Talks and posters at the 149th American Fisheries Society Meeting Reno, Nevada Sept. 29-Oct. 3, 2019

Spatial Ecology of Walleye in the Bay of Quinte and Eastern Lake Ontario

Authors

Connor Elliott
Erin Brown
James Hoyle
Bruce Tufts

Walleye (*Sander vitreus*) in the Bay of Quinte and eastern Lake Ontario are known to be highly migratory. Until recently, most of the available information about their movements has been obtained from traditional assessment approaches. Acoustic telemetry and expanding GLATOS receiver networks are now providing new opportunities to gain more detailed insights into their seasonal movements and distributions. The information collected as part of this study will be valuable to guide future management decisions for this trophy Walleye fishery. This project has been using acoustic telemetry to collect multiple years of fine scale movement data for Walleye in this area. Since the spring of 2017, 190 Walleye have been surgically implanted with acoustic transmitters at various locations, both within the Bay of Quinte and across eastern Lake Ontario. A combination of smaller non-migratory and larger migratory fish have been tagged in an attempt to better understand patterns of movement at different life history stages. Movement data for different groups of Walleye will be presented and the factors that might be driving these movements will be discussed.

Sessions

Spatial Ecology of Walleye in the Bay of Quinte and Eastern Lake Ontario
Tuesday, Oct 1 1:50 PM
Reno-Sparks Convention Center, A1

Stock Structure and Contribution of West and East Basin Walleye to Recreational and Commercial Fisheries in Lake Erie

Authors
Peter T. Euclide
Stuart A. Ludsin

Elizabeth A. Marschall
Kuan-Yu Chen
Jason Robinson
Matthew Faust
Thomas M. MacDougall
Chris Wilson
Wesley Larson

Genomic techniques have been extensively used to inform mixed-stock fisheries management along North America's west coast, however, these same techniques are only now being used to support management in the Laurentian Great Lakes basin. Throughout the basin, Walleye (*Sander vitreus*) is an ecologically and economically important species and the focus of extensive stock discrimination research, especially in Lake Erie. While Lake Erie's Walleye population is supported by multiple local spawning stocks, managers have been unable to consistently discriminate among them and hence determine each stock's relative contributions to fisheries. We present the first attempt at stock reassignment in the Great Lakes using a RAD-Capture (Rapture) panel of 12,081 polymorphic loci. We used the R package assign POP to successfully reassign 384 individuals of known spawning origin to the lake-basin level (east vs. west). Following panel optimization, we tested the panel on 1,000 a mixed assemblage of individuals of unknown spawning-site origin to quantify the contributions of east vs. west basin stocks to eastern Lake Erie's recreational and commercial fisheries. Our study currently is the largest genetic mixed-stock analysis of Walleye in the Great Lakes and one of the first examples of next-generation sequencing technology being used for management in the region.
Sessions

Stock Structure and Contribution of West and East Basin Walleye to Recreational and Commercial Fisheries in Lake Erie
Tuesday, Oct 1 4:00 PM
Reno-Sparks Convention Center, A2

Do Lake-Specific Characteristics Mediate the Temporal Relationship between Walleye Growth and Warming Water Temperature?

Authors
Danielle Massie,
Yan Li,
Gretchen Hansen,
Tyler Wagner

Quantifying the drivers of spatiotemporal variability in fish growth is necessary for predicting species' response to environmental changes. In particular, it is important to understand how warming water temperature influence growth, and whether ecosystem properties may mediate the growth-temperature relationship. Our objectives were to: 1) quantify the spatiotemporal variability of Walleye growth in Minnesota and Wisconsin lakes, 2) determine if annual growth coefficient estimates (*K*) are correlated with growing degree days (GDD), and 3) identify if lake characteristics are drivers of the *K*-GDD relationship. To calculate spatiotemporal growth variability, we fitted a Bayesian hierarchical von Bertalanffy growth model to Walleye length-at-age data from 1993-2015 for 25 lakes. Growth estimates were found to vary substantially among years and lakes. We predict that northern lakes with cooler water temperatures will have a positive *K*-GGD relationship, while southern lakes may have a negative relationship due to temperatures potentially reaching beyond the optimal temperature for Walleye growth. Additionally, we hypothesize that deeper lakes may help mitigate the influence of warming water temperatures, while fish in shallower lakes may be more affected by warming water temperatures. This study will provide insights into the conservation of cool-water species subjected to a changing environment.

Do Lake-Specific Characteristics Mediate the Temporal Relationship between Walleye Growth and Warming Water Temperature?
Wednesday, Oct 2 10:30 AM
Reno-Sparks Convention Center, A13

Winter Temperature Effects on Yellow Perch Reproduction at the Southern Edge of the Species Range.

Authors

John Cannaday
Troy Farmer

Climate change is altering thermal regimes in aquatic systems worldwide, often impacting species on the southern edges of their ranges. Yellow Perch *Perca flavescens*, a cool water species, are sporadically distributed at the southern edge of their range in systems that provide coolwater refuges during summer months (e.g., tailwaters below hypolimnetic release dams). However, minimum winter temperatures are much warmer in these systems than in northern locations. In northern populations, egg quality is linked to overwinter thermal conditions, with long, cold winters resulting in higher quality eggs compared to short, warm winters. We explored if Yellow Perch from the Savannah River, SC

required similar exposure to long, cold winters for proper reproductive development. We conducted controlled laboratory experiments to determine if fish exposed to colder (8^0 C) or longer (42 d) winters would have higher offspring quality (larger, higher energetic density), than those exposed to warmer (12^0 C) or shorter (21 d) winters. Successful reproduction (spawning, fertilization, and hatching) occurred in all treatments -17 to 33 days after spring warming began. Results for hatching success, egg and larval size, and energetic density will be presented. Our results will provide improved understanding of Yellow Perch reproduction at the southern edge of their range.
Sessions

Winter Temperature Effects on Yellow Perch Reproduction at the Southern Edge of the Species Range.
Tuesday, Oct 1 4:00 PM
Reno-Sparks Convention Center, A4

Standardized Gillnet Survey Results Are Poor Predictors of Walleye Angling Success in South Dakota's Missouri River Reservoirs

Authors
Cameron Goble,
Mark Fincel

Gillnets are commonly used gears to capture Walleye (*Sander vitreus*) throughout North America. However, relationships between gillnet data and angler success are rarely evaluated. Here we present 20^+ years of standardized gillnet and creel data from three large (24,000 – 154,000 hectares) Missouri River reservoirs. South Dakota Game, Fish and Parks (GFP) annually samples Lakes Oahe, Sharpe, and Francis Case to assess temporal and spatial trends in Walleye populations as well as angler use, catch-rates, harvest, and satisfaction. We hypothesized that: 1) if South Dakota resident anglers are accessing annual GFP summary data, and 2) if standardized gillnet surveys are adequately indexing Walleye populations, then correlations would exist between Walleye population metrics (e.g. abundance [CPUE], condition [*Wr*], size-structure [PSD], etc.) and angler success. Overall, gillnet derived Walleye population metrics performed poorly explaining within-year angler success or predicting future success across all three reservoirs. Additionally, angler effort was better predicted than angler catch statistics. Walleye biomass and condition were modestly related to effort suggesting that anglers may target areas where surveys indicated (perhaps falsely) the future possibility of high angling success. However, we found using gillnet catch statistics to explain current or future angling success appears to be a misguided notion.

Standardized Gillnet Survey Results Are Poor Predictors of Walleye Angling Success in South Dakota's Missouri River Reservoirs
Wednesday, Oct 2 10:30 AM
Reno-Sparks Convention Center, C2

Assessing Post-Stocking Predation on Fingerling Walleye Sanders Vitreus

Poster Number: 452
Authors

Emily E. Ball
Michael J. Weber

Stocking fingerlings is a common practice to sustain Walleye populations throughout North America. However, predation of recently stocked fishes can have a negative effect on the success of a stocking program. The objective of this study was to assess post-stocking predation on fingerling Walleye (total length: 140-285 mm) in two Iowa lakes. Largemouth Bass, Smallmouth Bass, Northern Pike, adult Walleye, and Muskellunge diets were assessed before and up to nine weeks post-stocking on East and West Okoboji during fall 2015-2017 and predator population abundance was estimated to evaluate total consumption. Between 184-907 predator stomach samples were collected per lake and year. Proportion of fingerling Walleye in predator diets were spatially and temporally variable (0-60%) and were not associated with time since stocking. Consumption of fingerling Walleye varied across predators, systems, and years, with predators collectively consuming between 18-79% of stocked individuals. Northern Pike consumed the largest percentage of fingerling Walleye in East Okoboji (23-32%) whereas Largemouth Bass consumed the largest percentage of fingerling Walleye in West Okoboji (12-28%). Results from this study indicate that predation may be a factor influencing Walleye stocking success.

Freshwater Fisheries Management
Monday, Sep 30 5:30 PM
Reno-Sparks Convention Center

Session: Food Webs
Location: Reno-Sparks Convention Center, A20
Date: Thursday, Oct 3 8:00 AM

Duration: 20 minutes
Speakers
Abstracts

Bigger Is Better! Evidence of Size-Selective Predation on Age-0 Walleye Sander Vitreus

Presenting Author
Emily E. Ball
Iowa State University

Authors
Michael J. Weber
Iowa State University

Abstracts

The argument of “bigger-is-better” has led fish hatcheries to progressively rear larger Walleye to hypothetically improve survival. Our objective was to evaluate potential for size-selective predation of stocked age-0 Walleye by a suite of piscivores. Largemouth Bass, Smallmouth Bass, Northern Pike, adult Walleye, and Muskellunge diets and gape measurements were collected from East and West Okoboji, Iowa during fall 2015-2017. Over the study duration, 298 Walleye were recovered from 3,514 predator stomachs (8.5%), with total length being determined for 165 individuals. Size distributions of stocked and consumed Walleye differed, with smaller individuals <220 mm consumed more often than larger individuals. Consumed Walleye total length were not related to predator length. However, prey:predator total length ratio was positively related to consumed Walleye total length, with adult Walleye and Northern Pike consuming Walleye that were 10-30% of their total length and Largemouth Bass and Smallmouth Bass consuming Walleye that were 30-50% of their total length. All predators selected Walleye between 100-129 mm TL and selected against Walleye 220-300 mm. Collectively, these results provide insight as to size-specific prey-predator interactions that have the potential to negatively influence stocking programs.

AFS Contributed Paper Presentations

Contrasting Angler Effort, Catch and Harvest in Two Popular Ohio River Fisheries

Poster Number: 481
Authors
Jeremy Pritt,
Curtis Wagner

Recreational fishing effort in large rivers is spread over vast distances, is spatially and temporally dynamic, and directed at multiple species. In this study, we conducted a probabilistic, access-based creel survey of the 726-km segment of the Ohio River bordering Ohio during January–December 2017. We contrasted angler effort, catch, and harvest for the two most popular species groups: *Sander* spp. and *Micropterus* spp. Spatially, 93% of *Sander* spp. directed effort occurred in tailwater habitats (areas < 2 km downstream of dams) whereas 91% *Micropterus* spp. directed effort occurred in non-tail water habitats. Temporally, 88% of *Sander* spp. directed effort occurred during October–April whereas 84% of *Micropterus* spp. directed effort occurred during April–October. Anglers in both fisheries experienced similar catch rates (0.8 fish/angler-hour for *Sander* spp. in tailwater habitats and 0.67 fish/angler-hour for *Micropterus* spp. in non-tail water habitats), but the *Sander* spp. fishery was harvest-oriented (20% of captured fish were harvested) whereas the *Micropterus* spp. fishery was dominated by catch-and-release angling (< 1% of captured fish were harvested). Understanding fishery-specific differences in angler effort, catch, and harvest informs fisheries management activities including implementing and enforcing harvest regulations, fish stocking, and developing access.

Sessions

Freshwater Fisheries Management
Monday, Sep 30 5:30 PM
Reno-Sparks Convention Center

Lake Erie Hypoxia Reduces Yellow Perch Growth

Poster Number: 493

Authors
Mason Collins
Jacob Moreland
Meghan Angelina
John Cannaday
Stuart A. Ludsin
Elizabeth A. Marschall
Troy Farmer

Yellow Perch (*Perca flavescens*) are economically and ecologically important across the Laurentian Great Lakes. Quantifying annual age-specific growth rates provides important baseline information for managers and can indicate how environmental stressors affect habitat quality. In Lake Erie, late summer hypoxia ($O_2 \leq 2$ mg/L) develops annually in the central basin although the timing, duration, and spatial extent of hypoxia varies significantly across years. Previous work found Lake Erie yellow perch fall body condition was negatively related with hypoxia duration during the preceding summer. This work aimed to further

investigate relationships between hypoxia and yellow perch growth in Lake Erie's central basin by quantifying annual back-calculated growth of 1,433 yellow perch collected during 2009-2014. We related back-calculated growth to an annual index of hypoxia extent in central Lake Erie during 2001-2012. We also included growing degree days and cohort-specific abundance indices in our analysis to account for other abiotic and density-dependent factors that may affect growth. Preliminary results indicate that age-1 yellow perch growth was negatively related to both annual hypoxic extent and age-1 abundance in central Lake Erie, suggesting hypoxia may negatively impact yellow perch habitat quality and, subsequently, growth in central Lake Erie.

Habitat and Water Quality
Monday, Sep 30 5:30 PM
Reno-Sparks Convention Center

Latitudinal Variation in Yellow Perch Growth across North America

Poster Number: 600

Authors
Hannah Mulligan
Fiona Slater
Rachel Moore
Savannah Seeber
Taylor Skipper
William Sims
John Cannaday
Troy Farmer

Latitudinal variation in growth across a species range has been quantified for several sought-after sport fishes throughout North America but remains unexplored for other species that share similar ranges. Yellow Perch (*Perca flavescens*) from the Savannah River, South Carolina are one of the southernmost known populations of for this species, however growth rates have not been investigated for this species at the southern end of their range. We sought to 1) quantify yellow perch growth in South Carolina and 2) combine our length-at-age data with similar data from across the species range to understand how latitudinal variation and site-specific thermal regimes influence Yellow Perch growth across North America. Historical data on Yellow Perch were obtained from several populations across the species range in North America. We fit sex-

specific von Bertalanffy growth curves to each population and regressed growth parameters against population-specific latitude and thermal metrics. Initial results indicate faster growth and shorter life spans in southern compared to northern populations. Fast growth and shorter lifespans could lead to higher levels of stochasticity in Yellow Perch recruitment at southern latitudes. This analysis provides important information for managers on yellow perch growth and life history traits across their range in North America.
Sessions

Statistics and Modeling
Monday, Sep 30 5:30 PM
Reno-Sparks Convention Center

Field-Based Evidence of Latent Effects on Lake Erie Walleye Growth Rates

Session: Variation in Life History of Fishes: Accounting for and Incorporating Spatiotemporal Variability in Demographic Rates
Location: Reno-Sparks Convention Center, A13
Date: Wednesday, Oct 2 10:50 AM
Duration: 20 minutes
Speakers

Presenting Author
L. Zoe Almeida
Ohio State University

Authors
Matthew Faust
Ohio Department of Natural Resources

Stuart A. Ludsin
The Ohio State University

Elizabeth A. Marschall
The Ohio State University - Aquatic Ecology Laboratory

Abstracts

Growth rates are generally assumed to be responses to recent environmental conditions; however, evidence shows that growth during one year may also reflect environmental conditions experienced earlier in life. We examined which

early-life factors influence growth rates of Lake Erie Walleye (*Sander vitreus*) using data from annual gillnet surveys (1978-2015) to characterize median size-at-age of cohorts from ages 3 to 5 (i.e., young adults). For females, percent ice cover during February-March, which immediately precedes the hatching period, was the only early-life factor correlated with later growth rates. Percent ice cover during the year of hatching was positively correlated with growth in young female adults (pseudo R^2 = 0.54). For males, median body size at age-2 and whether the annual cohort originated before or after 1987 were the important early-life factors: 1) median size at age-2 was positively correlated with growth; 2) cohorts produced during 1987-2015 had the fastest growth; and 3) cohorts produced before 1987 had a steeper relationship between size at age-2 and growth (pseudo R^2 = 0.39). Our analyses demonstrate that early-life experiences may have lingering influences on adult Walleye growth. We are currently using structural equation modeling to identify the mechanisms that might be underlying these correlations.

Field-Based Evidence of Latent Effects on Lake Erie Walleye Growth Rates

Tracks

AFS Symposium Entries

Session Types

Estimating Lake Thermal-Optical Habitat Area (TOHA) to Help Guide Walleye Management

Session: Aligning Advances in Water Temperature Prediction with the Needs of Freshwater Fisheries Science and Management
Location: Reno-Sparks Convention Center, A16
Date: Wednesday, Oct 2 10:50 AM
Duration: 20 minutes

Speakers

Authors
Kelsey Vitense
University of Minnesota

Authors
Jordan Read
U.S. Geological Survey

Presenting Author
Gretchen Hansen
University of Minnesota

Abstracts

Walleye (*Sander vitreus*) are an economically important fish and are managed in thousands of lakes throughout North America. Walleye populations in some Midwestern lakes have declined over the last several decades, while others have remained stable or increased. Light and temperature conditions in lakes strongly impact walleye feeding and growth rates, and the amount of suitable walleye habitat in a lake can be summarized as the benthic area where optimal temperature and light conditions overlap (i.e., the thermal-optical habitat area, TOHA). Previous work has demonstrated that walleye abundance is positively related to TOHA at broad spatial scales and that declines in one high profile Minnesota walleye population are associated with declines in TOHA. We estimated current and historical temperature and light conditions in Minnesota walleye lakes using process-guided deep learning and generalized additive models. We combined these temperature and light predictions to estimate current and historical TOHA in hundreds of Minnesota lakes. We are using these TOHA estimates to better understand trends in walleye populations and to help prioritize lakes for walleye management (e.g., stocking of lakes with ample habitat). Additionally, our models can be used to assess the sensitivity of walleye habitat to changes in temperature and water clarity.

Estimating Lake Thermal-Optical Habitat Area (TOHA) to Help Guide Walleye Management

Tracks

AFS Symposium Entries

Session Types

Assessing the Dispersal of Stocked Walleye Fry in a Northern Minnesota Chain of Lakes

Authors
Joseph W. Amundson,
Andrew W. Hafs,
Tony Kennedy

The dispersal of stocked Walleye *Sander vitreus* fry in the Cass Lake Chain located in Northern Minnesota had not been previously evaluated because of the difficulty in differentiating between stocked and naturally produced fish. As part of Minnesota's Walleye egg take policy 10% of eggs taken for hatchery purposes

are stocked back into the donor lake. This policy can result in elevated fry densities (mean: 7,000 fry/littoral acre, typical range: 500-1,000 fry/littoral acre) in Lake Andrusia. In 2016-2018 fry were mass-marked by immersion in oxytetracycline (OTC) prior to stocking into Andrusia (donor lake). Age-0 walleyes were sampled throughout the chain each fall (2016-2018). Each year, age-0 fish were widely distributed by late August. Marking rates in each lake in the chain ranged from 0 to 99% (median = 73%). The chain was previously thought to be largely self-sustaining with put-back stocking considered a social aspect of management rather than contributory to the Walleye population, which was clearly demonstrated. The stocked fish ability to disperse throughout the chain helped suppress density dependent effects, although, total length (mm) increased as distance from stocking site to collection site increased.
Sessions

Assessing the Dispersal of Stocked Walleye Fry in a Northern Minnesota Chain of Lakes
Tuesday, Oct 1 2:10 PM
Reno-Sparks Convention Center, A8

What Makes Anglers Happy: A Sentiment Analysis of Walleye Angler Fora in the United States

Authors
Kirsten Vacura,
Paul Venturelli

Human behavior is an important factor in natural resource management. Obtaining the public's opinion – for example, through creel, mail, and phone surveys – can be time consuming and expensive. Analyzing the text that hunters and anglers contribute to online fora may be a faster and cheaper alternative. In this study, we used walleye (*Sander vitreus*) oriented online fora to compare and explain the "happiness" of walleye anglers among and within ten U.S. states. We used sentiment analysis to score text data from each state as positive, negative, or neutral, and then normalized these scores by expressing them relative to the baseline level of happiness in each state. We determined the extent to which fisheries management explained variation in "happiness" scores within and among anglers within states via statistical analyses that included such factors as regulation strictness and complexity, angler density, stocking programs, and transparency of the state's natural resource agency. We found significant differences in the happiness levels of anglers among states, as well as potential factors driving these differences.

What Makes Anglers Happy: A Sentiment Analysis of Walleye Angler Fora in the United States

Thursday, Oct 3 8:40 AM
Reno-Sparks Convention Center, A9

Developing a Dual-Purpose Gtseq Panel for Stock Discrimination and Parentage Analysis in Walleye

Authors
Kristen Gruenthal,
Matthew Bootsma,
Loren Miller,
Greg G. Sass,
Wes Larson

Previous genetic research on walleye (*Sander vitreus*) has provided vital information used toward stewardship of this culturally and recreationally important species. However, currently available genetic tools, such as microsatellites, do not provide enough power for assignment of parentage or stock discrimination. We leveraged RADseq data to identify tens of thousands of high-resolution single nucleotide polymorphisms (SNPs) and designed a pilot GTseq panel incorporating 600 loci, covering nearly 1800 SNPs, based on microhaplotype heterozygosity and utility for genetic differentiation. We will discuss the trade-offs we experienced between choosing loci for population discrimination and parentage, as well as provide a roadmap for developing GTseq panels useful for multiple applications. We will also discuss our workflow for low-cost high-throughput genotyping. Finally, our walleye panel represents a powerful new tool that will provide important data for researchers and natural resource agencies across the Upper Midwest, and we outline some of its potential utility for fisheries management.
Sessions

Developing a Dual-Purpose Gtseq Panel for Stock Discrimination and Parentage Analysis in Walleye
Tuesday, Oct 1 8:00 AM
Reno-Sparks Convention Center, A2

Utility of Water and Otolith Microchemistry to Differentiate Blue Catfish and Walleye Stocks in Kansas

Poster Number: 566
Authors

Ben Neely,
Jeff Koch,
Ernesto Flores,
Vanessa Salazar
Trace element analyses are rapidly gaining prominence in fisheries management to explain movements of fishes and evaluate stockings. Blue Catfish *Ictalurus furcatus*are stocked in several reservoirs but reports of entrainment create concern around efficiency of stocking programs. Walleye *Sander vitreus* are frequently stocked in Kansas reservoirs to supplement existing populations, but levels of natural recruitment are largely unknown. In both situations, the ability to trace individual fish to its natal origin would provide resolution to these stocking concerns. To this end, Kansas Department of Wildlife, Parks, and Tourism has developed a database of water microchemistry from 25 impoundments and all four state-operated fish hatcheries. To examine how water microchemistry (e.g. Sr:Ca) relates to otolith microchemistry, Blue Catfish and Walleye otoliths were collected from individuals in eight populations with water microchemistry data. Water and otolith microchemistry were positively related for both Blue Catfish and Walleye suggesting these two species could be evaluated with microchemistry methods. However, there was substantial overlap in Sr:Ca among several impoundments. Preliminary results suggest that otolith microchemistry can be useful for identifying natal origin of Blue Catfish and Walleye in Kansas impoundments.
Sessions

New Technology and Applications
Monday, Sep 30 5:30 PM
Reno-Sparks Convention Center

Assessing the Effects of Double-Crested Cormorants on Walleye and Yellow Perch Populations in Leech Lake, Minnesota

Authors

Cody Coyle,
Andrew W. Hafs,
Doug Schultz,
Steve Mortensen

Accurate estimates of natural mortality in sub-adult fish is beneficial to fisheries managers for setting specific harvest regulations on complex aquatic systems. Restoration of Double-crested Cormorants *Phalacrocorax auritus* throughout much of their native range has sparked interest in the impact this piscivorous bird may have on sportfish populations. The current colony on Leech Lake,

Minnesota has been managed since 2005 due to concern of negative effects on Walleye *Sander vitreus* and Yellow Perch *Perca flavescens*. Fish consumption was estimated using a bioenergetics model and Monte Carlo methods, with Yellow Perch (61%) and Walleye (4.8%) comprising 65.8% of all diet contents. Walleye and Yellow Perch abundance and instantaneous mortality rates for select cohorts were estimated during pre- and post-cormorant management time periods and compared to species-specific estimates of consumption by cormorants. Cormorant diets were dominated by age-0 and age-1 fishes, but fish as old as age-3 were observed. A better understanding how cormorants effect recruitment of fish cohorts beyond maturity will lead to better management of the fishery.

Assessing the Effects of Double-Crested Cormorants on Walleye and Yellow Perch Populations in Leech Lake, Minnesota
Wednesday, Oct 2 9:20 AM
Reno-Sparks Convention Center, C2

Lessons Learned during a Cooperative Management Plan to Restore a Naturally-Reproducing Walleye Population in a Northern Wisconsin Lake

Authors

Hadley Boehm,
Mark Luehring,
Joe Dan Rose,
Rob Andersen,
Mitchell McGeshick,
Michael Preul,
George Madison,
Patrick Hanchin,
Stephen Gilbert

Lac Vieux Desert (LVD) is a drainage lake on the Michigan-Wisconsin border that historically supported a self-sustaining Walleye population important to tribal fishers and anglers. Over the past decade there has been a sustained decline in recruitment, and in 2016 the adult population reached a low of 1.2 adults/hectare, with few fish under 381 mm observed. Due to the lake's demonstrated capacity for natural reproduction, and importance of the fishery, a cooperative rehabilitation plan was undertaken with the objective of restoring natural Walleye recruitment. Cooperators include the Great Lakes Indian Fish and Wildlife Commission, Sokaogon and LVD Chippewa bands, LVD Lake Association, and Wisconsin and Michigan Departments of Natural Resources. The plan includes

annual stocking of Walleye fry and fall fingerlings in alternate years, an increased minimum length limit for anglers, suspension of tribal harvest, and intensive monitoring through 2022. Sampling has demonstrated survival of stocked fingerlings, and continued sampling will show whether these fish naturally reproduce upon maturity. We found that cooperation enabled more effective implementation of the plan than would have been possible by a lone group, and highlight lessons learned during the shared decision making process and potential application to other multi-stakeholder fisheries management challenges.
Sessions

Lessons Learned during a Cooperative Management Plan to Restore a Naturally-Reproducing Walleye Population in a Northern Wisconsin Lake
Wednesday, Oct 2 9:00 AM
Reno-Sparks Convention Center, C2

Tidbits Learned from Development of a Reference Genome for Yellow Perch (*Perca flavescens*)

Authors:
Amanda Hulse-Kemp
Mark Arick II
Michael Carvan
Frederick Goetz
Rebecca Klapper
Keithanne Mockaitis
Aurash Mohaimani
Ram Podicheti
Natalia Garcia-Reyero
Angela Schmoldt
Osvaldo J. Sepulveda-Villet
Brian Shepherd
Matthew Smith
Allyn Spear

The yellow perch (*Perca flavescens*) is a native North American fish that is important commercially and ecologically and is also a high-value food fish. Its native range is concentrated in the Midwestern U.S. Habitat loss and alteration have resulted in declining commercial fisheries, which has spurred interest in aquaculture production. However, significant production limitations exist: key issues are slow growth to market size, and the occurrence of sexually dimorphic growth, wherein females grow faster and larger than males. To address this, recent efforts have shown promise using genetic improvement and production of all-female progeny. Understanding sex-specific differences, as they relate to genes, is of interest because of the potential to use these genes as markers to optimize commercial production. To address this need, we developed a

reference genome sequence for this species. The majority of the assembly can be found within 24 psuedochromosomes and we estimate the size of the genome to be ~1.0 Gb. We used transcriptome assemblies for gene annotation as a means to understand regions of importance underlying sex-specific differences in growth and immune function. This presentation will address the present status of this reference genome and transcriptomic differences between male and female yellow perch.
Sessions

Tidbits Learned from Development of a Reference Genome for Yellow Perch (Perca flavescens)
Thursday, Oct 3 3:20 PM
Reno-Sparks Convention Center, A10