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Understanding and Preserving Lake Whitefish Spawning Habitats

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Lake whitefish (*Coregonus clupeaformis*) were once abundant in Lake Michigan. However, in recent years populations have faced steep declines due to habitat loss, climate change, and impacts from invasive species. Recognizing the significance of this decline, our efforts to understand and protect the environmental conditions that support lake whitefish spawning have become a priority. While spawning in Green Bay tributaries has been well documented, no egg deposition has been found among the many reefs in Green Bay. The Native Species Branch of the Green Bay Fish and Wildlife Conservation Office conducted a pilot study to better understand key factors influencing lake whitefish spawning site selection on Larson's Reef in Lake Michigan. By deploying specialized egg traps, paired with previously collected high-resolution bathymetry and backscatter information, this work aims to clarify how substrate type, water depth, temperature, and location may influence lake whitefish spawning site selection and egg deposition. A total of 100 egg traps were deployed across 20 sites for 15 days in November to test for the presence or absence of whitefish eggs. Sites were selected based on assumed preferred spawning habitat types using data from reef mapping surveys. These efforts will contribute to the broader goal of sustaining lake whitefish populations and preserving the ecological balance of Lake Michigan.

Poster Presentation, Professional

Riverine Acoustic Fish Telemetry (RAFT) Network: Building a Comprehensive Network of Acoustic Telemetry Data in the Mississippi River Basin

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Acoustic telemetry is a popular technology used by fisheries scientists and managers to study fish movements in aquatic systems. River systems, however, pose unique challenges when tracking fish due to their variable flows, braided nature and connectivity to other systems. The dispersal of fish in river systems is not always confined by geographic or political boundaries, and migratory fish can travel great distances outside of study areas, across state borders, or into different river systems. To build a complete movement history of fishes, data sources must be shared generously across agencies and research projects outside of the defined study area to fill in gaps, making trust and cooperation essential. The Riverine Acoustic Fish Telemetry (RAFT; formerly, FishTracks) Network has a history of consolidating and sharing telemetry data, starting in the Illinois River in 2014, and is now being developed as a web-based, centralized location to safely access, archive, and visualize acoustic telemetry data collected anywhere within the Mississippi River Basin. In 2024, RAFT partnered with the Ocean Tracking Network (OTN), as its first riverine node, to join a worldwide support system and enhance more structured standardization, quality control, and data sharing tools. Here, we give a brief introduction to RAFT, the unique technical and cultural challenges of its development, and the exciting opportunities ahead for collaborative science in the Mississippi River Basin.

Poster Presentation, Professional

Relative Vulnerability of Yellow Perch and Bluegill to Largemouth Bass and Walleye Predation in Northern Wisconsin Lakes

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Joseph Mrnak Quinn Smith, Max Wilkinson, Dan Dembkowski, and Dan Isermann

Over the past several decades, some northern Wisconsin lakes have experienced declines in walleye recruitment and abundance with concomitant increases in largemouth bass abundance, mirroring broader shifts in fish community structure and species dominance that are expected to occur in relation to changing climatic conditions. Shifts in the predatory community could have important implications for prey fish populations such as yellow perch and bluegill, which also support important fisheries. To understand the potential impacts of shifts in predatory structure on prey fishes, we defined morphometric relationships between 1) body depth and total length for yellow perch and bluegill; and 2) body length and gape width for walleye and largemouth bass. These morphometric relationships were paired with predator and prey length-frequency distributions in five northern Wisconsin lakes to estimate the relative vulnerability of yellow perch and bluegill to predation by largemouth bass and walleye. Understanding how relative vulnerability of yellow perch and bluegill differs between predator types and across a range of populations with different predator and prey size structures provides insight to implications for prey fish management under shifting predator regimes.

Poster Presentation, Student

A Laboratory Assessment of Grass Carp (*Ctenopharyngodon idella*) Bait Consumption Using a Dye

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Management of invasive carp has become a great interest to fisheries managers in the Great Lakes, as the continued spread of these species threatens the aquatic ecology and economy of the region. Fish removal using traditional gear is difficult for Grass Carp (*Ctenopharyngodon idella*), whose herbivorous feeding strategy and net-avoidant behavior often leave them shielded in densely vegetated areas. The use of Grass Carp baits has been tested as part of an integrated pest management removal strategy to congregate fish to areas more accessible to traditional gear. A previous study evaluated the consumption of different baits by Grass Carp in a laboratory setting. The study used a lipid-soluble tracer dye concentration, (Sudan Black B [SBB]), to quantify bait consumption and reported rapeseed meal-based baits were preferred. However, manufacturing a bait from seed meal is an arduous process leading to poor yield and pellets with low stability. Due to its manufacturing process, the rapeseed bait is expensive, which may become cost-prohibitive when considering largescale management use. Canola meal (a byproduct of canola oil) is produced from a cultivar of rapeseeds and is less expensive for large scale manufacturing. Therefore, the goal of this project was to compare the Grass Carp consumption of canola- and rapeseed-based baits using the previous SBB quantification methods. Experimental tanks were stocked with five Grass Carp each and were randomly assigned to either a control, canola, or rapeseed bait treatment in triplicate (N=3). Fish were fed with the control bait for three weeks and were then fed a SBB top-coated bait a single day. Fish were dissected 72 hours after feeding and fin and jaw tissues were processed for SBB quantification using a microplate reader. We observed no differences in the consumption of canola- and rapeseed-based baits in Grass Carp, suggesting canola-based baits could be used in future research with Grass Carp biopesticides and pesticides.

Poster Presentation, Professional

Factors Influencing Recruitment of Age-0 Walleye in the Fox River and Lower Green Bay, Lake Michigan

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Daniel Dembkowski, Jason Breeggemann, and Daniel Isermann

Green Bay supports one of the most prominent recreational fisheries for walleye in North America. The recreational fishery provides annual harvests in excess of 100,000 fish and provides millions of dollars to local economies. The Fox River in southern Green Bay represents one of the primary sources of recruitment to the fishery. Recruitment dynamics during early life stages can substantially influence population and fishery characteristics, including angler success and satisfaction. Thus, understanding factors that influence recruitment of walleyes in the Fox River and lower Green Bay can aid fishery management efforts at a larger scale. We paired a 30-year time series (spanning 1993-2022) of age-0 walleye electrofishing catch rates (CPE) with suites of abiotic and biotic factors to quantify the extent of recruitment variation and identify factors explaining variation in age-0 walleye recruitment. Age-0 walleye electrofishing CPE ranged 0-101.2 fish/h (mean = 15.7 fish/h; CV = 140%). Multiple regression analyses and variable importance rankings indicated that age-0 walleye CPE was positively influenced by springtime river discharge, winter severity, and abundance of age-0 yellow perch, and negatively influenced by abundance of adult yellow perch, abundance of adult walleye, and springtime warming rate. Collectively, these variables explained approximately 60% of the variation in age-0 walleye abundance. Identification of these factors can help managers predict when strong or weak year classes may be expected, which may allow time to adjust actions to meet management objectives or to manage angler expectations.

Poster Presentation, Student

Diet Composition and Overlap of Walleye and Largemouth Bass in Northern Wisconsin Lakes: Implications for Walleye Recruitment and Size Structure of Prey Fish

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Over the past two decades, some northern Wisconsin lakes have experienced declines in walleye recruitment and abundance with concomitant increases in largemouth bass abundance, mirroring broader shifts in fish community structure and species dominance that are projected to occur in relation to changing climatic conditions. Differential trends in abundance of these two species could be mediated or exacerbated by trophic interactions. Previous research has indicated that few walleye have been observed in largemouth bass diets but demonstrated moderate-high diet overlap between the two species during some months, suggesting that potential competitive (rather than predatory) interactions may influence observed trends in recruitment, abundance, and community structure. However, whether the magnitude of diet overlap differs between lakes with and without sustained walleye recruitment is unknown. Furthermore, shifts in predatory species dominance from walleye to largemouth bass could have important implications for prey fish abundance and size structure because of differences in gape limitation and size-selective predation. To address these questions, our research objectives are to determine if: 1) diet compositions of walleye and largemouth bass vary in relation to fish size and season; 2) the magnitude of diet overlap between walleye and largemouth bass varies between lakes with declining and sustained natural walleye recruitment; and 3) sizes of predominant ingested prey fish vary between walleye and largemouth bass. Our approach includes an intensive assessment of diet composition for both species collected during May-October in 2012, 2013, and 2024 from northern Wisconsin lakes with and without sustained natural walleye recruitment. Results will provide insight into mechanisms underlying declines in walleye recruitment in some lakes and implications of shifts in predatory assemblages for size structure of prey fish.

Poster Presentation, Professional

Ovulation Status Does Not Affect the Egg Size of Walleye (*Sander vitreus*)

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Taylor Preul-Stimetz, Zach Feiner, and Stephanie Shaw

Walleye (*Sander vitreus*), a key opportunistic apex predator in freshwater ecosystems and a cornerstone of regional fisheries, are experiencing population decline due to poor natural recruitment. Maternal effects on egg characteristics, like egg and oil droplet size, can influence egg quality and larval survival. Insights into these traits are essential for understanding successful recruitment. Our objective was to test whether egg traits differed between unovulated females and ovulated females, as there is no standardized approach to sampling walleye eggs. We sampled eggs from 165 walleye of varying sizes in Escanaba Lake, Wisconsin during the routine spring fish surveys of 2024. We found that ovulation status did not affect egg and oil droplet diameters. We are also investigating the effects of maternal length and date of spawn on relationships between ovulation status and egg traits. It is important to note, however, that all eggs were collected within 16 days post ice-out, close to peak spawning. Additional research is needed to understand how proximity to peak spawning activity might influence differences between ovulated and unovulated eggs.

Poster Presentation, Student

Use of Metabarcoding within the Early Detection and Monitoring Program

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Sharon Rayford, Cari-Ann Hayer, and Touhue Yang

Metabarcoding is a sampling method for environmental DNA that is useful for detecting fish species through shed DNA in the water. This method is advantageous as an additional gear type and complimentary to traditional gear as it can detect rare and/or novel species as well as species that may be hard to capture in traditional gear types. Over the last two field seasons the aquatic invasive species program at the Green Bay Fish and Wildlife Conservation Office has been experimenting with metabarcoding technologies to determine how, where, and when it can be used to support our early detection and monitoring surveys. In 2023, we sampled Burns Harbor (IN) with experimental gill nets and boat electrofishing and took water samples for metabarcoding. Metabarcoding detected 54 species, 10 of which were unique to this method. Traditional methods detected 30 species, 9 of which were unique to this method. The unique detections suggest that metabarcoding sampling can complement traditional gear sampling.

Poster Presentation, Professional

Brook and Brown Trout Population Responses to Stream Restoration in a Driftless Region Stream

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Justin VanDeHey

The Driftless region of Wisconsin is home to roughly 17,000 miles of high-quality trout streams consisting of natural reproducing Brook and Brown Trout. Life history characteristics of Brook and Brown Trout are similar often leading to interspecific competition in sympatric situations. Due to anthropogenic degradation of streams, stream restoration has become a common practice in the past century. Many large-scale stream restoration projects have been conducted throughout North America, with the aim to improve the physical habitat of a degraded stream. However, the effects of these restorations, including the population dynamics of target fish species, needs to be fully understood to inform future restoration practices. Brook and Brown Trout populations were analyzed pre- and post-stream restoration using standardized electrofishing survey data. Linear regression models and t-tests showed an increase of total trout abundance post restoration, which could be explained by the addition of new trout habitat. The increase of trout was not proportional among species, with the ratio of Brook to Brown Trout showing a significant decrease. Stream restoration, along with other abiotic factors, have been found to favor Brown Trout over Brook Trout. Both species had an increase in size structure post-restoration seen with the increase of PSD and cumulative frequency distribution size. Restored habitat can hold a variety of size classes and structure gives larger fish cover. Further research is required to confirm the effects of stream restoration on Brook and Brown Trout as there are many factors that play in a fish population dynamic.

Poster Presentation, Student

Round Goby (*Neogobius melanostomus*) Distribution and Abundance Relative to Native Benthic Fishes in Lake Michigan Tributaries, Wisconsin

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Aaron Gloss and Cari-Ann Hayer

Round goby (*Neogobius melanostomus*) were likely introduced to North America via ballast water from transoceanic ships and were first discovered in the St. Clair River in 1990. Within five years round goby spread to all Laurentian Great Lakes and have since begun a secondary invasion into Great Lakes tributaries. These invasive fish exhibit aggressive behavior and can displace native benthic stream fishes. This study replicated a project completed in 2010 that assessed changes in distribution and abundance of round goby and potential impacts on five native benthic fishes (logperch *Percina caprodes*, blackside darter *Percina maculata*, fantail darter *Etheostoma flabellare*, johnny darter *Etheostoma nigrum*, mottled sculpin *Cottus bairdii*) in Wisconsin tributaries to Lake Michigan. Utilizing backpack electrofishing we revisited 21 sites where round goby were previously present and eight sites where they were historically absent. Round goby were present at all previously-surveyed sites and six sites where round goby were historically absent. Round goby relative abundance and catch-per-unit effort have generally increased from the 2010 study and higher round goby abundance was related to lower focal species abundance. Future analysis will evaluate impacts of round goby spread on focal native species and examine how environmental predictors of presence and absence change over time.

Poster Presentation, Professional

Is that a Leech Lake Strain Fish? Yea that's a Leecher, For Sure. Testing the Limits of Visual Identification of Muskellunge Strains Among Anglers and Natural Resource Professionals

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Andrew Notbohm

Muskellunge anglers and fisheries professionals often attempt to identify the source heritage of an individual fish based on phenotypes, or what the fish looks like. For example, pronounced spots on a musky are often associated with Great Lakes Spotted or Leech Lake Strain musky whereas more bars and washed out green pigments are associated with Wisconsin River or Chippewa River Strain fish. Friction can occur when prevalence of one strain of musky based on visual observations/assumptions from angling don't match standard survey data results or genetic analyses. In this case study, we sought to test whether or not muskellunge angling experience or fisheries management experience, among other factors, were related to correctly identifying a fishes' genetic heritage in a system where multiple genetic strains have been stocked for many years. We asked 335 musky anglers and natural resource professionals to indicate which strain 40 adult fish were from by choosing between Wisconsin Strain or Leech Lake based upon a provided image. The average score across all respondents was 68.8%. Those self-identified as expert musky anglers with 10+ years of experience scored only marginally better with an average score of 70.7%. Among expert anglers who identified as fishing guides, the average score was slightly increased to 72.6%. Natural resource staff who identified as expert anglers scored the highest of all cohorts analyzed (76.88%). No one scored a 100% and only 3.5% of respondents scored 90% or higher. The high error rate for even the 'experts' in this analyses highlights the pitfalls associated with using visually based identification of genetic strains afield and casts doubt on the reliability of visually based identification no matter who the source is. We recommend using robust tools such as genetic analyses or known-age PIT tag tracking to accurately identify genetic strain of fish in mixed-strain fisheries.

Poster Presentation, Professional

Evaluation of an Underwater Camera Method to Sample Freshwater Fish Assemblages Under the Ice

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Ross Vander Vorste, David Schumann, Patrick Kelly, and Kristen Bouska

Ice cover has long restricted our understanding of the habitat use patterns of fishes in temperate aquatic ecosystems by preventing the use of conventional sampling methods. Using methods developed for shallow marine ecosystems, we described the suitability of standardized underwater camera (UWC) sampling in Stoddard Island Complex and Lawrence Lake; two backwaters in Pool 8 on the Upper Mississippi River. To assess the efficacy of the UWC sampling method in backwater habitats, we analyzed the viewing radius using environmental covariates collected at each randomly selected site (n = 42 per lake). Using AICc model selection techniques we found that water clarity was included in all four top performing models (Δ AICc < 2) and produced the highest AIC sum of weights (0.99). Sampling time and site number were also analyzed to optimize the efficiency of the method. We analyzed accumulated Bluegill (*Lepomis macrochirus*) maximum abundance over the ten-minute sampling period, which showed no clear inflection point, indicating maximum abundance continues to be captured near the end of the sampling time-frame. We used rarefaction analysis to identify the number of sampling units necessary to capture species richness, which predicted species richness would not continue to increase with further sampling units based on the collected data. The rarefaction analysis indicates species richness was captured in fewer sites than were sampled. During our second sampling winter, we will increase our sampling time to 20 minutes and decrease our sampling sites to 21 per backwater.

Poster Presentation, Student

DNR Beaver Control in Wisconsin Trout Streams 2020-2024

Katherine Sharpe, *Wisconsin DNR*, katherine.ahrens@wisconsin.gov
Matt Mitro, and Spencer VanderBloemen

The Wisconsin DNR administrates control of beaver (*Castor canadensis*) on a subset of trout streams through a contract with Wildlife Services, a program in the US Department of Agriculture's Animal Plant Health Inspection Service (APHIS). APHIS Wildlife Services controls beaver for many purposes including the maintenance of free-flowing streams for trout in which flow is not obstructed by beaver dams, to prevent flooding that may damage roads and other infrastructure, and to protect other natural resources, like wild rice lakes, from changes in habitat that would be unsuitable for sustaining these valuable resources. Although beavers are native to Wisconsin and can provide valuable ecological services, there are instances in which beavers negatively influence important natural resources and manmade infrastructure. In these circumstances, implementing beaver control may be a justifiable measure to protect specific areas and resources. The protection of coldwater stream habitat for trout is such a circumstance. Wisconsin has about 38,000 perennial stream miles, of which about 13,000 stream miles are classified trout streams. The Wisconsin DNR contracts with APHIS to control beaver on about 1,500 stream miles (12%) of classified trout streams. Over the last five years, about 27% of beaver control in Wisconsin reported by stream or site has been supported by the DNR for trout management purposes, with most (73%) being for other purposes. However, the average annual number of beavers and dams removed per stream was greater for trout streams (6.1 beavers and 3.2 dams per stream) than for other streams or sites (3.2 beavers and 1.7 dams). About 42% of beavers removed and 41% of beaver dams removed statewide were from trout management sites. By outlining beaver control activity by project purpose, we show that DNR beaver control for trout management contributes to a relatively low proportion of overall beaver control efforts in Wisconsin.

Poster Presentation, Professional

Monitoring Pesticide Water Concentration During a Native Fish Restoration

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Bryan M. Lada, Anne Wood, David Hering, and Gavin N. Saari

Management chemicals (pesticides) are a key component within an integrated pest management plan. Fintrol is a liquid pesticide formulation containing antimycin-a that was historically used in native fish restorations. Despite the lapse of Fintrol registration in 2017, any remaining purchased product that is still available can be applied to streams for controlling nuisance fish species. Antimycin-a dissipates rather rapidly in water and there is a lack of empirical data characterizing its' loss in streams even though fish bioactivity assays have reported that antimycin-a toxicity can vary by stream gradient and water chemistry. The goal of the current study was to measure the antimycin-a water concentration spatially and temporally in Munson Creek, at Crater Lake National Park, Oregon, during a Bull Trout restoration project. The National Park Service applied pesticide to Munson Creek for 6 hours using multiple drip buckets, spatially located throughout a designated stream reach, and a drip rate previously calculated to cause 100 percent fish mortality. Water samples were collected above and below drip buckets to measure antimycin-a water concentrations and characterize chemical dissipation throughout the treated stream. Antimycin-a water samples were processed and analytically verified using a high-performance liquid chromatography triple quadrupole mass spectrometer. This presentation will discuss the observed antimycin-a water concentrations measured during the native fish restoration project and how the corresponding information can be used to inform the field application manual.

Poster Presentation, Professional

A Localized Population of Eurasian Ruffe in Northern Green Bay, Michigan: A Review of 2022-2024 Population Dynamics

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Jacob Pantzlaff, Dalton Hendricks, Sharon Rayford, Cari-Ann Hayer, and Troy Zorn

Since the introduction to the Great Lakes in the mid-1980's, Eurasian ruffe (*Gymnocephalus cernuus*) have sustaining populations in Lake Superior. More recently, a population of Eurasian ruffe has established in Little Bay de Noc in Northern Lake Michigan, possibly the result of ballast mediated intra-lake dispersal from Duluth harbor in Lake Superior to Escanaba in Lake Michigan. Studying this localized population is important to understanding population characteristics, dynamics of distribution and range expansion factors for Eurasian ruffe. Eurasian ruffe are often out-competing native fish for food and habitat due to their aggressive and territorial behavior. They compete with yellow perch (*Perca fluvencens*) and walleye (*Sander vitreus*), feeding on the same benthic organisms and occupying the same habitat niches. An established Eurasian ruffe population can change the organization of the food web and therefore risk the health of a native species population. This project serves different objectives through a variety of methods during annual surveys. First, evaluate detection of Eurasian ruffe using micromesh gill nets, fyke nets and trawling in Little Bay de Noc. Second, determine the most effective and efficient sampling gear. Third, use catch data to qualify the distribution, habitat and potential spread of Eurasian ruffe in northern Lake Michigan. Finally, quantify water quality parameter correlation to detection probability.

Poster Presentation, Student

Understanding Thermal Variability in Brown Trout Occupied Habitats: A Study Using Archival Temperature Tags

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Kat Sharpe, Nick Hoffman, and Matt Mitro

Wisconsin's trout streams exhibit temporal and spatial thermal variability. Stationary water temperature data loggers can capture thermal variability over time but may not adequately represent spatial thermal variability among areas inhabited by trout. We used archival temperature tags surgically implanted in Brown Trout Salmo trutta to: (1) compare the temperature experienced by trout to stationary water temperature data loggers; and (2) compare temperatures experienced by tagged trout to one another. We released 17 tagged Brown Trout in a section of Elk Creek (Richland Co.) in August 2024 and set two stationary water temperature data loggers upstream and downstream of the release location and one in a spring-fed tributary which entered Elk Creek upstream of the release location. We recovered tags from five trout in October, two in Elk Creek and three in the spring-fed tributary. The average daily water temperature in Elk Creek ranged from 17.2°C to 9.5°C at the upstream data logger location, 16.6°C to 9.6°C at the downstream location, and 12.2°C to 10.8°C in the spring-fed tributary. Variability in temperatures among areas occupied by the five tagged trout were greatest in August when water temperatures in Elk Creek and the spring-fed tributary differed most. The greatest temperature variation observed among trout was about 6.5°C (range, 11.4-18°C). During our study, new beaver dams were built within this section of Elk Creek, including between the fish release location and the spring-fed tributary, and the dams may have restricted trout movement among thermally variable sections of the stream. We discuss implications for trout management including the importance of access to thermally variable habitat during summer and thermal effects on feeding and growth.

Poster Presentation, Professional

Has Improved Angler Technology Influenced Fish Catchability and "Harvestability" in Escanaba Lake Wisconsin Over Time?

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Taylor N. Preul-Stimetz, Max V. Wilkinson, Zachary S. Feiner, Olaf P. Jensen, and Greg G. Sass

Improvements in angler technology over time have the potential to increase angler success and fish catchability. Recent research testing for the influences of angler technology on fish catch rates have been mixed, with some studies showing a positive influence of technology use and others with no effect. Knowing that angler technology has improved over time and under the assumption that angler use of technology has increased, we tested whether catchability of muskellunge and walleye and "harvestability" of northern pike and yellow perch has changed over time in Escanaba Lake, Wisconsin during 1990-2022. Using compulsory creel survey data, angler catch rates, and annual mark recapture population estimates for muskellunge and walleye, we tested for trends in the catchability coefficient (q) over time. Because catch and release information were not available for northern pike and yellow perch, we tested for trends in "harvestability" (i.e., harvest per unit effort/population abundance) over time. We hypothesized that muskellunge and walleye catchability would increase over time due to improved angler technology. We hypothesized that northern pike and yellow perch "harvestability" would decrease over time due to increasing prevalence of catch and release angler behaviors independent of the influence of angler technology. Our study has implications for angling technology influences on catch efficiency, fish conservation, and angler behaviors.

Poster Presentation, Professional

Fishing for a Photo: Post-Catch Handling by Anglers is not Likely to Cause Brown Trout (*Salmo trutta*) Mortality

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The Driftless Area in southwestern Wisconsin provides abundant recreational opportunities for trout angling, including a catch and release season during winter to late spring. Despite public disagreement about the handling and photography of captured trout online, little is known about Brown Trout (*Salmo trutta*) survival following prolonged exposure events from catch and release angling in winter. Although, salmonid mortality has been evaluated in other temperate regions with different temperature regimes (i.e., hot atmospheric conditions) our objectives were to: (1) compare Brown Trout mortality in above freezing and below freezing air temperatures following three periods of atmospheric exposure (i.e., ~5, 30, and 60 seconds); and (2) describe the effects of snow exposure on the survival of released Brown Trout following the same exposure times. Following Brown Trout exposure to atmospheric conditions and snow we observed zero mortality during the above and below freezing trials for 24 hours after exposure to the treatments. Despite differing opinions about the risk that handling and photography to captured trout that exist online, we found no evidence of population-level impacts of the winter catch and release season in southwestern Wisconsin.

Poster Presentation, Student

Bait Delivery Tool for Grass Carp Control Through RNA Interference

James Wamboldt, *U.S. Geological Survey*, jwamboldt@usgs.gov
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Upriver expansion of Grass Carp *Ctenopharyngodon idella* (GRC) in the Mississippi River threatens the regional ecology and economy of the upper Mississippi River. Grass Carp are a troublesome, herbivorous species invasive to U.S. waters. Their overgrazing can damage aquatic vegetation communities, which can disrupt food webs for native fish and waterfowl, increase risk of wave erosion resulting in damaged property, and increase the risk of harmful algal blooms. Development of innovative tools to enhance current invasive carp removal programs will be a necessary component of adaptive management strategies moving forward. There are limitations using traditional fishing techniques and concerns of species selectivity with other methods of removal. The use of genetic controls using RNA interference (RNAi) to selectively turn off critical genes of the target organism may be a promising alternative. The goal of this project is to develop an environmentally safe, selective, and efficacious genetic control tool for the oral delivery of RNAi to Grass Carp using a rapeseed bait previously developed. We have identified highly expressed genes for Grass Carp by RNA-seq and demonstrated knockdown in primary cultured Grass Carp gill cells using small interfering RNAs designed to target these genes. Additionally, we have cloned selected candidate RNAs for expression in microalgae (*Chlamydomonas reinhardtii*) chloroplasts and are working to incorporate these microalgae into a rapeseed bait for RNAi delivery. We will present the results of our in-vitro gene knockdown, optimization of dsRNA expression in microalgae, and future strategies for in-vivo efficacy testing of this oral delivery tool for RNAi.

Poster Presentation, Professional