While progressive counts make more efficient use of personnel time, there was a tendency for them to underestimate effort relative to instantaneous counts. Roving creel interviews provided incomplete trip catch and harvest rate data while access interviews provided complete trip information. We saw no consistent differences between incomplete and complete trip catch and harvest rates over several years, but a post card survey providing complete trip data from the same angler population captured by the roving survey revealed that complete trip catch and harvest rates were consistently higher than incomplete trip rates. Finally, we explored ways to reduce survey costs by using full season data over several years to establish an abbreviated survey over only a portion of the season which could be used to extrapolate full season catches. For fisheries with predictable seasonal patterns, and available multi-year data sets, design of abbreviated surveys complemented by occasional full surveys could provide opportunity for savings while still maintaining the ability to assess trends in the fishery.

### **Using the internet and traditional creel surveys to understand angler behavior**

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Abstract: Buffering inland fisheries against large-scale changes in ecosystem function, climate regimes, and societal valuations of natural resources requires progressive management at large spatial and temporal scales. Current paradigms of inland fishery management generally utilize

waterbody-specific, fish-centric frameworks designed to regulate fish populations directly, and anglers indirectly, through fish stock enhancement and harvest regulation. In reality, anglers are the most manageable component of a fishery but management of anglers requires explicit consideration of their behavior (e.g., spatial and temporal patterns of participant use), which, unlike fish populations, operates at a scale larger than a single waterbody. Therefore, a first step in creating a resilient and sustainable recreational fishery requires gaining a thorough understanding of angler behavior so that managers can anticipate current and future management needs. This understanding of angler behavior may be enhanced by the use of traditional creel surveys and the use of information gained from internet sources. The information-seeking behavior of anglers was previously difficult to gather, but information on how angler's use the internet to search for fishing information is now available. This new information allows us to make large scale temporal and spatial comparisons of information gathering behavior. Information-sharing behavior was once restricted to the coffee shop but now takes place on social media websites. Posts to online fishing social network provide a relative index of fishing effort on an individual waterbody and regional scale; potentially reducing the need for intensive creel surveys. Angler behavior is also influenced by travel distance and the use, or overuse, of waterbodies. Kernel-density estimation was used to describe the spatial area of influence of reservoirs; differences in area of influence are likely related to access and amenities, fish community, and angler preferences. In combination, these techniques provide natural resource agencies with the tools needed for fisheries management agencies to ensure resilient and sustainable inland recreational fishing on a larger temporal and spatial scale.

## **SPECIAL SESSION:NY ANGLER RESEARCH**

### **Measurement error in catch rate estimation from creel surveys using complete and incomplete fishing trips**

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Abstract: Information on fishing effort, catch, harvest, and survival is critical for formulating management policies in freshwater fisheries and understanding the dynamics of aquatic ecosystems. Fisheries managers often use creel surveys to assess fisheries statistics parameters. The mean-of-ratios estimator is traditionally the accepted method for estimating catch rates from incomplete angler trips, while the ratio-of-means estimator is preferable for estimating catch rates from complete trips. Recent studies have demonstrated persistent bias when comparing the two estimators using catch data from incomplete and complete trips from the same sample of anglers and promoted the use of linear regression models to correct for apparent bias in catch rates based on incomplete trips. We contend that ordinary least squares linear regression is inappropriate to correct for this apparent bias because there is measurement error in both the

response (e.g., catch rate estimated from complete trips) and explanatory (e.g., catch rate estimated from incomplete trips) variables, which underestimates the slope of the relationship. Alternatively, when both variables contain measurement error, model II regression methods provide less biased estimates. Despite the availability of several methods for dealing with error in both variables, relatively few ecologists or fisheries managers account for this problem, instead relying on linear regression irrespective of potential measurement error. Using interview data (incomplete trips) from roving creel surveys collected by the New York Department of Environmental Conservation and a catch card survey (completed trips) conducted on the same sample of anglers, we compared catch rates derived from both estimators to show that linear regression underestimates the slope of the relationship and that model II regression reduces bias and performs better as a corrective model.

### **Contributions of a long term angler survey informing fisheries management in the New York waters of Lake Erie**

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Abstract: The New York waters of Lake Erie sustains one of the largest sport fisheries in New York State, recently ranking third in angler use among New York's leading freshwater sport fisheries. The most prominent sport fisheries by boat anglers pursue walleye, smallmouth bass and yellow perch. This resource reputedly supports the best smallmouth bass fishing quality in New York State. Other species valued by boat anglers include rainbow trout and lake trout. Measuring the performance of fisheries that target walleye and yellow perch is the foundation of inter-agency fish stock assessment and management in Lake Erie. Commercial fishing performance is measured by mandatory catch and effort reports by commercial operators. In New York's Lake Erie waters the performance of the sport fishery has been measured by annual direct contact angler surveys since 1988. Results from these fishery assessments are merged with fish population indices obtained from long-term agency netting programs to produce comprehensive assessments of yellow perch and walleye populations. These comprehensive assessments are reported annually by inter-agency technical groups and serve important functions of contributing to the information base that informs annual bi-national decisions regarding safe harvest limits, and validating New York's compliance with previous decisions on safe harvest limits.

### **Thirty years of angler diary data collection on Long Island**

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Abstract: The NYSDEC began an angler diary program on Lake Ronkonkoma in 1978 as part of the New York State Bass Study. The angler diary program was expanded to other warmwater ponds and lakes in the region in 1981 to monitor bass fishing throughout the region. In 1991 a coldwater diary program was added to monitor trout fishing in streams and lakes on Long Island. Angler participation has fluctuated over the life of the program. Angler diary data has been used

to monitor stocking programs and the effects of regulation changes in both warmwater and coldwater lakes and streams. The program has also facilitated communication between the Regional Fisheries Unit and local anglers. Angler participation and catch rates in several different waters in the region over the life of the program will be reviewed. The strengths and weaknesses of the diary program over the past 30 years will be discussed.

### **Sixty years of angler data from Adirondack waters**

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Abstract: For the past 60 years Cornell University researchers have been collecting voluntary angling data from a variety of lakes and an extensive river fishery on private clubs in the Adirondack region. These long-term angling records provide insights into the trends in the quality and status of these fisheries, as well as changes in angler practices. Overall, these data have provided feedback regarding the response of these fisheries to changes in environmental conditions and changes in management practices. Historically, declining brook trout catches in the early 1960s alerted Cornell researchers to acidic conditions and the impact of acid precipitation in Adirondack waters. More recently, angler data in the past two decades have documented ongoing improvements in a number of lake fisheries in which stocking no longer occurs, demonstrating that these fisheries are now self-sustaining. In addition, recent comparisons of angler catch rates in lakes with known levels of fish abundance have helped us understand how fish behavior can influence angler success.

### **Over 40 Years of Assessing Lake Ontario's Trout and Salmon Fishery**

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Abstract: Lake Ontario supports a variety of fishing opportunities, but is best known for its trout and salmon fishery. This fishery did not exist 50 years ago when pelagic piscivores were nearly gone. Efforts to address environmental degradation and overly abundant alewife and sea lamprey were initiated by 1971. The Lake Ontario Sport Fish Restoration Program was drafted by 1972 with goals to reestablish a balanced predator-prey fish community and develop an intensive sport fishery. By the mid-1970s managers realized the need to measure fishing activity in the open waters as Lake Ontario was becoming a world-class fishery boasting the largest trout and salmon in the Great Lakes. Salmonid fishing effort increased through the early years of the program, declined through the 1990s but has remained stable for over a decade. The highest total salmonid catch rates in a 29-year data series have occurred since 2009, and since 2003 Chinook salmon catch rates were at the highest recorded. In recent years anglers have also experienced excellent catch rates for other salmonid species (e.g. brown trout, rainbow trout, and coho salmon). Continued monitoring of Lake Ontario's multi-million dollar fishery is essential for measuring progress towards the Fish Community Objectives that guide management.

### **Assessing Changes to New York's Stream Trout Fishery**

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**Abstract:** Every year thousands of anglers flock to New York's 3,000+ miles of streams to catch a variety of native and introduced trout species. Stocking has long been used to support this interest, with the first records of brown and rainbow trout stocking dating back to the late 1800's. Since the 1980's the state has used a philosophy known as Catch Rate Oriented Trout Stocking (CROTS) to guide stocking and management decisions. A 30 year-old model, however, may no longer accurately represent the fishery it was created for. We undertook a three year research project to examine the current state of NY's stream trout fishery. Creel censuses were employed to assess angler behavior and success, while in-stream electrofishing gave estimates of population abundance and change. We found a number of differences from the rates and assumptions historically used in the stocking model. Most notably, angler effort levels were lower than previously thought and catch-and-release fishing was far more prevalent. By combining this information with maximum-likelihood estimation we were able to estimate new parameters for the model that better reflect the current state of the fishery.

### **Lake Ontario tributaries angler survey**

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**Abstract:** Angler surveys of all the major tributaries to Lake Ontario in New York was conducted from September 2011 through April 2012. This was the first of the continuing surveys that followed the 2005-2006 and 2007-2008 baseline studies. The purpose of these surveys is to provide a long term data set consisting of periodic surveys to monitor trends in the Lake Ontario tributary fishery. Prior to the year 2005 study the last comprehensive tributary survey was the 1984 New York State Great Lakes Angler Survey. Four agents surveyed 21 Lake Ontario tributaries in 2011-2012. We used an instantaneous access site survey design on the Salmon River and an instantaneous roving design on the other tributaries. A total of 8,953 interviews were obtained. Total estimated effort for all tributaries was 1,582,428 angler hours. The Salmon River accounted for 68 % of the total with 1,077,316 angler hours. October had by far the highest monthly effort for all the non-Salmon River tributaries, with an estimated 203,735 angler hours, followed by November (110,913) and September (45,619). Peak effort on the Salmon River occurred in September and October. Seventeen of 21 tributaries surveyed had reported catches of Chinook salmon totaling 126,259 and 45,612, fish caught and harvested respectively. The Salmon River accounted for 68% (86,184) of the catch and 70% (31,915) of the harvest. Coho salmon were a small component of the tributary fishery only being caught in 11 of the 21 tributaries surveyed and totaling 30,857 fish. The Salmon River accounted for 95% of the coho catch (29,295) and 97% of the harvest (10,218). The estimated steelhead catch from all tributaries combined totaled 170,642, with the Salmon River accounting for the most fish (96,398). Sixteen of 21 tributaries surveyed had reported catches of brown trout for a total of 52,897, led by Maxwell Creek (10,330). Sixty percent of the anglers or parties surveyed on the Salmon River were non-New York State residents. The other "high use" tributaries (Oswego

River, Oak Orchard, South Sandy, and Eighteenmile creeks) ranged from 33 to 55% non-residents.

## Contributed Oral Presentations

### **Black Spot Infection: The Relationship Between Fish Body Condition, Infection Prevalence, and Cyst Abundance in The Seneca Lake Watershed**

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Abstract: Black spot infection, caused by a trematode, has been observed in increasing prevalence in fish populations of the Seneca Lake watershed. From the beginning of June to the end of July 2013, the infection status of two host species *Rhinichthys atratulus* blacknose dace and *Semotilus atromaculatus* creek chub was closely monitored. By electrofishing a 75-meter site at five infected tributaries each month, the possible relationship between infection and body condition of these host species was studied using measurements of length and weight. Using these morphological measurements, we discovered that there is a slight decrease in body condition of infected fish when compared to non-infected fish. The results of these data, exploratory dissections, as well as a photo analysis, were used to determine where the trematode embeds most frequently and how the abundance of cysts may impact the body condition of host fish. We concluded that there is a relationship between the total number of cysts and body condition in creek chub, and that the parasite encysts most frequently in the section below the lateral line, between the pelvic and anal fins, of both blacknose dace and creek chub.

### **Late-spawning suckers in Adirondack ponds, 2013 and earlier**

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Abstract: Fish taxonomy is a dynamic field of study and new species are being described at an increasing rate. Some populations of late-spawning suckers of the eastern Adirondacks have behavioral, physical and genetic differences that suggest they are a different species. The behavior of late-spawning suckers is unique to the Adirondack region and includes at least one species in NY that is not found elsewhere. The Summer Sucker (*Catostomus utawana*) of the western Adirondacks was redescribed in 2007 by Morse and Daniels and is part of this story, but another late-spawning group found in ponds of the eastern Adirondacks has different characteristics. Spawning after mid June has been an enduring character of both of these groups. Characterizing these fish has been hampered by their physical similarity (cryptic) and the difficulties of completing thorough field work in remote areas. We are making an appeal to those catching fish in Adirondack ponds to tell us if suckers that they catch fit a pattern of late spawning and females have tubercles. If so, fin tissue should be stored for genetic work and whole specimens should be preserved for further research. This presentation provides recent field observations and laboratory results about these late spawners.

### **Northern Snakeheads in New York City – Results of Seven Years of Monitoring**

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Abstract: A population of northern snakeheads *Channa argus* was discovered in two connected lakes in Queens, NY in 2005 and annually monitored by boat electrofishing from 2006 to 2013. During this time the snakehead catch rate has varied between 0 – 7.5 fish/hour showing no trend towards an increasing or decreasing population size. Catch rates of other fishes showed variations depending on species but also showed no trend in catch rates. Largemouth bass were not captured or observed in electrofishing surveys from 2006 – 2009 but were found in both lakes beginning in 2010 and in all surveys of Willow Lake since 2010, but not in Meadow Lake. Despite being in suitable habitat the Queens northern snakehead population has apparently not increased from 2006 to the present. Potential causal factors in this lack of or delay in population increase include water quality and presence of other fish species, although the exact reasons for this lack of population growth are unknown.

**Status of a Radiotelemetry Study of Movements of Hatchery-Reared Brook Trout (*Salvelinus fontinalis*) Released into Shu Swamp Nature Preserve, Mill Neck, NY.**

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Abstract: Shu Swamp Preserve (29 hectares) is part of the Oyster Bay Stewardship area and contains Beaver Brook, the only officially recognized spawning area ground of Brook Trout (*Salvelinus fontinalis*) in western Long Island. Beaver Brook (1.2 km length) empties into Beaver Lake (26 hectares), which exits via dam into the Mill Neck estuary. Beginning in the early 2000's Beaver Brook was restocked with adults and fingerlings raised from eggs by children participating in Trout Unlimited's Trout in the Classroom program. Cold Spring Harbor Fish Hatchery has provided adult fish and eggs. Stocking efforts have shown success; since 2008 YOY have been observed in late winter/early spring. Our goal is to document and understand the success of acclimation of hatchery-reared brook trout to formerly native habitats. Initially we are monitoring movements of tagged mature and immature hatchery-reared trout released into Beaver Brook. Since June 2012 we have PIT-tagged 232 mature trout and radio-tagged 27 immature trout and five mature trout. Pit tags are detected at the entrance of Beaver Brook into Beaver Lake and the Beaver Lake spillway. Locations of radio-tagged fish were determined twice weekly. 41% of PIT tags were detected at the lake entrance and 10% at the spillway; most occurring soon after release. There was no evidence of sea-run type migration. Radio-tagged trout typically moved downstream upon release (mean = 228 m). During the life of the tag, trout tended to establish 1-4 residencies (mean = 12 days). Residencies were interrupted by translocations from 10-430 m in distance.

**Brook trout population dynamics in a changing climate**

Authors: Dr. Cliff Kraft<sup>1</sup> and N. Thomas Daniel<sup>1</sup>

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Abstract: Brook trout (*Salvelinus fontinalis*) are a dominant fish in waters ranging from the Appalachian Mountains to the Arctic Circle. Although their highly variable life history has allowed them to colonize coldwater habitats in streams, lakes and coastal ocean waters, these popular sport fish face an uncertain fate in light of several climate change scenarios. Assessing the potential influence of variable temperature and hydrological regimes on brook trout populations poses an important challenge to fisheries biologists. For the past four years we have estimated brook trout population size and mortality in three Adirondack lakes with contrasting thermal conditions by conducting a robust design mark-recapture study. Each lake provides ample, minimal or no thermal refuge during the warm summer months due to differences in morphometry, landscape position and stratification. We expect to see reduced brook trout survivorship in lakes with little to no thermal stratification because lethal temperatures often occur throughout these lakes in mid-summer. We captured fish in gill net and trap net surveys in these and several other Adirondack lakes in an attempt to compare results from our labor-intensive robust design population estimates with

less intense survey methods. By comparing the results of our robust design mark-recapture study with our gill net and trap net surveys, we also hope to evaluate the degree to which the latter, less intensive, methods accurately reflect brook trout population characteristics.

### **The distribution of larval sea lamprey and their nutritional sources in Hudson River Tributaries**

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Abstract: Sea lampreys (*Petromyzon marinus*) are a member of the Northeast's anadromous fish community, but have largely been ignored because of human preconceptions. As a result even the distribution of sea lampreys is poorly understood throughout its native range, which includes the Hudson River and its tributaries. Sea lampreys are sensitive to many environmental pressures including temperature, and will likely rapidly respond to climate change. Therefore, it is important to know where populations are currently located so that future work can determine if changes in distribution occur. Sea lampreys are currently present in four tributaries of the Hudson River: 1) Cedar Pond Brook, 2) Catskill Creek, 3) Roeliff Jansen Kill, and 4) Rondout Creek. Catskill Creek is the most important for sea lampreys in the Hudson River, as it contains the largest stretch of habitat available for migrating adults and excellent larval habitat.

Additionally, stable isotope analyses of larval lampreys and benthic macroinvertebrates were conducted to compare their ecological roles in those tributaries. Site influenced the importance of terrestrially derived plant material (allochthonous) and aquatic plant sources (autochthonous) to sea lamprey larvae. For instance, larval lampreys from the Catskill depended up to 60% on allochthonous sources, while those at Cedar Pond Brook only obtained ~1% of their nutrition from the same source. Changes in watershed land use were not associated with nutritional source dependence, and variability of local sources may be more important than watershed level effects. Larval lampreys were isotopically distinct from all macroinvertebrates measured, suggesting that they exploit resources in different proportions from measured invertebrates and help more fully utilize organic material in streams. This study provides important data about the current distribution of sea lampreys in the Hudson River, and is the first to examine sea lampreys and the invertebrate community simultaneously with stable isotopes.

### **Evidence of Cisco Spawning in Chaumont Bay, Lake Ontario.**

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Abstract: Cisco *Coregonus artedii* are an important prey fish for many Great Lakes predators, including lake trout *Salvelinus namaycush*. Their numbers have declined drastically in the last century due to the impacts of invasive species such as sea lamprey *Petromyzon marinus* and alewife *Alosa pseudoharanguis*, overfishing, and habitat degradation. Chaumont Bay, New York contains one of the last remaining spawning populations of cisco in Lake Ontario. In November and December of 2013 we attempted to identify the spawning site in Chaumont Bay using radio telemetry. 25 fish were tagged with radio transmitters and tracked through the bay. Future work on this project includes location and genetic identification of cisco eggs and hatched larvae, investigation into the possible predation on larvae by invasive alewife, and modeling of other potential spawning sites in Chaumont Bay.

### **Differential impacts of Tropical Storm Irene on trout populations in the Upper Esopus Creek basin**

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**Abstract:** The Upper Esopus Creek, in the eastern Catskill Mountains of New York, was subjected to extreme flooding from Tropical Storm Irene on August 28, 2011. Discharge at several USGS stream-flow gages in the basin approached or surpassed levels corresponding to the one percent chance of occurrence (>100 year flood). Although comparable floods have been found to severely reduce species abundances and disrupt entire ecosystems, the actual impacts on resident biota in the Esopus were only speculative. Fishery population and community data from quantitative surveys done at 9 sites during 2012 and 2013 in the Upper Esopus Creek were compared with data from annual (2009-11) surveys done before Tropical Storm Irene to characterize the potential impacts and recovery in streams across the basin. Preliminary analysis indicates that the floods did not have a strong adverse impact on overall fish communities, and fish density and biomass actually increased at some locations following the flood. Brown trout populations rebounded quickly while rainbow trout densities continue to decline and their age structure remains unbalanced. These findings not only gauge ecological impacts and prospects for recovery, but also help define the conditions or management practices which might lessen or prevent ecosystem damage from future extreme events, which are expected to occur more frequently under changing climatic conditions.

### **Susceptibility of goldfish to viral hemorrhagic septicemia virus type IVb by intraperitoneal injection**

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**Abstract:** To our knowledge no one has tested in vivo susceptibility of goldfish *Carassius auratus auratus* to viral hemorrhagic septicemia virus type IVb (VHSV). In 2013, two challenge experiments were conducted where goldfish were injected with a high dose of VHSV. The 24 control fish and 96 experimental fish were randomized into 3 and 12 plastic tanks (15 L), each containing 8 fish, respectively. We observed 10% mortality in the VHSV-injected fish. Forty-two percent of pooled organs and 79% of brain samples from survivors were positive by qRT-PCR at the end of the 42-day experiment. A second experiment was conducted with the same dose and challenge method to observe histological lesions in the affected goldfish. Two control fish and five experimental (VHSV-injected) were sampled each week for 5 weeks. Moribund fish were again euthanized with MS-222. The left pectoral fin was removed from each specimen to determine its infection status with qRT-PCR. Then each goldfish was fixed in 10% neutral buffered formalin for 48 hours, decalcified for 2 weeks in an EDTA solution, and processed for histological evaluation. We observed 20% mortality (5/25) in VHSV-injected fish and 40% (10/25) of fin samples were positive by qRT-PCR. Characteristic lesions will be presented.

### **More than the sum of its parts: A discussion on the combined effect of anthropogenic pollutants and dams on river fish**

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Abstract: Many rivers that are dammed are also heavily polluted. There are multiple ways in which dams and anthropogenic pollution could interact to change the way they affect fish. Dams stop fish from reaching cleaner streams up river and may cause fish to spawn in more polluted areas. Pollution alters behavior and physiology, and thus affects a fish's ability to navigate out of dam reservoirs or up fish-passages. Dams may affect the spread of pollutants by concentrating them in the water of the dam reservoir or in sediment, to be remobilized at flood or dam-removal. Decreased amount of water released from a dam through diversion, seasonal storage or increased evaporation would increase pollutant concentration downstream if the source of the pollutant is also downstream of the dam. Dams also change the temperature regime of a river, affecting breakdown of pollutants as well as the uptake rate of pollutants in fish through changed respiration rate. These effects and their implications on different types of fish highlight synergies that are generally ignored, but are important considerations as more dams are proposed worldwide.

### **MS Thesis Idea: Sampling and 3D Distribution of Mysid “Shrimps”**

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Abstract: Mysid “shrimps” (*Mysis diluviana*) form an integral part of the Great Lakes food web. They comprise a substantial portion of the biomass in the Great Lakes, and have many complex interactions with other species. Understanding Mysids is important for managing and responding to the system. Important to this are their spatial distributions, which play a major role in their ecology. I want to fill some knowledge gaps about their distributions. We understand vertical distributions and what drives them fairly well; but the recent vertical restructuring of Lake Ontario requires us to reassess this knowledge. Also, we have a poor understanding of horizontal patchiness in their distributions and the mechanisms behind them. Before I analyze these, however, I need to ensure that the acoustic data I am using is founded on solid relationships. The objectives of my thesis research are to: 1) strengthen target strength to length relationships for Mysids, 2) estimate lake-wide abundances and biomass in Lake Ontario for 2013, and 3) describe 3-D distributions and identify driving factors. This will be important for understanding trophic and other interactions of Mysids.

### **An Overview of Recent Developments in Native Fish Management in New York**

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Abstract: The management of rare and endangered fish in New York has made significant advancements in recent years. Increasing attention is being paid to non-sport fish community members, as well as shifts in the approach to management of some sportfish. Activity by the DEC and partners in the past year will be reviewed and discussed.

### **Response of stream chemistry and young-of-year brook trout to lime applications in acidified tributaries to Honnedaga Lake**

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Abstract: Despite decades of atmospheric acid deposition, a heritage brook trout population has survived in Honnedaga Lake in the Adirondack region of New York. Open-lake trap net catches declined throughout the 1970s, when brook trout were considered extirpated from the lake but survived in some

circum-neutral tributaries. Amendments to the Clean Air Act in 1990 mandated reductions in sulfate and nitrogen oxide emissions. By 2000, brook trout had re-colonized the lake coincident with reductions in surface-water sulfate, nitrate, and inorganic aluminum. Brook trout are currently absent or at low densities in 78% of tributaries that are either episodically or chronically acidified with associated toxic inorganic aluminum levels ( $>2 \mu\text{mol/L}$ ). The acidified nature of most tributaries was hypothesized to limit the distribution and abundance of young-of-year trout and the size of the adult brook trout population in the lake.

We are investigating the potential to accelerate the recovery of brook trout abundance through lime applications to tributaries. Water chemistry and young-of-year brook trout response to lime application was assessed in two episodically acidified tributaries. Early results show comparable increases in pH and decreases in inorganic aluminum in both tributaries; while young-of-year brook trout density increased 3- to-10 fold in one tributary but was not different in the other tributary. The differential response by young-of-year brook trout appears to be related to the amount of groundwater inputs and spawning activity specific to each tributary.

### **Using Stable Isotope Analysis of Archived Fish Scales to Study Trophic Dynamics**

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**Abstract:** The use of stable isotope analysis is a burgeoning technique in fisheries science, with a multitude of potential applications. Isotopes of nitrogen and carbon have been used to trace migrations, determine trophic structure, and examine ontogenetic niche shifts. Fish scale samples can be used for these purposes; however, analysis of scales has previously been limited to the final years of growth due to collagen underplating on older annuli. By removing collagen from the scales and analyzing the external layer of individual annuli, we were able to creating a time-resolved, whole life trophic history from archived scale samples. Scales from ten adult brown trout (*Salmo trutta*) caught in Onondaga Lake NY, were processed using this method. Carbon and nitrogen isotope analysis was performed on individual annuli to determine trophic level during the time of annuli formation. Results from our comparison of treated and untreated scales showed that this method was successful. The nitrogen isotope values between the first and last year of growth increased in all individuals, indicating a shift in trophic level. Furthermore, the largest increase typically occurred after the second year of growth, which may signify an ontogenetic niche shift or a migration from stream to lake. Our results indicate that this technique can be useful for studying long term changes in trophic dynamics and the effects of a changing climate.

### **Do Lake Ontario salmonid diets reflect prey fish community dynamics?**

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**Abstract:** Nutrient reductions and species invasions have altered Lake Ontario's prey fish community over the last 30 years, but it is not known if such changes are reflected in salmonid feeding behavior. Some of the most potentially important changes involve general declines in abundance and shifts in species dominance in both pelagic and benthic prey fishes. Using a suite of data sources we developed a 30 year time series of salmonid diets, collected by cooperating anglers, to determine if changes observed in the prey fish community are also evident in piscivore diet samples. We found that piscivore diet composition generally reflected prey fish community dynamics in piscivores that consumed benthic fishes (slimy sculpin, round goby), with little change in salmonids that relied heavily on pelagic prey fishes (alewife, rainbow smelt). Round goby density has increased over the past five years and is now a large proportion

of brown trout (44%) and lake trout (15%) diets. Additionally, round goby were the dominant prey fish consumed by smallmouth bass and yellow perch in 2013. Alewife was the dominant prey fish consumed by all salmonids, during all years, with rainbow smelt the second most common species. Lake Ontario supports a multimillion dollar sport fishing industry that contributes to local economies in New York and Ontario. The fishery is primarily based on anglers targeting salmonids, but smallmouth bass and yellow perch are also important. Understanding the interaction between piscivore foraging behavior and prey fish community dynamics will allow managers to make more informed decisions about sport fish management in response to changes in the Lake Ontario ecosystem.

### **Variation in fatty acid signatures of Lake Ontario prey fish**

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Abstract: Fatty acid signatures (FAS) are currently used in food web studies to provide insights into long term feeding habits of predators based on the degree of similarity between their FAS and that of their prey. To date, FAS data of fish from Lake Ontario are limited and are required to better understand possible energy connections between nearshore and offshore environments. In this study, three major prey fish (alewife - *Alosa pseudoharengus*, rainbow smelt - *Osmerus mordax*, and round goby - *Neogobius melanostomus*) were collected at three sites along the south shore of Lake Ontario (Olcott, Rochester, Oswego) at nearshore (<70 m) and offshore (>70 m) locations. Using multivariate statistics, we will compare species FAS as well as their spatial variation. These data will further our understanding of predator-prey interactions in Lake Ontario's food web.

### **Diel changes of vertical fish distribution in the Lake Ontario offshore: potential impact to utilization of the deep chlorophyll layer**

Authors: Milan Riha<sup>1</sup>, Maureen Walsh<sup>2</sup>, Toby Holda<sup>1</sup>, and Lars Rudstam<sup>1</sup>

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Abstract: Change in productivity of the Lake Ontario offshore caused shift in vertical structuring of lower trophic levels and increase in importance of the Deep Chlorophyll Layer (DCL). Most of algae and zooplankton are currently present in cold meta- and hypolimnetic water during summer. These shifts in the structure of lower trophic levels leads to the question of if and when fish use the zooplankton in the DCL? The objective of this study was to describe the diel vertical distribution of fish in the Lake Ontario offshore during summer (July – September) and determine which biotic and abiotic factors most strongly influence their vertical distribution (temperature, zooplankton distribution, etc.). The study was performed in the year 2013 as a part of large project focused on the whole DCL phenomenon (Vertical restructuring and nearshore-offshore gradients in Lake Ontario). Night gillnets catches were comprised mostly of alewife (98%) and confirmed the importance of this species for the offshore fish community. Alewife night time vertical distribution from gillnet catches were bimodal with one peak near the surface and the second in the lower epilimnion. Acoustic sampling confirmed the aggregation in the lower epilimnion but due to methodological constraints could not verify near-surface occurrence. During the day alewife schools were found deeper in the water than during the night and partly merged with merged in the DCL layer. Therefore, alewife may be feeding on zooplankton in the DCL during the day.

### **First evidence of behavioral toxicity to estuarine forage fish from exposure to the harmful dinoflagellate, *Cochlodinium polykrikoides*.**

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Abstract: Harmful algal blooms (HABs) caused by the dinoflagellate, *Cochlodinium polykrikoides*, have increased in geographic extent, frequency, and duration in coastal areas worldwide. These blooms have negatively impacted many coastal fisheries, causing mass mortalities of both wild and farmed fish. Forage fish species may be particularly susceptible to HABs as they feed on plankton and are highly abundant in coastal ecosystems where these blooms occur. While mortalities associated with HABs have been well documented for fish, the potential sublethal impacts fish behavior have not been explored. We conducted a series of behavioral toxicity experiments using a clonal laboratory culture of *C. polykrikoides* and three forage fish species common on the U.S. East Coast. *C. polykrikoides* caused significant sublethal effects to fish behavior, most notably increasing the mean speed of exposed fish. This research provides the first evidence of sublethal behavioral toxicity of *C. polykrikoides* to fish, improving our understanding of the potential ecosystem effects of this HAB.

### **Distribution of the deep chlorophyll layer (DCL) in Lake Ontario during 2013: a vertically restructured system.**

Authors: Annie Scofield<sup>1</sup>, James Watkins<sup>1</sup>, and Lars Rudstam<sup>1</sup>

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Abstract: Greater water clarity in Lake Ontario has led to a vertical redistribution of phytoplankton and increased formation of the deep chlorophyll layer (DCL). This shift has potential to provide an increased nutrition source for cold-adapted species, and understanding the mechanisms driving DCL formation and maintenance is a critical step toward predicting its ecological significance. As part of the Cooperative Science and Monitoring Initiative (CSMI) in 2013, we measured chlorophyll-a concentrations using both in-situ and extractive methods to map the distribution and strength of the DCL in Lake Ontario. During thermal stratification, a strong DCL developed offshore and was closely associated with thermocline depth, as well as subsurface maxima in dissolved oxygen and particle concentration. These results agree with surveys completed in 2008 and suggest that the DCL may be an important productivity and biomass feature. The shift in primary production from epilimnetic waters to the metalimnion may have important implications for the bioenergetics of zooplankton, mysids and fish such as native coregonids in Lake Ontario.

### **Juvenile river herring habitat use and migrations from Maine to Florida**

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Abstract: River herring (alewife, *Alosa pseudoharengus*, and blueback herring, *A. aestivalis*) populations have declined to a fraction of historic levels throughout their ranges, and most management efforts to protect and restore populations have experienced limited (if any) success. Many studies have focused on freshwater habitat use and emigration patterns of juvenile river herring but these generally focus on single watersheds. Using otolith chemistry, we can generally infer movements among fresh waters, estuaries, and the ocean, and also estimate size at emigration. Using this information, I was able to compare behaviors within each species throughout its range and investigate how general watershed characteristics such as length of river accessible to fish, watershed area, and urbanization might affect population traits, specifically size at emigration or time spent in a given habitat (freshwater or estuarine). I also compare how behaviors differ in rivers that both species inhabit versus those that only one of the species utilizes.

Understanding broadly how these species behave in different watershed types can have important implications for management and habitat restoration projects.

### **Dynamic seasonality of surface chl and whiting events in Lake Ontario tracked by remote sensing and shipbased platforms in 2013.**

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Abstract: 2013 was a year of intensive sampling in Lake Ontario through the binational Cooperative Science and Monitoring Initiative (CSMI). Several US and Canadian government agencies and universities collaborated to achieve lakewide coverage not seen since the international field sampling years of the 1970s. We use animations of remotely sensed surface temperature, chl *a* and particle concentration to track the seasonality of spring blooms, summer stratification, late summer whiting events, and the fall turnover. This provides an important context for the variable spatial and temporal extent of our collaborative efforts on several shipbased platforms. Remote sensing observations are nearly continuous in time and space and permit us to scale up to lakewide and growing season estimates. Shipboard measurements provide vital groundtruthing and document biological populations and important subsurface features such as the deep chlorophyll layer.

### **Estimating fishing behavior of the 11.8 m Yankee bottom trawl and potential influence on Lake Ontario fish community changes**

Authors: Brian Weidel<sup>1</sup>, Maureen Walsh<sup>1</sup>

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Abstract: Lake Ontario prey fish abundance indices are critical for fisheries management but are less applicable for analyses requiring density data, such as habitat use change, mass balance modeling, or across-lake comparisons. Density estimates require quantifying the area swept by bottom trawls over the range of fishing depths. We used trawl mensuration sensors and video to quantify the behavior of the 11.8 m Yankee bottom trawl commonly used to assess benthic fishes in the Great Lakes. Mensuration and video data illustrated bottom-contact time was positively related to fishing depth, with bottom-contact up to 6 minutes before the intended start time and up to 5 minutes after trawl haul-back was initiated. Trawl wing spread varied across depths (7.0 – 9.25 m) and was well represented with an exponential model. Combining models for time on bottom, net speed, and wing spread yielded an area swept range from 3000 - 10,500 m<sup>2</sup> (8-170m) for the same intended five minute tow time. Our results were similar to Lake Michigan-based Yankee trawl models with respect to time on bottom and total area swept. Using these area-swept estimates we demonstrate how trawl effort dynamics may influence our understanding of Lake Ontario fish community changes

## **Contributed Posters**

### **Feeding Ecology of Yellow Perch in an eastern Lake Ontario Tributary and Embayment**

Authors: Ross Abbett<sup>1</sup>, James Johnson<sup>1</sup>



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**Abstract:** We examined the feeding ecology of yellow perch (*Perca flavescens*) in the Salmon River estuary (n = 152) and in Sterling Pond (n = 153), from fish collected at 4-h intervals over a 24-h period. Yellow perch collected from the Salmon River were larger (54-196 mm) than fish collected from Sterling Pond (47-100 mm). Feeding activity peaked in the Salmon River at 0400-h and was high from 1600-h to 2400-h with the lowest activity at 1200-h and 0800-h. At Sterling Pond there was a distinct peak in feeding activity at 1600-h with lesser peaks at 0800-h and 2000-h and minimal activity at 1200-h and 2400-h. Amphipods were the dominant prey item for yellow perch in Sterling Pond (63.6%) across all time periods and during the crepuscular (1200-2000) and early morning (0400) periods (33.7%) in the Salmon River. Ephemeroptera and chironomids were the next frequently consumed food items in Sterling Pond comprising 11.9% and 7.3% of the diet respectively, whereas copepods and chironomids were second and third ranked for perch in the Salmon River comprising 13.0% and 12.7% of the diet, respectively. Diel variation in diet composition ( $\bar{x} = 0.87$ ) was greater for yellow perch in Sterling Pond than in the Salmon River ( $\bar{x} = 0.47$ ).

### **Effects of Adjustments to Correct Lake Ontario Trawling Locations**

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**Abstract:** Analysis of habitat effects on fish assemblages requires accurate correspondence of fish collections and geographic locations. Errors in recorded trawl locations can arise from equipment limitations or transcription errors and may result in erroneous fish and habitat correspondence. The USGS-NYSDEC trawl survey is the most extensive database of fish collections in Lake Ontario. This database is highly accurate, but some errors exist, the largest occur when there is a mistake in the coordinate data. Equipment limitations errors typically cause smaller geographic translocation than the transcription errors, but occurred more frequently in the database. The accuracy of trawl locations can be evaluated by mapping the reported locations and comparing the reported fishing depth with bathymetric data. The trawling locations were adjusted to the correct depth by the shortest possible distance. All accurate catches were associated with habitat data from the corresponding location and used to build fish prediction models. Two neural network models of Yellow Perch distribution in Lake Ontario were developed, one using the most restrained dataset (only samples not requiring adjustment) and the other including adjusted samples. The restrained model excluded many species absences and did not extrapolate as well as the more data rich model.

**Spatial Scale and Natal Influence on Spawning Site Fidelity in Northern Pike: Investigation using Otolith Microchemistry Techniques**

Authors: Ben J. Amos<sup>1</sup>, and John M. Farrell<sup>1</sup>

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Abstract: Reliance on wetlands for Northern Pike reproduction renders populations vulnerable to anthropogenic disturbance including habitat impairment and water level regulation. While spawning site fidelity has been well documented with tagging studies, few have attempted to directly address natal site fidelity. Integrated tagging and genetic studies in a Minnesota lake and the St. Lawrence River provide mixed evidence for natal site fidelity. Further, otolith microchemistry analysis did not support natal site fidelity in degraded Wisconsin waterways. Otolith microchemistry analysis of Baltic Sea Northern Pike showed evidence of natal homing in only 50% of study streams, separated by >50 km. Trace analysis of 3 St. Lawrence River tributary wetlands shows significant elemental differences among individual branches and associate bays. Otolith microchemistry analysis could provide insight into the natal origin of spawning pike. Two spatial scales will be investigated to examine the confounding influence of low dispersal on natal site distinction. Comparison of tributary spawning sites separated by 10-20 km representing coarse scales, to branches in closer proximity (<100m) provide an opportunity for a fine-resolution analysis. A more complete understanding of spawning site fidelity would enhance our mechanistic view of Northern Pike population structure and influence conservation and management of reproductive habitats.

### **Lake sturgeon spawning habitat enhancement: coordinating three sonar technologies**

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Abstract: One suspected reason for persistently low lake sturgeon population levels is limited access to suitable spawning habitat: fast flowing water and gravel or cobble substrate. A dam regulates the Seneca River's flow from Cayuga Lake, potentially restricting sturgeon access to upstream spawning habitat. Spawning sized sturgeon have been observed below the dam during the spring spawning season. As part of a project to create suitable spawning habitat in this area, we used sidescan sonar to map substrates, multibeam sonar to map bathymetry, and an Acoustic Doppler Current Profiler to map summer water flow. Our poster outlines the use and results of these three sonar technologies. Combining these technologies, project partners will predict spawning season flow and select the optimal site for habitat enhancement. Pre- and post-enhancement sampling will assess changes in spawning activity.

### **Changes in fish distribution: 91,000 site records in the NY Fish Atlas**

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Abstract: Fish distributional patterns have many uses to field biologists, and many questions can be addressed with New York's wealth of fish records. These have been summarized in a map series on DEC's webpage showing changes before and after 1977. Changes in fish occurrence

within each of 300+ small watershed units (HUC-10) were also mapped within these periods, to show which fish have the greatest gains, like green sunfish. Other species show losses. Applications to GIS analyses are demonstrated.

### **Setting the stage for a multidisciplinary study of Summer flounder (*Paralichthys dentatus*) in Shinnecock Bay, NY**

Authors: Sara Cernadas-Martin<sup>1</sup>, Konstantine Rountos<sup>1</sup>, Ellen Pikitch, Ellen<sup>1</sup>

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Abstract: Summer flounder (*Paralichthys dentatus*) is one of the most recreationally important marine species along the Northeast US coastline. Although spawning, hatching and larval dispersion occur on the continental shelf, larvae grow and develop in estuaries and bays until reaching maturity. Shinnecock Bay is an estuary that fulfills this role, serving as a critical nursery ground for many fish species. In order to comprehensively assess the population status of Summer flounder in Shinnecock Bay, we first analyze data from three years (2011-2013) of a fisheries independent benthic trawling survey. This survey provides useful data on the relative abundance and size frequency of Summer flounder in the Bay in relation to habitat type (i.e. seagrass, sand, mud), providing the preliminary information necessary to design a more robust study. We propose and outline a multidisciplinary approach to achieve our objectives which consists of 1) stock isolation and inbreeding levels through molecular genetics analyses, 2) ecosystem relation with Summer Flounder through stable isotopes analyses, 3) statistical population modelling and 4) quantifying recreational and artisanal angling effort.

### **Diel Feeding Ecology of Slimy Sculpin in Skaneateles Lake, A Finger Lake in Central New York.**

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Abstract: In the fall of 2002, we examined the diel feeding ecology of slimy sculpin (*Cottus Cognatus*) from Grout Brook, a tributary to Skaneateles Lake. Of the six time periods examined, slimy sculpin consumed the least during the nighttime (2400h and 0400h). Chironomidae were the major prey consumed the most during all time periods except for 2400 where Ephemeroptera was consumed the most. There was little preference for food in the drift ( $0.15 \pm 0.02$ ) and a moderate preference for food from the benthos ( $0.59 \pm 0.06$ ). Diptera (Chironomidae), Ephemeroptera (Baetidae) and Trichoptera (Brachycentridae) were the major taxon in both benthic communities. According to the prey selection analysis, slimy sculpin do not appear to select specific prey but behave opportunistically to what is available in the brook. Computed daily ration and index of fullness equations were  $y=0.0007x^{0.4433}$  and  $y=1.1265x^{-0.557}$ , respectively.

Education and Early Detection Programs for Aquatic Invasive Species in the Finger Lakes

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Abstract: The Finger Lakes are important to the economy of upstate NY. The lakes provide drinking water, recreational opportunities, and scenic views for residents and visitors alike. Every year new aquatic invasive species are being found in the lakes, and these threaten water quality and fish habitat. The Finger Lakes Institute at Hobart and William Smith Colleges led a watercraft steward program during the summer of 2012 and 2013. The purpose of the program is to educate boaters, anglers, and other launch users about how to prevent the further spread of these invasive species into the Finger Lakes, Great Lakes, and other waterbodies. In addition to cleaning boats and educating boaters, stewards collected data on the following for each watercraft launch and retrieve: time of day, registration state, type of watercraft, and previous waterbody visited. As part of the 2013 program, additional research was initiated to better understand some of the social aspects of the invasive species issues such as public perceptions, attitudes towards, and knowledge of invasive species, as well as amenability and support for various management techniques and policy approaches that can be used to deal with aquatic invasive species issues. Results from these efforts will be presented.

### **Eastern Brook Trout Joint Venture (EBTJV) Stream Surveys in NYSDEC Region 9: 2010 to 2013**

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Abstract: In 2006, the Eastern Brook Trout Joint Venture (EBTJV) reported that HUC 12 level watersheds in NYSDEC Region 9 contained wild brook trout (*Salvelinus fontinalis*) populations mainly categorized as “greatly reduced” or “extirpated”. However, this analysis was based mostly on old or very incomplete sampling data. As a part of the NYS Brook Trout Conservation Strategy, Seasonal Fishery Technicians evaluated streams in Region 9 to determine the current distribution of wild brook trout and other wild trout species, current threats, potential areas for brook trout restoration initiatives and which streams needed water classification upgrading to protect them from unregulated disturbance. From 2010-2013, 1,583 streams were evaluated, 1,322 of which had never been sampled before. In 1,296 streams electrofished, we found allopatric populations of wild brook trout in 142 streams and 52 streams where brook trout existed sympatrically with brown trout (*Salmo trutta*) or rainbow trout (*Oncorhynchus mykiss*). Wild brown trout occurred in 213 streams and wild rainbow trout in 31 streams. Of the 373 streams where wild trout populations were found, 63% are not protected from unregulated disturbance and 98% are not classified as wild trout streams. A total of 279 potentially impassible culverts were identified in the surveys.

### **Composition of Fish Assemblages in Seneca Lake Tributaries**

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Abstract: Sensitive fish species are influenced by degraded water and habitat quality associated with certain landuses. A survey of fish assemblages was conducted to learn more about the patterns of species distribution and impacts of environmental stressors within each stream and watershed. Fourteen streams in the Seneca Lake watershed were electrofished (75m reach) in June 2011 and 2012. Species richness varied across stream sites with highest fish species richness found in Wilson Creek (9) and lowest in Plum Creek (2; mean = 5.4). Fish abundance followed different trends, with highest abundance in Glen Eldridge (635 fish) and lowest in Wilson Creek (84 fish). The typical fish assemblage of these streams included *Rhinichthys atratulus* blacknose dace, *Semotilus atromaculatus* creek chub, *Campostoma anomalum* central stoneroller and *Catostomus commersoni* white sucker. The most common species of fish, blacknose dace, varied in abundance (mean = 198), composing between 22 -100% of the community sample. The only game fish species were found in Catherine Creek (*Oncorhynchus mykiss* rainbow trout and *Micropterus salmonoides* largemouth bass), Kendaia Creek (*Oncorhynchus mykiss*) and Hector Falls (*Salmo trutta* brown trout). The homogenization of assemblages found in these tributaries indicates concerns primarily through loss of fish habitat, sedimentation, and water temperature.

### **Basin specific condition, growth and diet for yellow perch, *Perca flavescens*, in Lake George, New York**

Authors: Brett D'Arco<sup>1</sup>, Jeremy Farrell<sup>1</sup>, Charles Boylen<sup>1</sup> and Sandra Nierzwicki-Bauer<sup>1</sup>

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Abstract: Gill netting was carried out in conjunction with the NYSDEC at 25 sites to determine interbasin differences of yellow perch, *Perca flavescens* in Lake George, New York. Health condition, growth and diet were analyzed for 737 yellow perch. The length-weight relationship exhibited significant differences amongst the basins for condition constants (b). The perch from the north basin exhibited allometric growth, while those in the south and Narrows displayed isometric growth. Relative weights were found to be below the general target range and had significant differences among the basins. Von Bertalanffy growth models were determined using total length versus age, as determined by microscopic examination of otolith annuli. Growth models of the basins showed variation in growth of yellow perch. The diets of fish from the different basins showed significant overlap (Schoener Index >0.6). However, mean percent count analysis of the prey categories revealed differences in consumption. A significantly higher mean percent count of clams was consumed by yellow perch in the north and Narrows than in the south. Insects had a significantly higher mean percent count consumed in the south than in the north. The differences in condition and growth may be due to a difference in prey consumption.

### **Fish Advisory Update for the Saint Regis Mohawk Tribe**

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Abstract: The first fish advice issued by the Saint Regis Mohawk Tribe (1986) was a precautionary response to the designation of three Superfund hazardous waste sites upstream of Tribal Waters on the St. Lawrence River. This advice for fish was primarily concerned with the persistent class of chemicals termed polychlorinated biphenyls or PCBs—although elevated PCBs were documented in waterfowl, amphibians, and some mammals. The advisories for Tribal Waters were effective at depressing fish consumption. Nearly 30 years later contaminant levels in fish have significantly declined; however, site specific impacts remain. Many tribal members desire to resume fishing, but complex advisories and risk perception remain significant barriers. To inform the decision making process of this advisory the Tribe utilized mailed fish and game surveys, in depth interviews with volunteers, and student interviews of elders. Funded by the Great Lakes Restoration Initiative and in partnership with the New York State Department of Health, this update includes simplified risk-groups, simplified geographic regions, and an emphasis on providing consumption options.

### **Fish assemblage differences among sampling gears in the Oswegatchie River Watershed**

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Abstract: The Oswegatchie River (from the mouth at the St. Lawrence River upstream to Natural Dam), the Indian River (from the confluence with the Oswegatchie River upstream to Rossie), and Black Lake were sampled for New York State listed fish species and all by-catch. Four gear types were used; a 30' hybrid bag seine with 1/4" mesh wings and 1/8" mesh bag; gill nets of varying dimensions; a Smith-Root boat electrofisher; and a Smith-Root backpack electrofisher. Gear selection was based predominately on water depth and substrate to maximize the gear's sampling capability. The deepest habitats were sampled with gill nets and the shallowest with backpack electrofisher. The seine was hypothesized to capture the greatest community diversity due to the abundance of small fishes in nearshore areas and the high gear efficiency. However, backpack electrofisher samples had the highest Shannon-Weaver diversity and evenness values, whereas seine catches exhibited the highest species richness, based on standardized average fish abundance. Of the fish caught with all gear types, nine of the ten least abundant species were represented in backpack electrofisher catches, followed by three of those ten species in the seine. These fish assemblage findings are likely attributed to gear specific habitat composition in addition to gear efficiency.

### **Lake Sturgeon in the Oswegatchie River and Black Lake NY.**

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Abstract: One of the systems targeted for Lake Sturgeon restoration by the New York State Department of Environmental Conservation is the Black Lake and Oswegatchie River watershed. From 1995 to 2004 more than 20,000 fingerlings were released as part the restoration effort. Three key metrics considered essential for Lake Sturgeon assessment are spatial distribution, abundance, and size. In sampling from 2008 to 2013, Lake Sturgeon were found to be

widespread in Black Lake, present in the Indian River to the waterfall at Rossie, and were captured in all assessed sections of the Oswegatchie River upstream to Oxbow. Sturgeon/net/night (CPUE) varied from a low of 0.11 to 1.8 and 2.5 sturgeon/ night/ net in the Eel Weir section of the Oswegatchie. In Black Lake, CPUE's were between 2.5 and 4.8. The highest CPUE's in the system were observed at probable spawning sites, between 4 and 6.7 sturgeon/net/night. In 2013 the average size of sturgeon in the Oswegatchie was 1.03m and 7.8kg (n=30) and in Black Lake the average size was 1.32m and 16.8kg (n=31). The largest sturgeon caught was 1.67m (5.5 ft.) and 39.4kg (87 lb.). These three metrics provide a positive measure of the progress of sturgeon restoration in the Black Lake / Oswegatchie River system.

### **Habitat-assemblage modeling of aquatic macrophytes as a guide for enhancement of fish habitat**

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Abstract: Macrophytes are a dynamic and significant component of many aquatic systems, having profound beneficial and harmful effects both ecological and economic. We developed a model to predict aquatic macrophyte species assemblages and productivity for sites with various environmental characteristics in the upper Niagara River, New York. The Niagara River is a large system (average discharge > 200,000 cfs at the origin) that supports productive macrophyte assemblages, which are often dominated by *Vallisneria americana*, *Stuckenia spp.*, and *Ceratophyllum demersum*. Non-native *Butomus umbellatus* was one of the most frequently encountered species even though it was undocumented in previous surveys of the Niagara River as recent as 2002. Coupled with previous research relating fish and macrophyte species assemblages in the Niagara River, this model could be incorporated into the design of future habitat enhancement projects aimed at benefitting desirable species of fishes in the Niagara River. Seasonal changes in macrophyte species assemblages and productivity were also investigated.

### **Mercury levels in Blacknose dace from Seneca Lake tributaries (2011-2013)**

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Abstract: Mercury (Hg) is a common pollutant in aquatic systems, an issue of significant importance since the ingestion of fish with high methyl mercury (MeHg) levels can result in a number of deleterious health effects in humans and other organisms. Determining mercury levels of fish in streams, as well as lakes, is important since both tributaries and watersheds are known locations of MeHg production and bioaccumulation. This study presents variations in total mercury (HgT) concentrations in blacknose dace (BND), a small ubiquitous omnivorous fish, from several Seneca Lake tributaries over a three year period. Large differences in BND HgT concentrations were observed among the sampled Seneca Lake watershed tributaries; however, mercury levels in tributary BND's are on average below those previously reported for yellow perch, smallmouth bass, and lake trout from Seneca Lake. Though fish from most

tributaries exhibit fairly consistent HgT levels from year to year, fish sampled from Hector Falls Creek have shown a marked increase in HgT since 2011. Also, elevated HgT concentrations are observed in BND from the more urbanized Castle Creek and Reeder Creek. Based on our preliminary analyses, it appears that the BND is an excellent indicator species for observing temporal and spatial mercury trends.

### **Changes in Observed Fish Community Structure Due to Immediate Replication of Beach Seine Haul**

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Abstract: Two beach seine hauls were done in succession over the same area, while sampling fish in the Oswegatchie River watershed, in an attempt to get a more accurate sample of the fish community. A total of 41,453 fish of 47 species were captured out of the 101 sample sites and 202 hauls. There were notable differences in the composition of fish between hauls. The number of species captured increased by an average of 1.13 in the second haul. Furthermore, some fish species were more likely to be caught in the second haul, including rock bass, pumpkinseed, bluegill, creek chub, brook stickleback, and central mudminnow. These fish may have failed to evade the seine on the second run due to high turbidity created by the disturbance of the first haul or they may have been attracted by disturbed benthic prey items. Conducting two seine hauls over the same area may provide a more accurate representation of an area's fish community, but the cause of replicate differences needs more investigation.

### **Nearshore zooplankton community change in Lake Ontario from 1995 – 2010**

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Abstract: We compared lower trophic level parameters from seven nearshore (10-15 m bottom depth) sites along Lake Ontario's south and east shores from 1995 – 2010 to examine spatial and temporal changes in the nearshore zooplankton community. Zooplankton density and biomass declined significantly at sites closest to the St. Lawrence River but not at sites near the mouth of the Niagara River. Declines were most evident in July and October—times of peak *Cercopagis* and *Bythotrephes* biomass. July and October zooplankton density and biomass declined significantly due to declines in bosminids, daphnids, and cyclopoids. There was no trend in either spring TP or seasonal Secchi depth, but summer chlorophyll *a* increased significantly. Change points were detected in chlorophyll *a*, and July and October zooplankton density and biomass at times corresponding to the arrival of *Cercopagis* and increase in *Bythotrephes*. Nearshore patterns are similar to published findings for offshore waters.

### **Environmental Determinants of Sex Ratio in St. Lawrence River Northern Pike (*Esox lucius*): Development of a Molecular Sex Identification Tool and Experimentation with Physical and Chemical Variables**



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Abstract: Sex determination and gender ratio within fish populations can be influenced by environmental factors and selective mortality and therefore represents an important marker of population health. Despite its value, sex ratio is typically assessed in mature adult fish during the reproductive phase or through internal examination. Gender determination at early stages of development (e.g., egg and larval) presents a challenge because gonads are not identifiable precluding investigation of sex linked biological processes. We propose the development of a molecular diagnostic tool to determine gender at any life stage. Based on next generation sequencing data, a cDNA library can be developed to produce gender specific transcriptomes whereby male linked markers can be identified. If successful, the male specific assay will be used in experimental trials to test environmental factors hypothesized to influence expected sex ratios. Northern Pike males are heterogametic (XY chromosomes) and a 50:50 male to female sex ratio is expected, but in the St Lawrence River, ratios exhibit female dominance (25:75). Specifically, we will investigate temperature, dissolved oxygen, and xenoestrogen treatments on gender for Northern Pike eggs and larvae. Results will be used to enhance understanding of mechanisms driving Northern Pike sex ratio in the St. Lawrence River.

### **The Effect of Largemouth Bass on Adirondack Freshwater Ecosystem Communities**

Authors: Laura Kinhead<sup>1</sup>, Jeremy Farrell<sup>1</sup>, Charles Boylen<sup>1</sup> and Sandra Nierzwicki-Bauer<sup>1</sup>

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Abstract: The Adirondack Effects Assessment Program consistently surveyed the biotic communities of Lake Rondaxe, Dart Lake, and Moss Lake from 1994 through 2006. During this time period, largemouth bass (*Micropterus salmoides*) were first detected in Lake Rondaxe in 1998, and spread to Dart Lake and Moss Lake by 2000 and 2003, respectively. Fish, zooplankton, and phytoplankton community data from this chain of interconnected lakes were analyzed through discriminant analysis for measurable changes in the ecosystem of each lake related to the presence of largemouth bass. A discriminant analysis function was built that maximally separates between two groups (presence or absence of largemouth bass) from predictor variables including catch rates for eight species of fish, total concentrations of crustaceans, rotifers, and six phytoplankton taxonomic groups. The discriminant analysis results indicated significant differences in community structure (fish, zooplankton and phytoplankton) before and after the detection of largemouth bass with a classification accuracy of 87% of the 60 sampling events. When a one year delay was permitted for presence of largemouth bass to the discriminant function, 98% of the 60 sampling events were classified correctly. This increase in accuracy suggests that the presence of largemouth bass generates a measurable effect on the community structure within one year. Yellow perch and pumpkinseed were the only fish to show increases in abundance with largemouth bass presence, although the predictor values were not strongly weighted. Decreases in catches of common shiner and creek chub were the strongest predictors of the presence of largemouth bass, followed by decreases in total crustacean concentrations. Diatoms were the most affected group of phytoplankton by the presence of

largemouth bass. This research demonstrates the cascading effects of an introduced top predator on the community structure within interconnected lakes.

### **Toxicity of Oxytetracycline (OTC) to Larval Lake Herring**

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Abstract: Restoring native preyfish populations into Lake Ontario is a joint effort by the New York State Department of Environmental Conservation, U.S. Geological Survey, U.S. Fish and Wildlife Service and the Ontario Ministry of Natural Resources. Lake herring (*Coregonus artedii*), a native prey fish was once abundant in Lake Ontario. Interest in the restoration of lake herring has given rise to new culture techniques and methods for marking prior to release. We evaluated the toxicity and usefulness of Oxytetracycline (OTC) as a marker on bony structures, in particular the otolith. Newly hatched (1-d) and 5-d old lake herring were immersed in concentrations ranging from 0 to 1600mg/L OTC for 6-h. Survival of lake herring fry at 24,48,72, and 96 hours was not effected at concentrations up to 400mg/L OTC. We determined LC50 values (concentrations causing 50% mortality) to range from 847 to 968mg/L and 894 to 1066 mg/L for 1-day-old and 5-day-old larvae, respectively. One-day-old larvae tended to be more sensitive to the OTC treatment than the five day old larvae. Although our results suggest that immersion is safe at 400mg/L OTC, we found no visible marks on their otoliths. We suggest further studies into using higher concentrations of OTC or possibly using a different chemical (Calcein) to produce a visible mark on the boney structures of lake herring larvae.

### **St. Lawrence-Thousand Islands Yellow Perch Population**

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Abstract: The St. Lawrence River supports one of the major fisheries in New York State, ranking from second through fourth in angling effort during recent years, based on the Statewide Angler Survey. Most of this effort occurs in the 48 mile long stretch of river known as the Thousand Islands. A 2008-2009 creel survey reported that yellow perch (*Perca flavescens*) dominated catch in the St. Lawrence River fishery, with up to 1.34 million fish caught. Earlier surveys indicate that yellow perch have been a major part of the St. Lawrence River fishery for decades. Overall yellow perch abundance declined early in the survey period and has since fluctuated at a lower level as, for unknown reasons, annual survival declined. Growth, however, has generally increased, especially since 2005, probably due to the availability of goby (*Neogobius melanostomus*) forage. As a result of faster growth, despite generally reduced abundance, fishing quality may have actually improved as quality and preferred size yellow perch became more available.

### **Tools for Evaluation of Climate Change Effects on Fish Habitat**

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**Abstract:** Climate is predicted to become warmer with higher precipitation and more extreme storm events throughout the Great Lakes region. Climate change scenarios vary greatly and are difficult to link to changes in fish abundance or distribution. Building on the work of the Great Lakes Regional Aquatic Gap Analysis Project, we developed a set of probabilistic fish occurrence prediction models that were based on broad-scale habitat conditions linked to atmospheric climate change models. Those models were used to project the occurrence and distribution of selected fish species 50 and 100 years into the future. The vulnerability and sensitivity of fish stream habitat to climate change and opportunities for warmwater fish distributional expansion was measured and mapped. Coldwater fish, including brook trout are predicted to experience substantial distribution reduction and some opportunities for warmwater species to expand within the region; least and most vulnerable areas were evident. Model predictions, vulnerability measures, and ancillary landuse data have been captured in an interactive GIS mapper database system (FishVis) that allows users to examine projected changes to fish in any area of the US Great Lakes Basin from the stream reach to the entire region.

### **The Influence of Spawning Habitat on Round Goby (*Neogobius melanostomus*) Egg Predation for Broadcast Spawning Species**

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**Abstract:** Egg predation by Round Goby is a commonly referenced concern associated with their recent invasion of the Great Lakes. Surprisingly, few empirical studies have investigated Round Goby as egg predators. Nest building species (e.g. centrarchids) are known to resist egg predation due to nest protection; however, broadcast spawners may have greater susceptibility to predation as they do not guard their eggs. Additionally, broadcast spawning species vary significantly in their spawning habitat that may affect Round Goby egg predation outcomes. This study will examine how differences in spawning habitat influence Round Goby egg predation rates on four different broadcast spawning species. A laboratory experiment will be used to investigate Round Goby egg predation rates on Yellow Perch, Walleye, Northern Pike, and Muskellunge eggs in six different habitat treatments. A complementary field study will quantify density, distribution, and diet of egg predators in known spawning locations. Field comparisons of these four species will be used to determine the extent of egg predation in known spawning habitats. Laboratory and field observations will quantify habitat-specific egg predation risk by Round Goby among these four broadcast spawning species, helping managers to better understand the effects of the invasive Round Goby on native sportfish.

### **The development of a non-lethal index to determine sexual maturity in American eels (*Anguilla rostrata*)**

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Abstract: In recent decades eel populations have declined across the globe, making them of increased research and conservation interest. The catadromous, semelparous and panmictic nature of eels make them difficult to study and manage. The transition into a sexually mature adult (silver eel) is of particular interest because the conditions leading up to migration may determine individual maturation. Previous research strongly suggests eels need to reach a minimum fat content before maturity. The recent use of bioelectrical impedance analysis (BIA) in fisheries science to measure the composition and condition of fish, including fat content, may help in developing a non-lethal index of maturity in eels. BIA readings can be taken easily in the field without harming subject animals. A non-lethal index of silvering could be a powerful management tool for future research of catadromous eels. We collected BIA readings and morphometrics such as head length, eye diameter and fin length on eels caught in tributaries to the Hudson River to correlate with internal characteristics of maturity such as total lipid content, gonad weight and stomach weight. In one tributary we PIT tagged eels after measurements, then caught emigrating eels during the fall migration season to re-assess biometric characteristics.

### **Lake Herring Egg Development within a Hatchery Setting**

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Abstract: Restoration of native species into Lake Ontario is a binational effort. Specifically, Lake Herring (*Coregonus artedii*) populations over the last century have become severely reduced due to overharvesting and the loss of adequate spawning habitat. This has resulted in their replacement by non-endemic species such as the Alewife (*Alosa pseudoharengus*) and Rainbow smelt (*Osmerus mordax*). Since 2011-2012 efforts for developing culturing techniques at the Tunison Laboratory of Aquatic Science have been made in order to successfully raise and help reestablish Lake Herring as a dominant forage base using the remnant stock left in eastern Lake Ontario. In particular, we have found that the timeline for egg developmental stages though hatch appears to be based on temperature conditions. Lake herring eggs eyed up between 154-166 temperature units (TU's) and hatched between 381-403 TU's, with other developmental milestones occurring along the way. This information allows us to project incubation time requirements for each stage of early Lake Herring development regardless of temperature fluctuation.

### **Dietary transfer of fatty acids in juvenile yellow perch**

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Abstract: The objective of this study was to evaluate how dietary fatty acids are transferred from prey to predator. Two triplicate groups of juvenile yellow perch were fed two diets (*Mysis* sp. or bloodworm) for 36 weeks. Both diets presented a distinct fatty acid signature. At the end of the experiment, yellow perch fed *Mysis* sp. had a significantly higher growth rate (37 vs. -5%) and mortality (15 vs. 3%) than fish fed bloodworm. Yellow perch fed bloodworm did not experience weight gain throughout the experiment. Whole body lipid content was significantly higher in fish fed *Mysis* sp. than in fish fed bloodworm (5.8 vs. 1.4%). Some fatty acids of whole body yellow perch were reflective of their respective diet. Thus, fish fed bloodworm were rich in stearic acid (18:0) and linoleic acid (18:2n-6), whereas fish *Mysis* sp. contained high levels of eicosapentaenoic acid (20:5n-3). However, other fatty acids appeared to be conserved or synthesized throughout the feeding experiment (e.g., docosahexaenoic acid 22:6n-3). These results will be used in a quantitative fatty acid signature analysis to determine dietary component of predators.

### **Effect of the herbicide Sonar on the non-target toxicity of the lampricide TFM to warmwater and coldwater fish.**

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Abstract: Pesticides are applied to the environment when one, or several, nuisance species must be controlled. Sometimes, these chemicals impact species other than the target species, causing negative impacts on the environment. While all pesticides receive some aquatic toxicity testing, most of these tests do not account for the presence of other chemicals in the environment to which the pesticide is applied. An instance in Cayuga Lake shows potential for two pesticides to come in contact with each other. The inlet of the lake has become infested with an invasive plant species, *Hydrilla*. An active program to control this invasive plant includes treating the inlet with Sonar, an aquatic herbicide with the active ingredient of fluridone. This inlet will also be treated with the lampricide TFM (3-trifluoromethyl-4-nitrophenol) to control invasive sea lamprey. To further understand the potential synergistic effects that fluridone has on the toxicity of TFM to non-target fish species, we conducted toxicity tests using brown trout and fathead minnows. We found a statistically significant increase in the toxicity of TFM with fluridone present (6-h LC50 = 14.2 mg/L with fluridone vs. 6-h LC50 = 15.4 without fluridone) in brown trout. However, there was no significant increase in the toxicity of TFM when fluridone is present in fathead minnows. Fortunately the synergism seen in brown trout tests occurs at concentrations greater than lamprey treatment rates. Our results demonstrate the need for further study of the interaction of pesticides.

## **Characterizing temporal changes in black bass populations in New York lakes**

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Abstract: We have characterized how black bass relative abundance and relative weight have changed in lakes between 1988 and 2011. From a total of 50 lakes with largemouth bass relative abundance data, we identified decreasing trends in nine lakes and increasing trends in nine lakes. For the remaining 32 lakes, the trends were indeterminate. For 47 lakes with smallmouth bass relative abundance data, five showed decreasing trends and five showed increasing trends. Thirty-seven lakes had indeterminate trends. Of 20 lakes with spring-caught largemouth bass relative weight data, four lakes showed decreasing trends, two showed increasing trends, and 14 had indeterminate trends. Of the 7 lakes with relative weight data for spring-caught smallmouth bass, three showed decreasing trends, one showed increasing trends, and the remaining three had indeterminate trends. There were 17 lakes with relative weight data for fall-caught largemouth bass. Of these, six showed decreases, five showed increases, and the trend was indeterminate for an additional six lakes. Twelve lakes had relative weight data for fall-caught smallmouth bass. Six showed decreases, five showed increases, and four showed indeterminate trends. Grouping lakes as we have done may allow biologists to more effectively manage lakes.

## **Sampling Little Fish in Big Rivers: Larval Fish Detection Probabilities in Two Lake Erie Tributaries**

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Abstract: Larval fish are frequently sampled in coastal tributaries to elucidate factors driving recruitment, evaluate spawning success, and estimate production from spawning habitats. Because larval fish are small and unevenly distributed in space and time, and coastal tributaries are often large and heterogeneous, imperfect detection of the larvae of most species is likely. We estimated detection probabilities of larval fish from several taxa in the Maumee and Detroit rivers, the two largest tributaries of Lake Erie. We then determined how accounting for imperfect detection influences: (1) the probability of observing taxa as present, (2) density indices for larval fish of two Detroit River species, and (3) estimates of taxonomic richness of larval fish in the Maumee and Detroit rivers. We found that detection probabilities were highly variable among taxa but were always less than 1.0, indicating that imperfect detection is universal among taxa and between systems. In general, taxa with high fecundities, small hatching sizes, and no nesting behaviors had the greatest detection probabilities. Also, detection probabilities were greater in the Maumee River than those in the Detroit River. Accounting for imperfect detection greatly increased density indices for Lake Whitefish *Coregonus clupeaformis* and Gizzard Shad *Dorosoma cepedianum* but the effect was smaller for Gizzard Shad and during periods of high abundance for both species. In addition, estimates of taxonomic richness that account for

undetected taxa were typically one to two taxa greater than observed richness. Our findings show that incorporating detection probabilities into larval fish sampling programs may improve the analysis and interpretation of larval fish data.

### **Communicating Fishery Management Goals and Objectives Using an Adaptive Framework for the St. Clair-Detroit Rivers System Initiative**

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Abstract: Effective communication of fishery management goals and objectives can be challenging due to the complex relationships between fish populations, habitats, and humans. The management environment for fisheries in the St. Clair-Detroit Rivers System (SCDRS) is interjurisdictional consisting of numerous stakeholders who represent dozens of entities from two countries, two states, and dozens of municipalities and non-governmental organizations. The SCDRS Initiative was formed in 2003 to provide a forum where important issues concerning the health and management of fisheries in the SCDRS could be discussed and partners could develop consensus around common goals. The partnership strives to use a science-based adaptive management framework to involve stakeholders, fisheries, and water quality interests to improve environmental conditions in the SCDRS increasing natural biodiversity, de-listing Areas of Concern, and restoring ecosystem services. An adaptive management framework was developed to facilitate these interactions and effectively communicate the Initiative's strategic vision to a broad audience.

### **Comparing roving and access point angler surveys: Results from Oneida Lake in 2013**

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Abstract: Angler surveys are an essential tool for assessment of recreational fisheries and tracking fisheries management objectives. Estimation of catch and harvest rates requires angler interviews, and typically take the form of exit interviews at access sites or roving interviews of anglers actively fishing. Exit interviews offer the advantage of providing complete trip information, but can provide a biased sample of the angler population, particularly in diffuse access fisheries. Roving interviews likely more accurately sample the angling population, but require the assumption that catch and harvest rates after the interview remain the same as those reported at the time of the interview. In this study, data were collected through roving and access point angler surveys on Oneida Lake in 2013 (May-Sept). Three public access sites were sampled at random throughout the season (one site per sample day) concurrent with the lake-wide roving survey. Comparisons amongst survey designs, angler demographics, catch rates, spatial coverage, and their results are presented and discussed. Differences in catch rates

calculated for the roving and access surveys were found to be statistically insignificant. However, the roving survey yielded a larger sample size encompassing a wider demographic range. Differences in targeted species preference among the anglers interviewed by the two methods suggest that the methods sample different subsets of the angler population. Decisions regarding which survey type to employ should be based not only on logistics and costs, but also on the type of data needed to address management needs.

### **Status of a Freshwater Ecosystem after a Hurricane Event**

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Abstract: Brook trout (*Salvelinus fontinalis*) are classic indicators of ecosystem health. They are very particular when it comes to where they can live. Brook trout were studied to determine how they and in turn, the stream system had recovered after Hurricane Irene in 2011. From July to early November, water temperature and ambient light were recorded using data loggers in six different locations in Styles Brook of the eastern Adirondacks. Two sets of dissolved oxygen readings were monitored at three sites. Brook trout were visually surveyed and underwater video was taken throughout the stream to document presence and behavior. Scales were safely taken from nine fish for aging. Stream bottom sediment was obtained in one heavily damaged area of Styles Brook to be analyzed. Temperature and dissolved oxygen levels were excellent for brook trout survival. Underwater video documented feeding and territorial behaviors by brook trout. Sediment revealed to be thousands of years old, evidence of the damage caused by Hurricane Irene. Fish aging indicated trout being born in this stream after Irene. It was concluded that certain areas of Styles Brook can still support and propagate brook trout despite the devastation caused by Irene.

### **Is the Electric Trawl the Best Technique for Sampling Lotic Habitats?**

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Abstract: Sampling the fish fauna of lotic habitats is difficult. Backpack electrofishing and seining only sample shallow near-shore waters. The electric trawl, a fairly new technology is designed for sampling small benthic fish in deep lotic habitats. While the electric trawl is more effective than an un-electrofied Missouri trawl, side-by-side comparisons have not been made with other common sampling methods. In this study a total of 10 samples were taken with the electric trawl, and compared to adjacent samples with a backpack shocker (14) and shore seine (7) at three sites on the West Branch of the Delaware River, NY. The electric trawl had the highest catch per unit effort when compared to the backpack shocker and shore seine; but the backpack shocker caught the highest number of species and fish. While the electric trawl is the most effective way of sampling benthic fish in deep lotic habitat, the backpack shocker was a more effective and efficient means of getting an overview of the fish fauna.

### **Microplastics in Marine Estuaries**



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**Abstract** -Microplastics are defined as plastic particles 5 mm or less in size. Some microplastics enter the environment already in this size range, and some are formed when larger plastic debris photodegrade into smaller pieces. These small plastic particles are an environmental concern because they can be ingested by marine fauna at multiple trophic levels and can contain harmful chemical compounds, the longer term impacts of which are still poorly understood. This study investigates the prevalence of microplastics in locations as yet unstudied, to add to the growing knowledge base of microplastics and to better understand the environmental impacts of this problem. We sampled the surface waters of Shinnecock Bay and Jamaica Bay on Long Island to determine the amount and distribution of microplastics in each bay. Over 1400 plastic particles of different types were found throughout the study, and our resulting data is in the process of being analyzed. The goals of this research are to quantify microplastics in two unstudied locations and to explain the results by establishing likely sources of microplastics in each bay.

### **Dietary effects on lake trout fatty acid signature**

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**Abstract:** The objective of this study was to evaluate the influence of dietary fatty acids on whole body lake trout *Salvelinus namaycush*. Alevins ( $0.09 \pm 0.01$  mg) were fed five different diets (bloodworm, copepod, *Mysis* sp., *Daphnia* sp., or tubifex) in triplicate aquaria for 105 days. At the end of the experiment, fish were sampled and analyzed for lipid and fatty acid composition. Growth rate was significantly different among dietary treatments with fish fed bloodworm growing the most (548%) and fish fed *Daphnia* sp. the least (8%). Lipid content and fatty acid signature of whole body lake trout changed significantly in the direction of their diet. Whole body fatty acid signature was also significantly different among dietary treatment. These results provide support for the use of fatty acids as indicators of diet and will be used in a quantitative fatty acid signature analysis to determine dietary component of predators.