American Fisheries Society

Wisconsin Chapter

54th Annual Meeting

Oral Presentations

Wednesday, January 15, 2024

&

Thursday, January 16, 2024

Radisson Hotel, La Crosse, Wisconsin

Wednesday, 8:40 AM

50 Million Muskies Over 50 Years: An Approach to Evaluating Long-Term Stocking Success

Alexander Latzka, *Wisconsin DNR*, alexander.latzka@wisconsin.gov
Dan Oele, Colin Dassow, and Zach Lawson

The mighty musky is the state fish of Wisconsin, heavily targeted by dedicated anglers. Historically, musky stocking played a key role in the expansion and growth of musky populations, and many of the 700 managed musky populations today receive regular stocking to maintain populations or complement natural reproduction. However, stocking is not always successful, and budgetary limitations always demand the best use of limited resources. We sought out to analyze musky stocking success with the aim to guide future stocking decisions and get the best bang-for-our-buck. With nearly 50,000,000 muskies stocked in Wisconsin waters since 1974, there's a lot of data to analyze, but with big data come big problems. We'll highlight some of the difficulties in analyzing stocking success across such a large scale for a long-lived species like musky, and demonstrate the utility of generalized additive mixed models (GAMMs) for addressing them. We'll show how the findings from these GAMMs could be used to evaluate population-level stocking success and steer future stocking decisions toward the best returns, ultimately maximizing musky population potential for any budgetary situation.

Full Presentation, Professional

Wednesday, 9:00 AM

Identifying Potential Sources of Natural Recruitment of Muskellunge in Green Bay, Lake Michigan

Ryan Eastman, *University of Wisconsin - Stevens Point*, reastman@uwsp.edu
Jason Breeggemann, Robert Davis, Joshua Raabe, Daniel Dembkowski, and Daniel Isermann

Green Bay and its tributaries support a world-class fishery for trophy muskellunge that attracts anglers from across North America, but there has been little evidence of natural recruitment and the population remains reliant on stocking to sustain the fishery. Previous efforts to document natural recruitment have focused on the Fox and Menominee rivers where spawning is known to occur. Results of these assessments suggest that hatching success in these rivers is limited. However, recent telemetry-based research indicates that approximately half of Green Bay muskellunge spawn in non-tributary locations. These locations could represent important yet unconsidered sources of natural recruitment in southern Green Bay. Furthermore, anecdotal observations suggest spawning occurs in the Sturgeon Bay area but it is unknown if these fish contribute to the broader southern Green Bay population. Our objectives for this project are to determine if: (1) successful hatching is occurring at open-water locations in Green Bay, including locations in the Sturgeon Bay area, (2) presence of eggs or larval muskellunge at a location is related to a suite of habitat characteristics including distance to shore, bottom slope, depth, dissolved oxygen, substrate type, and aquatic vegetation, and (3) muskellunge spawning in the Sturgeon Bay area contribute to the overall population in southern Green Bay. We are integrating intensive egg and larval fish sampling and acoustic telemetry to address our objectives. We will present preliminary results related to spawning and hatching in non-tributary locations based on sampling efforts during the 2024 field season. We will also discuss the framework of our acoustic telemetry approach to assess the contribution of muskellunge spawning in the Sturgeon Bay area to the broader Green Bay population.

Full Presentation, Student

Wednesday, 9:20 AM

Introducing a Quantitative Approach to Retooling Wisconsin's Musky Waters Classification System

Dan Oele, *Wisconsin DNR*, daniel.oele@wisconsin.gov
Zach Lawson, Alex Latzka, and Colin Dassow

Muskellunge (*Esox masquinongy*) are a top predator species of great recreational and tribal interest. Wisconsin DNR currently classifies musky waters into four categories (A1 - Trophy, A2-Action, B-intermediate, C – musky present) largely based upon best professional judgment from local fisheries staff. With the benefit of 30+ years of survey data and standardized protocols utilizing modern statistical tools, we sought to leverage data rich systems to determine if key fisheries metrics could produce a data-driven musky classification scheme. Using population density and size structure as inputs to a k-means cluster analyses, we found that three musky classes emerged. More work remains to include musky waters that are not easily sampled into this framework but our results have implications for how musky management is administered and how the portfolio of managed musky waters, and the angling opportunities therein, are communicated to the public.

Full Presentation, Professional

Wednesday, 9:40 AM

Multi-Scale Fishery Responses to a Lake Trout Daily Bag Limit Reduction in Lake Superior

Dray Carl, *Wisconsin DNR,* dray.carl@wisconsin.gov
Christopher Zunker, Bradley Ray, and Michael Seider

In this study, we present a rigorous evaluation of the recreational fishery response to a Lake Trout daily bag limit reduction from three to two in the Apostle Islands region (WI-2) of Lake Superior. We used seven years of creel survey data both before and after the bag limit reduction (21,957 interviews and 7,323 time-interval pressure counts) to evaluate changes in Lake Trout harvest rate, length-at-harvest, angling pressure, trip duration, anglers per party, and effort per trip along with fishery-independent estimates of relative abundance and mean length. We bisected the study area into two management units (one control) and compared all indices in a before-after-control-impact (BACI) design at both regional and smaller scales near the regulation borders using linear mixed effects models and estimated marginal means. Regional Lake Trout harvest rate did not decrease after the bag limit reduction and reflected changes in relative abundance. However, harvest rate was lowered at the eastern border where harvest rate was the highest in the region. Effort per trip was unchanging at a regional scale, as a decrease in trip duration was offset by an increase in angling party size. Angling pressure was slightly displaced at a regional scale, but displacement was high near the regulation borders. Size of harvest shifted to larger Lake Trout after the bag limit reduction, likely due to the constant "one over" length regulation. Ultimately, it was four times more likely to harvest a full Lake Trout bag limit after the reduction, but we did not observe a reduction in harvest by a lower harvest rate. Managers should consider how daily bag limit changes may influence the dynamics of angler effort, especially near the regulation borders of large, multi-jurisdictional systems.

Full Presentation, Professional

Wednesday, 10:20 AM

CARPool Karaoke: Designing and Evaluating an Experimental Underwater Acoustic Deterrent System for Invasive Carp

Marybeth Brey, *U.S. Geological Survey*, mbrey@usgs.gov
Jessica C. Stanton, Andrea K. Fritts, Theodore R. Castro-Santos, Janice Albers, Matt D. Sholtis, and Christa M. Woodley

In 2021, an experimental underwater acoustic deterrent system (uADS) was designed and installed at Mississippi River Lock 19 to deter invasive carps from moving upstream. Testing of acoustic signals at large, management-relevant scales is a necessary step in determining the feasibility of using the uADS to influence bigheaded carp (*Hypophthalmichthys* spp.) movement while limiting effects on native species. Over the past four years, the uADS has played engineered signals on an experimental schedule of 80 hours on and 80 hours off. We will discuss the process from concept and construction through data analysis and evaluation with results of this multi-year study. We aim to provide results that will be useful for natural resource management agencies considering the use of acoustic deterrents for invasive carp management.

Full Presentation, Professional

Wednesday, 10:40 AM

Fine Scale Movement of Grass and Silver Carp through a Deterrent at a Large Riverine Lock

Janice Albers, *U.S. Geological Survey*, jalbers@usgs.gov
Jessica Stanton, Marybeth Brey, Theodore Castro-Santos, Matthew Sholtis, Nicholas Swyers, Joshua Tompkins, Rob Simmonds, Kyle Mosel, Jacob Faulkner, and Andrea Fritts

Restricting the movement of invasive riverine fish species while minimizing impacts on non-target fishes continues to be a challenge in large rivers. Experimental deterrent systems at lock and dam structures show promise in addressing this issue, provided we understand how fish interact with these structures. In November 2019, an experimental deployment of a multimodal deterrent (BioAcoustic Fish Fence consisting of sound, a bubble curtain, and lights) was initiated at Barkley Lock and Dam on the Cumberland River, KY, USA. The deterrent was operated on a weekly on and off cycles to compare fish behavior under different operational and environmental conditions. From fall 2020 to spring 2022, 75 grass carp *Ctenopharyngodon idella* and 1455 silver carp *Hypophthalmichthys molitrix* were implanted with acoustic telemetry transmitters. Their movements within the lock approach channel were tracked using an acoustic telemetry array (Innovasea 307 kHz fine-scale positioning array [within meters]). During 2021 and 2022, 66 grass carp and 1182 silver carp were detected with the array near the deterrent in the lock approach channel. We analyzed fish behavior during deterrent on and off periods, including how fish approached the deterrent and whether it was fully traversed, and the influence of environmental and deterrent covariates on the probability of a full deterrent crossing. These results provide insights into the behavior of grass and silver carp in response to a multimodal deterrent system, informing the design and implementation of future deterrent systems to manage invasive fish species more effectively.

Full Presentation, Professional

Wednesday, 11:00 AM

Aggregation for Eradication: An Exploratory Grass Carp Management Strategy in the Upper Mississippi River

Max Monfort, *University of Wisconsin – La Crosse*, monfort4993@uwlax.edu
James J. Wamboldt, Amanda A. Milde, Daniel H. Krause, Matthew R. Acre, Andrew T. Mueller, Dustin W. Broaddus, Jacob N. Griffin, Andrea K. Fritts, and David A. Schumann

Grass Carp (*Ctenopharyngodon idella*) consumption of aquatic macrophytes can alter trophic dynamics when introduced to new aquatic ecosystems, the increased commercial captures and expansion into further reaches of the Upper Mississippi River (UMR) could have negative affects to these aquatic ecosystems. Efforts to control this highly mobile and elusive species in the UMR and Great Lakes Basins are a substantial challenge to managers. A potential bait for Grass Carp has been evaluated at other invasive fronts (e.g., Lake Erie), but its application in the UMR has not yet been fully recognized. We refined methods from previous assessments and utilized 2023 Grass Carp longitudinal movements within the UMR to describe the utility of automated bait delivery systems to aggregate Grass Carp in pool 19 of the UMR. Specifically, our objectives were to: (1) describe Grass Carp movement ecology within the riverscape before, during, and after bait application, and (2) determine Grass Carp movement responses to feeding; use of the feeding area, time occupied at feeding area, and the effective attraction distance from the feeding area. Grass Carp behavior (n = 93) was evaluated in response to the deployment of a novel Grass Carp specific bait via automated bait delivery systems in three distinct habitats using acoustic telemetry arrays from March-November 2024. If successful, these methods could provide an exploratory, yet innovative, Grass Carp management strategy for more efficient removals within the UMR and other invasion fronts.

Full Presentation, Student

Wednesday, 11:20 AM

Working Toward a Standardized Assessment of Invasive and Nuisance Species in a Nebraska Reservoir?

Alexandria Keiler-Klein, *University of Nebraska at Kearney*, keiler-kleina@lopers.unk.edu
Melissa Wuellner and Keith Koupal

Nuisance and invasive species can, directly and indirectly, affect sport fisheries, but few agencies target these fishes in annual standard surveys. Understanding when and how to sample nuisance and invasive species is important to understanding their abundance and size structures. Determining optimal assessment techniques can provide management insight into interventions to address the impacts of nuisance and invasive fish abundance on salmonid species. The objective of this study was to determine which gear and time of year could be used to assess populations of invasive (Common Carp *Cyprinus carpio*) and/or nuisance (White sucker *Catostomus commersonii*) species in one Nebraska reservoir. Experimental gill nets, modified fyke nets, and nighttime boat electrofishing were employed at nine locations across Lake Ogallala monthly from April through September 2023. All individuals of the two species were enumerated and measured for total length (mm). This information was used to calculate catch per unit effort (CPUE), the coefficient of variation around CPUE, and a measure of length variability (Shannon-Weiner diversity based on 10-mm length bins) for each gear, month, and species. Additionally, we calculated the measurement of operational effort. Measurements were ranked across gears for each month and summed. The smallest ranks were used to identify the best gear and month for sampling each species. Preliminary results indicate electrofishing captures the best length diversity and operational effort for Common Carp and White Sucker in June and May respectively. CPUE for White Suckers and Common Carp was highest in April and July fyke netting respectively. Lastly, variability in CPUE was lowest with Common Carp July electrofishing and White Suckers May gill netting. The results from this study can be used by other states addressing similar and other nuisance and invasive species assessments to allow for more proactive, rather than reactive, management interventions.

Full Presentation, Student

Wednesday, 11:40 AM

Evaluating the Distribution of Fish Community Production in Northern Wisconsin Lakes with Different Walleye Recruitment Histories

Maxwel Wilkinson, *University of Wisconsin - Stevens Point*, mwilk933@uwsp.edu
Stephanie Shaw, Joseph Mrnak, Greg Sass, Daniel Dembkowski, and Daniel Isermann

The Ceded Territory of Wisconsin is a lake-rich region that supports important tribal subsistence and recreational fisheries for multiple species. Recently, declines in walleye *Sander vitreus* production and recruitment, coupled with increases in centrarchid abundance (e.g., largemouth bass *Micropterus salmoides* and bluegill *Lepomis macrochirus*) have created challenges for managers in terms of maintaining desired fish community structure amidst changing environmental conditions and angler preferences. Competitive and predatory interactions between centrarchid species and walleye have been hypothesized to influence walleye natural recruitment, notably in small lakes (<150-ha). Because some north-temperate lakes are limited in nutrient availability, shifts towards centrarchid dominance may reduce resource availability for walleye and further prevent recovery of walleye populations if limited production potential becomes re-distributed within the food-web. Thus, the primary objective of this study is to determine if the distribution of fish community production differs between lakes with declining and sustained natural walleye recruitment. We hypothesize that centrarchid production will be proportionally higher in lakes with declining walleye recruitment, potentially 'cultivating' an environment that is less suitable for self-sustaining walleye populations. We will present preliminary findings based on community-level production estimates obtained from four lakes during the 2024 field season and discuss potential implications of redistributed production for maintenance of desired fish community structure.

Full Presentation, Student

Wednesday, 1:00 PM

Managing for Predator-Prey Balance in Lake Michigan

Iyob Tsehaye, *Wisconsin DNR*, iyob.tsehaye@gmail.com
Richard D. Clark, Jr., Jory Jonas, Matthew S. Kornis, Nicholas D. Legler, Charles P. Madenjian, Benjamin Turschak, David M. Warner

The predator-prey dynamics in Lake Michigan, like in other Great Lakes, have experienced significant fluctuations over the past century, presumably due to overfishing, habitat changes, and invasive species. Many native species, most notably lake trout in the mid-20th century, have been severely depleted or extirpated, leading to the rise of invasive species such as alewife and rainbow smelt. In places where they have become abundant, theses invasive species have adversely impacted native fish populations through competition for food and predation on eggs and larvae. To control the proliferation of invasive prey fishes and rehabilitate native species, millions of native (lake trout) and non-native salmonines, including Chinook salmon, rainbow trout, brown trout, and Coho salmon, have been stocked in Lake Michigan since the 1960s. While these efforts have achieved some success (including the creation of important recreational fisheries), they have also led to new challenges. Prey fish populations, particularly alewife, have declined to historically low levels, prompting adjustments to stocking rates. However, recent population models indicate a reduced risk of predator-prey imbalance, likely due to significant reductions in stocking rates in recent years (e.g., 2013, 2017, and 2019). Yet, the historically low levels of alewife, coupled with increased natural reproduction of salmonine predators (e.g., lake trout and Chinook salmon), and potential dreissenid mussel induced bottom-up effects, underscore the need for ongoing monitoring and adaptive management to maintain ecological balance in Lake Michigan.

Full Presentation, Professional

Wednesday, 1:20 PM

Juvenile Walleye (*Sander vitreus*) Foraging Behavior, Success, and Growth Under Varying Light Conditions

Quinn Smith, *University of Wisconsin - Madison*, qcsmith2@wisc.edu
Noland O. Michels, Loranzie S. Rogers, Greg G. Sass, Thomas R. Hrabik, and Allen F. Mensinger

The foraging success and growth of piscivores often depend on environmental light availability. In north-temperate systems, high tannin concentrations limit light, and increasing variability in tannin levels may influence fish foraging behavior, success, growth, and further contribute to varying recruitment trends. To evaluate foraging and growth responses to varying light conditions, we studied juvenile Walleye (Sander vitreus) reaction distances and successful attacks/captures of prey at multiple light intensities (0, 0.05, 0.1, 1, 10, 40, 100, and 750 lux) and observed their growth at 3 of these light intensities (10, 100, and 750 lux) under various tannin concentrations (0 mg/L, 10 mg/L, and 20 mg/L). To study foraging behavior and success, juvenile Walleye (109-156 mm) foraged for 15 minutes on three Fathead Minnows (Pimephales promelas) in a 1900L foraging arena. Reaction distance and successful attacks/captures were calculated from video recordings. To study growth, 15 juvenile Walleye (127-182 mm) were randomly assigned to a treatment at one of three light intensities and tannin concentrations and fed ad-libitum at 18°C for 16 days. Total length and weight were measured at days 0, 8, and 16 and consumption was measured each day for each replicate. Capture success was greatest in very low light conditions (0.05-1 lux) and declined as light intensity increased. Walleye reaction distance increased from 0-1 lux and plateaued, but the probability of an attack decreased with increased light intensity. Juvenile Walleye growth was always positive and ranged from 0.010 to 0.023 g/g/day, with the greatest growth occurring in low light (10 lux) with highly stained water (20 mg/L). At each light level, tannin concentrations of 0mg/L had the lowest growth rates. These findings highlight the importance of low-light habitats for age-0 Walleye and provide insights into how changing light conditions and water clarity may affect foraging and growth in north-temperate systems.

Full Presentation, Student

Wednesday, 1:40 PM

In the Weeds: Understanding the Role of Aquatic Macrophytes in Walleye Recruitment in the Upper Midwest

Robert Davis, *University of Wisconsin – Madison*, robert.davis.bd@gmail.com
Ellen Albright, Catherine Hein, Michael Verhoeven, Heidi Rantala, and Zach Feiner

Aquatic macrophytes provide important habitat for fish at various life stages and can influence fish population characteristics such as growth and size structure. Even though aquatic plants are generally considered to be important to fish communities, the exact nature of the relationship is not well understood in some cases. Walleye are a culturally and economically important species to the upper Midwest that are currently experiencing declines in recruitment success due to climate change and other factors. In this study, we seek to elucidate the role that aquatic vegetation plays in determining walleye recruitment success. Point-intercept aquatic plant surveys spanning the years 2004 to 2021 from Minnesota (n = 46) and Wisconsin (n = 313) were used to quantitatively describe plant communities in lakes, and annual fall electrofishing recruitment surveys were used to quantify walleye recruitment during the same time period. Random forest models were used to understand the nature of the relationship of aquatic plant communities to walleye recruitment and any interactions that may exist between aquatic plant communities and other important environmental variables previously found to influence walleye recruitment success (e.g., growing degree days, lake surface area). We found that littoral vegetation coverage negatively influences recruitment with the number of failed year classes increasing as littoral area vegetated in a lake increases. Littoral vegetation had interactions with other variables, such as littoral area and growing degree days, suggesting that not all lakes will be affected similarly. Altogether, this study adds to the growing body of knowledge of factors that influence walleye recruitment.

Full Presentation, Professional

Wednesday, 2:00 PM

Identifying Walleye and Lake Whitefish Spawning Habitat to Inform Habitat Improvements for Lake Sturgeon in the Lower Fox River below De Pere Dam

Braden Lensing, *University of Wisconsin – Stevens Point*, blensing@uwsp.edu
Danial Dembkowski, Joshua Raabe, Jason Breeggemann, and Daniel Isermann

Previous research indicates that lake sturgeon *Acipenser fluvescens* recruitment is limited in the Lower Fox River below De Pere Dam. Habitat enhancements in the form of an offshore reef have been proposed to potentially improve the recruitment of lake sturgeon. However, identifying spawning habitats for other species could help to ensure that restoration efforts for lake sturgeon do not result in loss of spawning habitat for other species. The Lower Fox River supports spawning runs of walleye *Sander vitreus* and lake whitefish *Coregonus clupeaformis*, both of which support important fisheries in southern Green Bay. Our objectives are to 1) describe spatial variation in walleye and lake whitefish egg densities in the LFR below De Pere Dam to inform placement of the lake sturgeon spawning reef; 2) determine if spatial variation in egg densities are related to a suite of environmental variables (e.g., flow, depth, and substrate), 3) determine if spatial distributions of eggs are similar for walleye and lake whitefish, and 4) describe the timing (e.g., start, peak, end, and duration) of walleye and lake whitefish spawning. Heat maps generated from relative egg densities illustrate the spatial distribution of walleye and lake whitefish egg densities and reveal significant overlap in egg deposition between the two species, as well as notable overlap with three of four proposed reef locations. The 2023 lake whitefish spawning period spanned 14 days, beginning on November 8 and concluding around November 21. In contrast, the 2024 walleye spawning season lasted 38 days, commencing on March 18 and ending about April 25.

Full Presentation, Student

Wednesday, 2:20 PM

Identifying Critical Periods of Recovery in a Highly Exploited Walleye Population

Taylor Preul-Stimetz, *Wisconsin DNR*, taypreul@gmail.com
Stephanie L. Shaw, Kathryn M. Renik, and Greg G. Sass

The decline of walleye (*Sander vitreus*) populations raises concerns about the stability of freshwater ecosystems and the sustainability of recreational and subsistence fisheries. Long-term recovery patterns after intense exploitation or population collapse remain poorly understood, complicating efforts to establish realistic stakeholder expectations. We examined the recovery trajectory of a heavily exploited walleye population in Escanaba Lake, Wisconsin (1982–2002) following the implementation of a harvest-eliminating regulation (2003–2024). Directed walleye angler effort significantly declined post-regulation, yet catch rates remained stable. The elimination of fishing mortality led to rapid increases in production, biomass, and abundance during an initial recovery boom phase (2004–2008). This was followed by a prolonged period of instability (2009–2019) before seemingly stabilizing into a new density-dependent equilibrium (2019–2024). Growth patterns shifted with males and females displaying lower asymptotic lengths, but an increase in juvenile growth rates. Mortality rates sharply declined, particularly for males, resulting in a greater representation of older age classes. Recruitment dynamics were decoupled from adult population responses, with highly variable recruitment during 1988-2010, which included occasional boom years, shifting to lower, more stable recruitment during 2010-2024. Our findings emphasize the critical importance of incorporating long-term density-dependent processes and inter-annual variability when evaluating the outcomes of regulatory changes. Our study demonstrates the limited predictive value of recruitment or catch rate as indicators of recovery success. This is informative for setting realistic expectations for rightsholders and stakeholders and implementing adaptive management strategies to ensure the resilience of walleye populations under changing ecological and anthropogenic pressures.

Full Presentation, Professional

Wednesday, 4:00 PM

Diminishing Productivity and Hyperstable Harvest in Northern Wisconsin Walleye Fisheries

Joseph Mrnak, *Wisconsin DNR*, mrnak@wisc.edu
H.S. Embke, M.V. Wilkinson, S.L. Shaw, M.J. Vander Zanden, and G.G. Sass

Managing fisheries in a changing socio-ecological environment may require holistic approaches for identifying and adapting to novel ecosystem dynamics. Using 32 years of Ceded Territory of Wisconsin (CTWI) walleye (*Sander vitreus*) data, we estimated production (P), biomass (B), biomass turnover (P/B), yield (Y), and yield over production (Y/P) and tested for hyperstability in walleye yield. Most CTWI walleye populations showed low P and B, and $Y/P < 1$. Yet, production overharvest ($Y/P > 1$) was prevalent among Wisconsin walleye recruitment-based management approaches (natural recruitment (NR), sustained only by stocking, combination). Production, B, and P/B have declined in NR populations, while Y and Y/P have remained constant. Walleye Y was hyperstable along a production gradient among all management approaches and fishery types (i.e., angling only, angling/tribal harvest combined). Diminishing productivity and hyperstable yield may be jointly contributing to observed walleye declines. We classified lakes into management groups of low, moderate, or high vulnerability to harvest based on Y/P and P/B dynamics and identify that harvest may benefit from declines to maintain or increase the adaptive capacity of CTWI walleye.

Speed Presentation, Professional

Thursday, 8:00 AM

Diverse Waters: How Location and Fishing Method Define Wisconsin's Angler Diversity

Lonnie Parry-Gillis, *University of Wisconsin - Madison*, svyettlana@gmail.com
Olaf Jensen, Zach Feiner, Amy Schultz, Laura Schmidt, Cheryl Masterson, Titus Seilheimer, and Iyob Tsehaye

Recreational angling, a billion-dollar industry, significantly impacts fish populations in inland waters, making it a key focus of fisheries management. Creel surveys are commonly used to assess angler behavior, catch, and harvest, but they are increasingly developing to understand the social factors influencing fishing practices, such as motivations, demographics, and preferences. Most creel efforts have focused on rural fisheries, where anglers often travel long distances to fish, yet there is limited understanding of urban anglers and their interactions with local waterbodies. Focusing creel efforts on areas of highest management concern may lead to the underrepresentation of certain angler groups. This study explores how an angler's fishing location and method can provide insights into their motivations, behaviors, and demographics. We hypothesize significant differences not only between urban and rural anglers but also among different fishing methods. Creel surveys were conducted from May to October 2024 in Milwaukee, WI, along the Milwaukee River and Lake Michigan shoreline. Interviews from Milwaukee were analyzed alongside previous creel data from Dane County (2022) and Vilas County (2018-2019, 2022). Preliminary results reveal significant differences in demographics and target fish species across urban and rural anglers. Data analysis is ongoing, and findings from this study could inform more inclusive and representative fisheries management practices.

Speed Presentation, Student

Thursday, 8:10 AM

Retention Rate Differences Between Dangler Tagging Methods in Lake Sturgeon *Acipenser fulvescens* over 20 years in the St. Croix River, Wisconsin-Minnesota

Elise Bass, *University of Wisconsin – Stevens Point*, elisebass247@gmail.com
Kent Bass and Joseph Mrnak

Lake Sturgeon *Acipenser fulvescens* are a culturally, economically, and recreationally important large-bodied and long-lived species native to the Mississippi River Basin, the Great Lakes, and other large river systems throughout North America. Maximizing the Carlin dangler tag retention rate in Lake Sturgeon could allow managers to more accurately track important information such as movement, survival, and growth. The objectives of our study were to determine if retention differed between dangler tagging methods and if a relationship existed between the retention rate and duration since tagging of Lake Sturgeon in the St. Croix River, Wisconsin-Minnesota. Lake Sturgeon were captured and tagged with a passive integrated transponder (PIT) and Carlin dangler tag by the Wisconsin Department of Natural Resources (WDNR) through hook and line sampling between river-miles 79-129 of the St. Croix River from 2004-2024. Lake Sturgeon tagged prior to 2011 were tagged using the old method (single puncture), whereas fish tagged 2011 and after were tagged using the new method (two punctures). Recaptured fish that lost their dangler tag were identified by their PIT tag number. The duration of retention was then calculated as the number of days from the original dangler tagging event to the date of recapture. There was a statistically significant difference between the old method (63% retention rate) and new method (97.5% retention rate) of dangler tagging ($p < 0.001$). Logistic regression revealed a significant negative relationship between the total probability of tag retention and the duration since tagging ($p < 0.001$). Due to the significantly higher retention rate of the new dangler tagging method, we recommend fisheries managers use the new method of tagging (two punctures) when tagging Lake Sturgeon with dangler tags. Our study provides insight into the effectiveness of different Lake Sturgeon dangler tagging methods, aiding managers in more accurately assessing populations.

Speed Presentation, Student

Thursday, 8:20 AM

Initial Observations of Smallmouth Bass Movements Following a Simulated Tournament Displacement Event

Dan Dembkowski, *Wisconsin Cooperative Fishery Research Unit, University of Wisconsin - Stevens Point*, dan.dembkowski@uwsp.edu
Ben Vasquez, Scott Hansen, and Dan Isermann

Smallmouth bass populations have expanded in the Great Lakes and support destination fisheries in all five lakes. Increased occurrence of competitive catch-and-release tournaments targeting smallmouth bass may degrade natural patterns of connectivity by artificially concentrating bass around release locations or by mixing discrete stocks through translocation. The effects of tournament displacement on connectivity and stock structure are largely dependent on post-displacement fish behavior. We conducted a displacement experiment along Wisconsin's Door Peninsula during May 2024 and translocated 60 smallmouth bass from two discrete spawning locations to a centralized release location. Smallmouth bass were implanted with acoustic transmitters and post-displacement movement was monitored using an extensive array of acoustic receivers at and in-between capture and release locations. We will present initial observations of smallmouth bass behavior following the simulated tournament displacement event, including information regarding post-displacement dispersal and if fish were detected returning to their initial capture locations.

Speed Presentation, Professional

Thursday, 8:30 AM

Save a Walleye, Eat a Bass! Thirteen Years of the Intraguild Shootout Bass Tournament

John Kubisiak, *Wisconsin DNR*, john.kubisiak@wisconsin.gov
Stephen Gilbert

The Intraguild Shootout Bass Tournament is a tongue-in-cheek response to a wave of anti-bass sentiment that swept through northern Wisconsin in the early 2000's. It was modeled after the "Hook 'em and Cook 'em" bass and pike tournament organized by "Double G" and the Nelson Lake Association beginning in 2006. The Intraguild Shootout has been held annually for 13 years beginning in 2012, the year that a no-minimum length limit was implemented on Minocqua Chain, Oneida County Wisconsin. Tournament waters expanded from just Minocqua Chain during 2012 - 2014 to include other area waters with either a no minimum or a protected slot length limit for bass. We evaluate the tournament's hypotheses that bass 1. suppress walleye populations and 2. are not good to eat. We also compare tournament catch statistics to competitive bass tournaments held on the Minocqua Chain during the same period.

Speed Presentation, Professional

Thursday, 8:40 AM

Coarse Woody Habitat Addition Minimally Influences Isotopic Signatures of a North-Temperate Lake Fish Community

Willem Stoll, *Wisconsin DNR*, willem.stoll@wisconsin.gov
Joe Mrnak, Taylor Preul-Stimetz, Stephanie Shaw, and Greg G. Sass

Coarse woody habitat (CWH) is an essential structural habitat within northern temperate lakes and is known to have distinctive effects across trophic levels, however, its impacts on many resource dynamics are not well understood. Stable isotopes, such as δ13C, δ15N, and δD allow unique insight into food-web positioning, habitat use, and allochthonous inputs. Using a Before-After Control-Impact framework (BACI), we tested for isotopic shifts in adult fish tissue (δ13C, δ15N) and lake water (δD) after adding 140 trees to Sanford Lake in 2018, to test whether CWH addition influenced fish resource use and trophic positioning. Our results indicated that δ13C, δ15N, and δD did not change after CWH addition. We hypothesize that the system was already dominated by allochthonous carbon and CWH-induced increases in primary production masked any δ13C shifts. Similarly, since CWH addition did not introduce novel prey or predators and potentially increased common prey availability across trophic levels, it is unlikely δ15N would shift. The lack of a δD shift was likely confounded by highly variable water levels in the region within the study's time frame. This research surmises that more expansive research is needed at lower trophic levels to mechanistically understand isotopic dynamics resulting from CWH addition.

Speed Presentation, Student

Thursday, 8:50 AM

Optimizing Instream Habitat Sampling: How Many Transects are Enough to Describe Habitat Variability in Wisconsin Driftless Area Streams?

Evan Sirianni, *University of Wisconsin – La Crosse*, sirianni5831@uwlax.edu
David A. Schumann, Jason G. Freund, and Brandon Thill

Instream and environmental features are often measured by subsampling wadable stream reaches with time consuming transect protocols. These subsamples are generally thought to represent substantial variability among individual transects. We used habitat transect data to identify stagnation (leveling off) in the variability of water depth (cm), wetted width (m) and the mean and bottom current velocities (cm s-1) at 19 coldwater streams in southwestern Wisconsin. At each stream reach, 31 transects were sampled and used to develop hypothetical transect resampling scenarios to represent the variation (i.e. coefficient of variation) in each habitat feature if between 5 and 31 equally spaced transects were sampled. The coefficient of variation values for each of the habitat variables were calculated and the breakpoints (i.e. when the slope of the line becomes 0) were estimated using piecewise linear regression. The collective mean breakpoint of all habitat models was 14.80 (standard deviation [SD] = 6.31). Little difference among habitat variable breakpoint values (water depth (mean = 14.23, SD = 6.6), wetted width (mean = 14.43, SD = 6.0), mean current velocity (mean = 14.99, SD = 6.25), bottom current velocity (mean = 15.55, SD = 6.79), further suggest the use of 15 equally spaced transect measurements to collect representable habitat data in wadable streams. Additionally, there was no difference in the coefficient of variation breakpoint values between sites in sandstone (mean = 14.41, SD = 6.16) and dolostone (mean = 15.23, SD = 6.52) geologies (Wilcoxon rank sum test; test statistic = 747, p-value = 0.79). The small sample of stream reaches, and region sampled potentially limits the applicability of these results; however, these results do identify variation among the diverse streams we sampled. Further modeling with additional geographic regions and habitat variables may help to further refine the number of transects needed to identify habitat variance in streams.

Speed Presentation, Student

Thursday, 9:00 AM

Radial Tree Drops: Adding Woody Habitat to Low Gradient Lakes on the Chequamegon Nicolet National Forest

Nick Berndt, *US Forest Service*, nicholas.berndt@usda.gov

Historic unregulated logging practices on the Chequamegon Nicolet National Forest land base has left a decades long gap where old aged well developed shoreline timber was sent to the mill and not naturally falling into lakes. A younger forest with a different species composition now dominates the shores on many of these lakes. Where feasible, it has been a longstanding practice to drop trees and add nearshore woody habitat to help make up this deficit. However, on shallow weedy lakes with low gradient shorelines, these younger trees often don't fall in deep enough water to be of much use by fish. Using hand tools and portable winches on the ice, a small crew moved trees slightly offshore to deeper water. Trees were then arranged in a radial pattern to increase woody surface area exposed to the water. This slightly deeper configuration made woody habitat more available to fish year-round on these shallow weedy lakes. These radial tree drops can be another useful tool for increasing coarse woody debris on lakes where it otherwise might be a challenge. Additionally, this technique showed promise for moving large trees onto a lake without the need for a large crew, vehicles, or heavy equipment. This could be valuable for woody habitat additions during warmer winters with thin ice, where money and crew is limited, or on shorelines where suitable trees are not directly on the shoreline.

Speed Presentation, Professional

Thursday, 9:10 AM

What Happened When We Asked Nelson Lake to get RAD: A Case Study Bringing the Resist-Accept-Direct Framework to Stakeholders

Max Wolter, *Wisconsin DNR*, max.wolter@wisconsin.gov

Declining walleye recruitment has been a critical issue for many fisheries in Wisconsin. Rehabilitative actions, including stocking, harvest reductions, and habitat or fish community manipulations, have been attempted to "resist" ecosystems shifting away from walleye dominance, but the likelihood of rehabilitating walleye populations varies among waterbodies based on habitat suitability, social factors, and available agency/partner resources. The 2022 Wisconsin Walleye Management Plan calls for the application of the "RAD" (Resist-Accept-Direct) framework for approaching walleye management under changing environmental conditions. RAD outlines an approach where data and modeling, along with experiences from past management actions, help dictate where to continue to "Resist" ecosystem shifts, where managers may want to "Accept" ecosystem shifts, and where there may be opportunities to "Direct" ecosystem shifts to favorable outcomes. While modeling and data-driven approaches to applying the RAD may be sound, considerable work needs to be done to determine how stakeholders will respond to the RAD framework and the resulting proposed changes in management. We used Nelson Lake in Sawyer County, Wisconsin, a waterbody with a long and extensive history of "resisting" an ecosystem shift away from walleye dominance, as a case study in stakeholder reactions to RAD scenarios. Social data were captured at in-person public meetings in 2004 and 2024 and through a corresponding online questionnaire in 2024. We observed shifts in angler preferences that correspond to changes in the fishery over that span of time. We also explored demographic characteristics that may make individuals more likely to align with "accept" or "resist" management approaches. These results illustrate some of the challenges inherent to transitioning from a "resist" to an "accept" management strategy and provide guidance for how other managers may need to navigate these conversations with stakeholders.

Full Presentation, Professional

Thursday, 10:00 AM

Fish Community Use of Spring Ponds Within the Plover River System, Wisconsin

Jason Lins, *University of Wisconsin – Stevens Point*, Linsjasonj@gmail.com
Jared Homola, Amy Springer, and Joshua Raabe

Small natural features (SNF) are habitats with ecological importance disproportionate to their size that often provide habitats that are limited in surrounding landscapes. Spring ponds are small, spring-fed waterbodies that may serve as SNFs that provide a refuge for coldwater fishes, but these waterbodies have been understudied due to their remoteness and difficulty to access. Environmental DNA (eDNA) provides a means of assessing communities in remote locations without the need for physical specimen collection and may be effective for sampling spring ponds. The Plover River system in central Wisconsin has spring ponds that support cool/coldwater fish communities and are connected to the river through an outlet. Ten spring ponds were sampled using eDNA metabarcoding (12S and 16S) in three seasons and electrofished in summer, and three focal ponds were electrofished in four seasons and passive integrated transponder (PIT) arrays were installed at the outlets of focal ponds. Sixteen species were detected in spring ponds using eDNA, prominently brook stickleback *Culaea inconstans* (71.5%) and white sucker *Catostomus commersonii* (11.5%), and electrofishing detected twenty-two species, prominently white sucker (38.3%), and brook trout *Salvelinus fontinalis* (14.1%). Depth standard deviation, maximum depth, mean depth, median depth, outlet length, wood density, outlet location (rkm), and volume were pond characteristics that related to significant differences in presence/absence and relative abundance (sequencing reads and catch per hour). Community composition was significantly related to waterbody but not season. However, white suckers appeared to favor the Plover River during spring and fall, and spring ponds in summer from PIT array data. This study provides information on spring pond fish communities and indicates eDNA is likely to be useful for sampling spring ponds and that spring ponds fit the definition of a SNF.

Full Presentation, Student

Thursday, 10:20 AM

Comparing Native and Invasive Fish Management Strategies in the Upper Mississippi River using Metapopulation Models

Richie Erickson, *U.S. Geological Survey*, rerickson@usgs.gov

Locks and dams fragment the upper Mississippi River (UMR) and decrease fish passage within the river. For native fish species, this fragmentation can adversely affect populations by disrupting migrations and movement patterns that can lead to disconnected populations. Conversely, for invasive fish populations, this fragmentation can decrease the spread of injurious species. Management strategies in the UMR balance these two considerations. For example, the U.S. Army Corps of Engineers is currently constructing a fish passage project at Lock and Dam 22 in the UMR to enhance native fish populations. Federal and State agencies are developing and testing fish deterrents to reduce the spread of invasive carp populations in the UMR. I will describe a metapopulation model currently being applied to the UMR to compare silver carp control strategies and native and invasive fish passage scenarios. I will also talk about future direction and application of modeling efforts.

Full Presentation, Professional

Thursday, 10:40 AM

Considerations for Using Tag-Returns to Monitor Targeted Removal of Invasive Fishes

Jessica Stanton, *U.S. Geological Survey*, JCStanton@usgs.gov
Benjamin J. Marcek and Marybeth K. Brey

Targeted removals are used for management of some invasive fish populations. Tag-return studies are one approach that can be used to assess the efficacy of targeted removals. However, there are many decisions to make when designing a tag-return study. We used simulation modeling to outline general guidelines for consideration when designing efficient tag-return studies to measure annual removal rates of invasive fish, particularly invasive carps. We simulated datasets using scenarios with varying numbers of fishes tagged per year, removal rates, tag-reporting rates, tag-retention rates, and study durations. We generated these datasets under a set of 'known' parameters with added stochasticity then fit the simulated datasets to a Bayesian tag-return model and measured the precision and accuracy of the model estimated removal rates. We found that the model was able to predict removal rates without bias for most of the scenarios. However, we did find patterns in the precision of the predictions that could help inform tag-return studies. When the proportion of the population removed through harvest was constant, the proportion of the population harvested per year and the probability that harvested tags were reported had the largest effect on precision. The number of tags released per year, and the duration of the study also had moderate effects. For scenarios testing the ability of the model to predict harvest rates in stochastic populations, the precision of the model was primarily influenced by the number of fish tagged, the underlying nature of the stochasticity, and whether fish were tagged the year of the prediction. Based on our simulations, we outline how study objectives, the underlying population conditions, and the tolerance range for error can guide decisions regarding the number of fish to tag, how to monitor tag return rates, and how long to conduct a study.

Full Presentation, Professional

Thursday, 11:00 AM

Evaluating Lake Sturgeon Spawning Site Use and the Relative Contribution of Spawning Tributaries to Harvest in the Lake Winnebago System

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Daniel J. Dembkowski, Margaret H. Stadig, Joshua K. Raabe, and Daniel A. Isermann

The Lake Winnebago System (LWS) population in east-central Wisconsin represents one of the largest self-sustaining populations of lake sturgeon *Acipenscer fulvescens* in North America that supports an annual spearing fishery each February. Lake sturgeon spawn at more than 70 locations within tributaries to the LWS, but the extent and timing of spawning that occurs at many sites remains unknown. Understanding lake sturgeon use of spawning locations is important in allocating sampling effort needed to mark fish and obtain population estimates used in setting safe harvest levels for the fishery. Furthermore, some spawning sites represent habitat improvement efforts implemented by the Wisconsin Department of Natural Resources and little to no evaluation has been performed at these sites to determine relative use and potential for successful hatching. Our objectives were to describe lake sturgeon use, measure egg deposition rates and survival, and verify whether hatching is occurring at selected spawning locations in the Wolf River drainage, including sites where habitat improvements have occurred. Spawning sites were or will be visited repeatedly during the 2024 and 2025 spawning seasons and lake sturgeon are visually counted along defined transects. Eggs are collected with a manual transfer pump and D-frame drift nets are used to collect larvae. We will present results from our first sampling season. The information from our research may help the Wisconsin Department of Natural Resources strategically allocate spring sampling effort so that more sites can be sampled and could provide guidance regarding future habitat improvement projects.

Full Presentation, Student

Thursday, 11:20 AM

Buffalo in Wisconsin: Population Characteristics and Contribution to Bowfishing Tournament Harvest

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Ryan Bohen, Dan Dembkowski, Alex Latzka, and Joseph Hennessy

Bigmouth buffalo *Ictiobus cyprinellus* and smallmouth buffalo *Ictiobus bubalus* (herein buffalo) are native, non-game fishes that rarely receive management attention. Increased participation in bowfishing has prompted efforts to better understand the population dynamics of buffalo and other native fish to determine their resiliency to harvest. Buffalo are native to many water bodies in Wisconsin, but little information exists regarding their population dynamics and contribution to bowfishing harvest. Consequently, our research objectives were to: 1) describe age composition, reproductive traits, and population dynamics for buffalo populations in Wisconsin; 2) assess their resiliency to harvest, and 3) determine the contribution of buffalo to harvest at bowfishing tournaments. We collected buffalo from 14 Wisconsin waterbodies with the help of the Wisconsin Department of Natural Resources and Wisconsin Bowfishing Association (WBA). Fish were selected for age estimation using a modified age-length key approach. Lapillus and asteriscus otoliths were used for age estimation. Age structure of buffalo populations varied considerably among populations, with maximum ages ranging between 15 and 70 years. Maturation schedules also varied, with age at 50% maturity ranging between 2.0 and 6.5 years and length at 50% maturity ranging between 382 and 505 mm. Three populations were oversampled (100≤ fish) to determine the minimum number of fish in a subsample needed to fully represent age composition in the population. Bowfishing harvest was recorded at each WBA tournament in 2023 and will be recorded again in 2024. All fish brought to the weigh-in were enumerated and identified to species or species group. Contribution of buffalo to tournament harvest peaked at 70.9% at the first tournament and was lower at the next four tournaments at 10.7%, 6.0%, 0.3% and 3.5%, respectively. Our research provides fishery managers with landscape-level population information on buffalo in Wisconsin

Full Presentation, Professional

Thursday, 11:40 AM

Development of Point-of-Use Detection Tools for Prevention and Control of Red Swamp Crayfish

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Amy L. Springer, Stephen F. Spear, and Jared J. Homola

Prevention of new invasive species often hinges on early detection and quick removal. Aquatic invasive species can be especially difficult to detect without extensive sampling due to habitat complexity and low initial abundances. Point-of-use biomolecule detection methods provide a possible solution via near real-time identification of DNA or other biological materials. Loop-mediated isothermal amplification (LAMP) provides a user-friendly approach for environmental (e)DNA detection that can be easily deployed in the field and yield diagnostic results within 40 minutes. Water can be filtered and the eDNA can be rapidly extracted with a Chelex resin and a portable heat block. We are developing a LAMP assay for red swamp crayfish (Procambarus clarkii) to enable identification of introductory pathways (e.g. the pet trade) and monitoring of the spread of established invasion sites. We generated 36 candidate primer sets that we evaluated in silico for red swamp crayfish specificity using the program BLAST to identify DNA sequence alignments to other species in the NCBI database. Sixteen species-specific candidate primer sets were then optimized for temperature of the LAMP reaction and brand of master mix. The optimal set of conditions were then used to further evaluate species-specificity through test amplifications of extracted DNA of related species (i.e. other Procambarus crayfish). Finally, we performed limit of detection testing down to a concentration of 1 copy/μL of target DNA, with consistent detections present at 100 copies/μL. Field collection and analysis of eDNA water samples from known infested waterbodies will occur in the spring to identify potential environmental inhibitors. These results will determine our ability to detect red swamp crayfish presence. This tool could be implemented to detect—and possibly prevent—invasions through rapid field-based monitoring in areas where red swamp crayfish are a concern for introduction and spread.

Full Presentation, Student