

WHAT WE HAVE LEARNED AS WE CONTINUE TO  
MIGRATE UPSTREAM

February 16 &17, 2010

Ramada Inn

Elkhart, Indiana

40TH  
ANNIVERSARY



INDIANA CHAPTER  
OF  
THE AMERICAN FISHERIES SOCIETY

[www.fisheries.org/units/indiana](http://www.fisheries.org/units/indiana)

# WELCOME TO THE 40<sup>TH</sup> ANNUAL

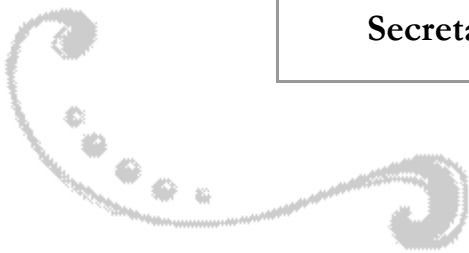
Indiana American Fisheries Society  
2010 Spring Conference, Elkhart, Indiana

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**Mark Pranckus**  
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# Schedule



*Tuesday, February 16th, 2010*

**Registration/Poster Set-up**

11:30 AM - 12:45 PM

**Plenary Session**

1:00 PM - 4:15 PM

**Business Meeting**

4:30 PM - 6:00 PM

**Dinner**

6:15 PM

**Poster Session**

7:00 PM

**Social/Student Professional Mixer**

7:00 PM - 11:00 PM

*Wednesday, February 17th, 2010*


**Announcements**

7:50 AM

**Technical Concurrent Sessions**

8:00 AM - 12:10 PM

**Adjourn**



# Plenary Session

40th Annual IAFS Spring Conference

Emerald Room

Time	Presentation	Speaker
1:00 PM	Welcome/Opening Remarks	Dave Meunick Debra King
1:10 PM	A Brief Historical Overview of the Indiana Chapter of the American Fisheries Society 1970 to 2010.	Dr. Thomas McComish
1:55 PM	Role of Private Consultants in the History of the Indiana Chapter of the American Fisheries Society	Gary Doxtater
<b>2:40-3:00 PM</b>	<b>Break</b>	
3:00 PM	Making Fishing Better: 40 Years of Professional Fisheries Management in Indiana	William James





# Plenary Session

40th Annual IAFS Spring Conference

## About the Session

### **40 Something – A Hoosier Fisheries Milestone**

This year marks the 40<sup>th</sup> anniversary of the Indiana Chapter of the American Fisheries Society. These past four decades have also witnessed the evolution of a significant, private aquatic management industry in Indiana as well as development of an effective, multifaceted program for public fisheries resource management. The common bond linking these activities has been fisheries professionals and they, in turn, have remained linked through the IN-AFS Chapter.

This plenary will examine the story of the Chapter's development and rich history as well as look back at those early days in the development of private and public aquatic/fisheries management in Indiana. But this is more than just a trip down memory lane. Today's speakers will suggest how our history helps shape our future as fisheries professionals. A "question and answer" session" to engage the audience in the discussion will conclude the plenary.

Our tour guides to yesteryear and the future consist of two charter members of the IN-AFS Chapter, Dr. Tom McComish and Gary Doxtater. Our third presenter is Bill James who only missed being a charter member by one year and has served as the Indiana DNR's Chief of Fisheries for the past 31 years. All three of our speakers have been recognized for their contributions to the Chapter and Indiana fisheries resources as past recipients of our Chapter's highest individual honor, the "Excellence in Fisheries Science" award.



# Poster Session

(In Alphabetical Order by Title)

Title	Author
A comparison of stable isotopic composition of riverine and reservoir fish assemblages	Camille Miller Ball State University
Aging largemouth bass with non-lethal calcified structures	Steven Donabauer Indiana Dept. of Natural Resources (IDNR)
Characterization of nearshore fish communities and habitat in the littoral zone of Indiana glacial lakes with respect to shoreline development	Kelly Boatright Indiana-Purdue University Fort Wayne
Diel variation in substrate preference in cyprinidae fishes	Luke Etchison Ball State University
Effects of environmental variables on morphology of <i>Elimia livescens</i> populations in Indiana	Ashley Dunithan Ball State University
Egg size variation among and within walleye populations	Amanda Farlow Purdue University
Endocrine disrupting effects on creek chubs exposed to agricultural contaminants in the Cedar Creek Watershed, northeast, Indiana	Daragh Deegan Indiana-Purdue University Fort Wayne
Incorporating volunteer data into variability in fish assemblage structure.	Jay Beugly Purdue University
Influence of gear type on species abundance and size structure in southern Lake Michigan	Samuel Michaels Ball State University



# Poster Session

(In Alphabetical Order by Title)

Title	Author
Linking physical parameters of Indiana's glacial lakes and their surrounding land use to fish population characteristics	Phillips Christian Perry Purdue University
Microhabitat selection among five congeneric darter species in Indiana river and stream ecosystems	Anne Fullenkamp Ball State University
Modeling yellow perch growth in southern Lake Michigan	Caleb Bollman Ball State University
Morphology and its effect on niche selection of stream fishes	Kevin Gaston Ball State University
Nearshore habitat utilization by juvenile bluegill and largemouth bass in Indiana's glacial lakes	Chris Middaugh Purdue University
Pre-spawn and post-spawn yellow perch in the Indiana portion of Lake Michigan: Are they two different populations?	Justin Walters Ball State University
Using tolerance values to describe fish community health in the eastern corn belt plain	Andrew Holloway Bureau of Water Quality
Where do fishes occur in the Wabash River? A GIS approach using bathymetry, water velocity, sediment, and woody debris	Mark Pyron Ball State University





# Technical Sessions

## Emerald/Blarney Room

Moderator: Jimmy Ferguson & Nathan Nye    AV: Ben Michaels & Sandy Clark-Kolaks

Time	Title	Author
8:00	Population characteristics of flathead catfish in the Wabash River, Indiana	Steve Donabauer IDNR
8:20	Ecological effects of floods on the middle Wabash River	Jennifer Pritchett Ball State University
8:40	Effects of time and bait selection on angler catch rates of flathead catfish in the upper Wabash River, Indiana	Brecken Kennedy Manchester College
9:00	Survey of angling, commercial fishing, and other recreation on the Wabash River	Robert Ball IDNR
9:20	Redside dace ( <i>Clinostomus elongates</i> ) in Mill Creek, Wabash County, Indiana: A strategy research and augmentation	Jacob Wenger Manchester College
9:40-10:00	<b>Break</b> <b>Blarney Room</b>	
10:00	Middle Eel River initiative: A holistic approach to understanding temporal and spatial variability of a stream	Matt Linn Manchester College
10:20	Spatiotemporal dynamics of Indiana stream fish assemblages after five decades of environmental change	Stephen Jacquemin Ball State University
10:40	Long-term monitoring of fish assemblage response to reach-scale urban stream restoration in northwest Indiana	Patrick Shirey University of Notre Dame
11:00-11:10	<b>Break</b>	
11:10	Taking Stock: A five-year look at fish kills in Indiana	Jennifer Campbell- Allison IDNR
11:30	How Good is Indiana's Bass Tournament Fishing?	Dan Carnahan IDNR
11:50	Using environmental DNA for aquatic surveillance and monitoring: lessons learned in the pursuit of the Asian carp invasion front	Andrew Mahon University of Notre Dame

# Technical Sessions

## Dublin/Shamrock Room

Moderator: Clint Kowalik & Janel Palla

AV: Michael Allen & Jeremy Price

Time	Title	Author
8:00	Long-term (1970 – 2006) dynamics of walleye and yellow perch in Saginaw Bay, Lake Huron	Lori Ivan Purdue University
8:20	Limnological assessment on the uses of hydroacoustic surveys to describe littoral zones in Indiana glacial lakes	Ashlee Haviland Manchester College
8:40	Emergence and growth of larval yellow perch ( <i>Perca flavescens</i> ) in Saginaw Bay, Lake Huron	Charles Roswell Purdue University
9:00	A brief survey of fish communities and aquatic macrophytes of Celina, Indiana, and Tipsaw Lakes of the Hoosier National Forest, Perry County, Indiana	Adam Charlton Aquatic Control
9:20	Population dynamics of muskellunge in Lake Webster, 2005-2009	Nathan Thomas IDNR
9:40-10:00	<b>Break</b> <b>Blarney Room</b>	
10:00	Effects of Genistein on the modulation of stress and immunity in salmonids.	Ama Bashar Indiana-Purdue University Fort Wayne
10:20	Creation of a glacial lakes status and trends monitoring program	Angela Grier IDNR
10:40	Predicting Biological Impairment from Habitat	Jason Doll Bureau of Water Quality



# Poster Abstracts

(In alphabetical order by title)

## ***A comparison of stable isotopic composition of riverine and reservoir fish assemblages***

*Camille Miller, Ball State University - Department of Biology - Aquatic Biology and Fisheries Center*  
*Stephen Jacquemin, Ball State University - Department of Biology - Aquatic Biology and Fisheries Center*  
*Mark Pyron, Ball State University - Department of Biology - Aquatic Biology and Fisheries Center*

We compared stable C13 and N15 isotopes for fish assemblages of the West Fork of the White River and Prairie Creek Reservoir, Delaware County, IN. The species we sampled were present in the river and reservoir assemblages: carp (*Cyprinus carpio*), gizzard shad (*Dorosoma cepedianum*), smallmouth bass (*Micropterus dolomieu*), spotfin shiner (*Cyprinella spiloptera*), Johnny darter (*Etheostoma nigrum*), yellow bullhead (*Ameiurus natalis*), and white crappie (*Pomoxis annularis*). A small white muscle tissue sample was desiccated and homogenized for isotopic analyses using a continuous flow mass spectrometer. We found significant differences in trophic level and nutrient source of reservoir and riverine species using isotopes. The trophic position of carp, smallmouth bass, spotfin shiner, and white crappie varied among ecosystems. Gizzard shad, Johnny darter, spotfin shiner, and yellow bullhead differed in carbon sources between the river and reservoir. The isotopic differences of local assemblages reflect variation in habitat structure of aquatic ecosystems. Stable isotopes offer a unique perspective of food web structure and energy transfer by providing a clear distinction of trophic and energetic dynamics of natural systems.

## ***Aging largemouth bass with non-lethal calcified structures***

*Steven B. Donabauer, Indiana Division of Fish and Wildlife*  
*Angela C. Grier, Indiana Division of Fish and Wildlife*

Indiana Division of Fish and Wildlife biologists primarily use scales to estimate the ages of largemouth bass (LMB) *Micropterus salmoides* despite the difficulty of aging large (>16 in) and presumably old fish. The purpose of this study was to determine the most precise and unbiased non-lethal aging structure for LMB. Direct-current boat electrofishing was used to capture LMB from six lakes in northern Indiana in May 2006. Two independent analysts' assigned ages to 290 LMB between 2.6 to 22.4 in using digital images of cross sectioned dorsal spines (DS) and pectoral fin rays (FR), and scales (SC) pressed on acetate slides. Analysts' resolved age discrepancies with a concert read. Pre-concert agreement ( $\pm 0$  years) between analysts' was higher (46%) for DS than either FR (32%) or SC (31%). Moreover, mean coefficient of variation values for DS were lower (16%) than for either FR (25%) or SC (27%) and suggests DS offer the most precise age estimates. Post-concert cross comparisons among structures revealed that ages were most accurately assigned to DS. Age-bias plots illustrated that age assignments were consistent among structures to approximately age-6. However, analysts' consistently underestimated the age of LMB older than age-7 when using FR and SC. Reliable age data would improve confidence in growth estimates, age-frequency distributions, and survival curves. Biologists are encouraged to: (1) involve additional age analysts' with a range of experience to better assess variation; and (2) include known-age fish or otoliths in the study design to reach more definitive conclusions regarding bias.



# ***Characterization of Nearshore Fish Communities and Habitat in the Littoral Zone of Indiana Glacial Lakes With Respect to Shoreline Development***

*Kelly Boatright, Indiana University-Purdue University, Department of Biology*  
*Robert Gillespie, Indiana University-Purdue University, Department of Biology*

Glacial lakes are a unique resource in the Midwest, but they are at risk from multiple stressors that include nutrient loading and destruction of riparian habitats. Indiana's glacial lakes experience a higher amount of urbanization than those in Wisconsin, Michigan, and Canada. Particularly, shoreline development reduces habitat complexity and abundance and diversity of aquatic macrophytes in the littoral zone. In addition, because they lie at lower latitudes than most other glacial lakes, Indiana lakes experience longer periods of warm water temperatures, making them prime recreation spots. Little research has been conducted on these highly impacted lakes in Indiana to understand the specific, cumulative effects of shoreline development on fish and plant communities in the nearshore area. The purpose of this study was to compare littoral fish species and habitats between developed and undeveloped lakes. Fish and vegetation were collected using pop nets, minnow traps, and light traps from five Indiana glacial lakes whose levels of shoreline development included none, low (less than 33% shoreline development), medium (between 33% and 66%), and high (more than 66%). Preliminary results show high variability in vegetation biomass between sites in highly developed lakes, while less developed lakes have more consistent shoreline habitats throughout the littoral zone. Further study may allow managers to permit shoreline alterations more effectively.

## ***Diel variation in substrate preference in cyprinidae fishes***

*Luke Etchison, Ball State University*  
*Mark Pyron, Ball State University*  
*Jay Beugly, Purdue University*

Diel substrate preference variation will be observed in four species of cyprinidae; silver shiner (*Notropis photogenis*), spotfin shiner (*Cyprinella spiloptera*), striped shiner (*Luxilus chrysocephalus*), and bluntnose minnow (*Pimephales notatus*). Artificial stream setups containing varying substrate types (silt, sand, cobble, and gravel) will be used to test if habitat preferences of cyprinid fishes shift between day and nighttime behavior. Tanks will be arranged with two substrate types whereby fishes will be observed twice daily (am / pm) and substrate preference recorded.

## ***Effects of environmental variables on morphology of *Elimia livescens* populations in Indiana***

*Ashley Dunitan, Ball State University*  
*Mark Pyron, Ball State University*

*Elimia livescens* gastropods were collected at 137 sites Indiana. We quantified morphological variation within and among 40 gastropod populations and tested for environmental correlates. We used the TPS morphometric software by James F. Rohlf, to digitize landmarks, construct outlines, and conduct multivariate analyses. The environmental variables we examined were watershed area, lake vs. stream, and water quality parameters. Latitude provided the strongest explanation for morphological variation among *E. livescens* populations.



## ***Egg size variation among and within walleye populations***

*Amanda Farlow, Purdue University Department of Forestry and Natural Resources*  
*Carolyn Foley, Purdue University Department of Forestry and Natural Resources*  
*Hui-Yu Wang, Natural Resources Conservation, University of Massachusetts Amherst*  
*Tomas Hook, Purdue University Department of Forestry and Natural Resources*

Within a species, egg size may vary among populations, within a population among individuals, and within an individual. Both maternal and environmental conditions can influence egg size via a combination of adaptive and plastic processes. For example, among populations life history theory suggests that females will evolve to produce few large eggs in poor growth environments, while within populations larger, older female fish tend to produce relatively large eggs. Moreover, intra-individual egg size variation may respond to both evolutionary environments and maternal phenotype, with smaller fish in unpredictable environments likely producing a broader range of egg sizes. In this study, we measured (egg diameter) and weighed (dry mass) walleye *Sander vitreus* eggs collected during 2009 from six different locations in the Great Lakes Region. These populations differed in spawning habitat quality and included some populations with similar stocking histories. We related mean egg size and intra-individual egg size variation to the lengths of females and examined differences among populations. Preliminary results suggest that walleye egg size varies more dramatically among populations than within populations.

## ***Endocrine disrupting effects on creek chubs exposed to agricultural contaminants in the Cedar Creek Watershed, northeast, Indiana***

*Daragh Deegan, Indiana University-Purdue University Fort Wayne*  
*Bob Gillespie, Indiana University-Purdue University Fort Wayne*  
*Mark Jordan, Indiana University-Purdue University Fort Wayne*  
*Marisol Sepulveda, Purdue University*  
*Jon Amberg, Purdue University*

The objective of this study was to assess the effects of contaminants from agricultural runoff on gene transcription of vitellogenin (VTG) and aromatase (CYP19) and on other potential indicators of endocrine disruption in creek chubs (*Semotilus atromaculatus*). It was hypothesized that VTG and CYP19 would be significantly greater in male chubs collected from drainage ditches than in those from a reference site. Creek chubs were collected from four agricultural drainage ditches. Based on similarities in concentrations of agrichemicals, two treatment groups were made; high-impact sites (HIS) and low-impact sites (LIS). Chubs were also collected from one reference headwater stream (REF). Mass, length, and liver somatic index (LSI) in chubs did not differ among sites. Hematocrit (HCT) values in male chubs did not differ significantly among sites, but HCT values in females were significantly higher at the HIS compared to the REF. Relative gene expression of CYP19 in male chubs did not differ significantly among sites, but was significantly lower in females at the HIS compared to the LIS and the REF, indicating an inhibition of CYP19 in females at the HIS. Relative gene expression of VTG in females and males did not differ significantly among sites. Gonad histological analysis identified 4 intersex chubs from the HIS and 1 from the LIS. The collection of 4 intersex creek chubs, and in the inhibition of CYP19 in females at sites with the highest concentration of agricultural contaminants, suggest that agrichemicals may cause endocrine disruption in female creek chubs.



## ***Influence of gear type on species abundance and size structure in southern Lake Michigan***

*Samuel Michaels, Ball State University  
Patrick Forsythe, Ball State University  
Thomas Lauer, Ball State University*

Fisheries managers are continually defining fish communities but face the continual task of using gears that have sampling bias. Our objective was to compare proportions of species abundance and size structure between two commonly used gears, bottom trawls and experimental gill nets for capturing yellow perch, alewife, spottail shiner, and round goby in the nearshore Indiana portion of Lake Michigan. We did so to determine whether both gear types gave similar abundance levels and length frequency distributions for these four species. Samples collected with the bottom trawl tended to underestimate the abundance of alewives and piscivorous-sized yellow perch when compared to samples from the gillnets; however, the trawl appeared to be more effective for capturing round gobies. Additionally, the bottom trawl was substantially more effective for collecting young-of-the-year of various species including yellow perch, alewives, spottail shiners, and round gobies. Our results suggest that both gear types should be employed in order to completely characterize the nearshore fish community in the southern portion of Lake Michigan. However, if the fisheries manager's objective is more specific, careful consideration should be taken when choosing the gear that maximizes time and efficiency.

## ***Incorporating volunteer data into variability in fish assemblage structure***

*Jay Beugly, Purdue University  
Reuben Goforth, Purdue University  
Sara Peel, Wabash River Enhancement Corporation  
Megan Heller, Purdue University  
Ron Turco, Purdue University  
Stan Lambert, Wabash River Enhancement Corporation  
Linda Prokopy, Purdue University*

Fishes were collected at 10 sites in west central Indiana. All sites are on streams that are direct tributaries of the mainstem Wabash River. Fish Samples were collected in June, July, September, and November. Environmental variables were collected by a combination of public volunteers and continuous sampling sondes (DO, pH, Conductivity, Turbidity, and Temperature). Volunteers calculated a citizen's qualitative habitat evaluation index (CQHEI) and an invertebrate pollution tolerance score (PTS) for 7 of the 10 sites. Fish assemblage structure was evaluated using a combination of ordinations based on species abundances, sonde, and volunteer collected data. The results demonstrate the importance of multiple data sources for determining factors affecting stream fish assemblages.



## ***Linking physical parameters of Indiana's Glacial Lakes and their surrounding land use to Fish Population Characteristics***

*Phillips Christian Perry, Purdue University*  
*Jarrold Doucette, Purdue University*  
*Angie Grier, Indiana Division of Fish and Wildlife*  
*Tomas Höök, Purdue University*

Of the thousands of glacial lakes situated across the Midwest landscape, over 450 are located in northern Indiana. These lakes vary widely in physical characteristics and in their position within the broader landscape. As such, they support fish populations with properties that vary from one lake to another. The purpose of our study is to relate the physical parameters of these lakes and their surrounding land use at multiple spatial scales to fish population characteristics. To accomplish this, we first delineated local and tributary catchments for each lake using methods originally developed by the Michigan and Minnesota DNRs. We then summarize morphometric characteristics and multi-scale land-use and catchment variables associated with each lake. Secondly, we summarize lake-specific historical fish population assessment data (1986-present) from the Indiana DNR's Fisheries Information System and we statistically relate lake-specific fish population indices to morphometric and catchment characteristics. Our ultimate goal is to better understand the scales at which environmental characteristics most strongly affect fish populations in Indiana's glacial lakes. The information we gain from this study will be helpful in identifying how future changes in the landscape may have effects on fish populations.

## ***Microhabitat Selection among Five Congeneric Darter Species in Indiana River and Stream Ecosystems***

*Anne Fullenkamp, Ball State University*  
*Thomas Lauer, Ball State University*

Five *Etheostoma* darter species including the greenside darter (*Etheostoma blennioides*), rainbow darter (*E. caeruleum*), fantail darter (*E. flabellare*), johnny darter (*E. nigrum*), and orangethroat darter (*E. spectabile*) were collected from seven streams and rivers in two Indiana counties to determine patterns of microhabitat use. Depth, flow, and substrate size characteristics segregated one or more species. Greenside and rainbow darters showed similar microhabitat use and were most commonly found among intermediate substrate sizes (cobble-boulder) and locations with higher velocities and greater depths. Fantail and orangethroat darters associated with intermediate to large substrate sizes (cobble-bedrock) in shallower average depths and lower velocities. Fantail darters were only observed in Franklin County. In contrast, johnny darters were found only in Delaware County among small substrate sizes (silt-sand) in above average depths and average velocities. Substrate size was most important in creating segregation among the five species based on Principal Components Analyses. Patterns of microhabitat use may be influenced by competition, morphology and other life history traits, and may explain the existence of congeneric species in ecosystems having heterogeneous habitats.



## ***Modeling Yellow Perch Growth in Southern Lake Michigan***

*Caleb Bollman, Ball State University*  
*Dr. Thomas Lauer, Ball State University*  
*Patrick Forsythe, Ball State University*

We collected young-of-the-year (YOY) yellow perch at three near-shore sample sites in Southern Lake Michigan to determine growth rates. YOY fish captured in September 2007, 2008, and 2009 were used to determine relative mean lengths throughout the first year of life. We used a model to explore abiotic and biotic factors that are known to influence growth and may explain variation in growth rates over the period 1984 – 2009. Identifying growth rates for YOY yellow perch provides a better understanding of their early life history and gives the earliest indications of year class strength, necessary for implementing sound management alternatives for this portion of Lake Michigan.

## ***Morphology and Its Effect on Niche Selection of Stream Fishes***

*Kevin Gaston, Ball State University*  
*Thomas Lauer, Ball State University*

We sampled fish and water flow at two stations in the White River and one station in Buck Creek, Delaware County IN, to determine whether flow influences fish aspect ratio. Fish were collected in both pool (low flow) and riffle (high flow) areas using backpack electrofishing. Water velocity was measured in each sampling location at the time of fish collections. We found that fish with smaller aspect ratios were found in areas with high flow rates, and in contrast, fish with higher aspect ratios were found in locations with lower flow rates. This study determined that the morphology of a fish affects its habitat selection. It is important to understand this relationship as anthropogenic alterations to rivers and streams (e.g., channelization) will impact the community of fishes found as flow rate changes.



# Technical Session Abstracts

(In order of presentation)

Dublin/Shamrock Room

## ***Long-term (1970-2006) dynamics of walleye and yellow perch in Saginaw Bay, Lake Huron***

*Lori Ivan, Purdue University*

*Tomas Höök, Purdue University*

*Michael Thomas, Michigan Department of Natural Resources*

*David Fielder, Michigan Department of Natural Resources*

Walleye and yellow perch are economically and ecologically important species in the Great Lakes. Saginaw Bay historically supported large commercial and recreational fisheries for both walleye and yellow perch, but alterations in nutrient loadings and invasion by nonnative species caused severe declines in both fisheries, leading to closings for walleye and reductions in yield for yellow perch. We analyzed long-term fall trawl surveys to understand dynamics of these two species using dynamic factor analysis (DFA), a smoothing technique. Interpretations of temporal trends were then assessed using correlation analysis. Walleye increased during the thirty year time series, but average length in fall declined. In contrast, yellow perch age-1 and age-2 CPUE declined while average size increased. Age-0 yellow perch showed little temporal trend in either CPUE or average length. There is strong evidence for compensatory density-dependent growth and survival for young yellow perch. Evidence for density-dependent effects on walleye is not as strong, but, while CPUE has increased throughout the time series, size-at-age has declined. Associations between yellow perch and walleye trends were dependent on the temporal scales of analyses. DFA results suggest that walleye and yellow perch abundance and growth are diverging in Saginaw Bay.

## ***Limnological assessment on the uses of hydroacoustic surveys to describe littoral zones in Indiana glacial lakes***

*Ashlee Haviland, Manchester College*

*Jerry Sweeten, Manchester College*

Hydroacoustic technology has significantly improved the ability of biologists to examine lake ecosystems, monitor fish movement, and determine overall ecological integrity of lakes and streams. The goal of this study was to use a Tier II aquatic vegetation survey along with a hydroacoustic survey on Atwood Lake, Lagrange County; Hackenburg Lake, Lagrange County; and Kuhn Lake, Kosciusko County, Indiana to accurately determine the extent of the littoral zone and to describe and inventory aquatic macrophytes within each individual lake. Hydroacoustic surveys coupled with Tier II vegetation surveys provide information regarding the accuracy of data collection. The Biosonics Echosounder hydroacoustic system used in this study operates from a slow-moving boat and records bottom depth, submerged vegetation height, and submerged vegetation density. This information was merged with geographic location coordinates from a Global Positioning System (GPS) and stored in digital files, representing submerged aquatic vegetation (SAV) status at points along transect lines. Adequate spatial interpolation was used to present the SAV information, including density, height, and water depth, as spatially continuous data for mapping bathymetry and littoral zones. This study identified that definitive littoral zones were evident in all three lakes and plant species varied among the lakes, development along lake shorelines, size, and location of the lake. Echosounder accuracy was also determined when Tier II surveys and a hydroacoustic surveys were analyzed. Tier II surveys indicated SAV growth in all lakes did not extend past the 15 foot contour, which was consistent with data processing using EcoSAV 2.0 and ArcGIS.

## ***Emergence and growth of larval yellow perch (*Perca flavescens*) in Saginaw Bay, Lake Huron***

*Charles Roswell, Purdue University*

*Tomas Höök, Purdue University*

*Carolyn Foley, Purdue University*

*Steven Potthoven, NOAA - Great Lakes Environmental Research Laboratory*

Yellow perch are important economically, recreationally, and ecologically in Saginaw Bay, Lake Huron. Monitoring in recent years has indicated that production of age-0 perch in Saginaw Bay increased after the collapse of the Lake Huron alewife population, which had potentially competed with or preyed upon larval yellow perch. However, despite this increased production of young yellow perch, recruitment to the adult population has not increased. To understand early life dynamics, we sampled larval yellow perch, zooplankton, and measured surface temperatures weekly at up to 18 sites in Saginaw Bay during April-July 2009. In the laboratory, we identified and enumerated larval fish, and we measured and aged yellow perch larvae using otolith daily increment counts to understand spatial and temporal patterns of yellow perch growth, emergence, and distribution. Larval perch first emerged in late April near the mouth of the Saginaw River, and subsequently, more perch emerged across most of inner Saginaw Bay. During this period of high reproductive success, yellow perch appear to hatch in a variety of habitats in and connected to Saginaw Bay; however, conditions for growth and survival likely vary across these habitats.

## ***A brief survey of the fish communities and aquatic macrophytes of Celina, Indian, and Tipsaw Lakes of the Hoosier National Forest, Perry County, Indiana***

*Adam Charlton, Aquatic Control, Inc.*

*Nathan Long, Aquatic Control, Inc.*

*James Ferguson, Aquatic Control, Inc.*

The United State's Forest Service, Tell City District, contracted Aquatic Control, Inc. to survey the fish communities and invasive aquatic macrophytes of Celina (164 acres), Indian (154 acres), and Tipsaw (131 acres) Lakes of the Hoosier National Forest. Each lake was sampled at night with a boat electrofishing unit using pulsed direct current. All fish were collected, measured (total length in inches), weighed (pounds), and released. Population characteristics such as relative abundance, catch per effort, and proportional stock density for sportfish were calculated. Bluegill *Lepomis macrochirus* ranked first in relative abundance followed by largemouth bass *Micropterus salmoides* at all three lakes. Bluegill catch rates were 650 fish/hour, 417 fish/hour, and 211 fish/hour at Tipsaw, Indian, and Celina Lakes respectively. Largemouth bass catch rates were 157 fish/hour, 127 fish/hour, and 91 fish/hour at Indian, Tipsaw, and Celina Lakes respectively. Bluegill proportional stock density was 30 at Tipsaw Lake, 12 at Lake Celina, and 8 at Indian Lake. Largemouth bass proportional stock density was 39 at Tipsaw Lake, 23 at Lake Celina, and 22 at Indian Lake. Aquatic macrophytes were sampled visually from a boat as well as physically with a throwable rake. Eurasian watermilfoil *Myriophyllum spicatum* was the only invasive species detected, occurring in all three lakes. Eurasian watermilfoil coverage was 26.95 acres at Lake Celina, 16.59 acres at Indian Lake, and 14.14 acres at Tipsaw Lake. Despite the presence of Eurasian watermilfoil, all three lakes continue to display relatively diverse native aquatic macrophyte communities and support quality fisheries for largemouth bass, bluegill, and redear sunfish *Lepomis microlophus*.



## ***Neashore Habitat Utilization by Juvenile Bluegill and Largemouth Bass in Indiana's Glacial Lakes***

*Chris Middaugh, Purdue University*

*Carolyn Foley, Purdue University*

*Angela Grier, Indiana DNR*

*Steve Donabauer, Indiana DNR*

*Tomas Hook, Purdue University*

Nearshore zones provide important nursery habitats to fish in many lentic systems. Young fish may concentrate in these areas because of the abundant food and cover available. However, these zones may be highly impacted through anthropogenic activities, such as addition of shoreline structures or clearing of vegetation. To better understand how nearshore habitat features structure distributions and interactions of young fish, during 2009 we collected environmental information and young fish at numerous sites in seven glacial lakes in northeast and central Indiana. We utilized both seining and barge electroshocking to collect a wide variety of fishes which were identified to species and enumerated. In addition we measured the lengths and weights of the young game fish and analyzed diet contents of young-of-year (YOY) largemouth bass *Micropterus salmoides*. Bluegill *Lepomis macrochirus* and largemouth bass were the most abundant species collected and we thus focused analyses on these species. Preliminary analyses suggest that distributions and size structures of both species and diets of YOY largemouth bass vary among sites, (e.g., a positive trend between bottom cover and YOY bluegill numbers). Future analyses will facilitate comparison of natural and anthropogenic features in structuring distributions and diets of young fish in nearshore zones.

### ***Pre-spawn and post-spawn yellow perch in the Indiana portion of Lake Michigan: Are they two different populations?***

*Justin Walters, Ball State University*

*Thomas Lauer, Ball State University*

*Patrick Forsythe, Ball State University*

Pre-spawn and post-spawning yellow perch collected in 2009 from the Indiana waters of Lake Michigan were compared for CPUE levels, median lengths, length frequency distributions, and sex ratios to determine whether the population demographics differed. Three zones were sampled using gill nets at various depths depending on fish abundance at East Chicago (west), Burns Harbor (central), and Michigan City (east). Post spawn yellow perch CPUE increased as well as median length. Length frequency distributions differed, shifting to a larger median size post spawn for both males and females. Finally, there was an increase in the proportion of females post spawn. The post-spawn population consisted of more and larger female fish that are typically more fecund and contribute more to fish recruitment. These data infer fish were spawning elsewhere and then migrating to Indiana waters, presumably to recover and feed. This study identified limitations in studying recruitment dynamics, including spawning sites, and suggests that spatial dispersion for yellow perch is extensive in Lake Michigan and specific to individual life cycle events.



## ***Using Tolerance Values to Describe Fish Community Health in the Eastern Corn Belt Plain***

*Andrew Holloway, Bureau of Water Quality  
Jason Doll, Bureau of Water Quality*

Species presence/absence, abundance data, and habitat quality data were used to establish habitat Tolerance Values (TV) for individual fish species in the Eastern Corn Belt Plain. TVs were calculated based on Normalized Difference Index Values from data collected by the Indiana Department of Environmental Management. TVs were then used to assess data collected by the Bureau of Water Quality (BWQ) in 2008 and 2009. The TVs are calculated with presence/absence and abundance data averaged by categories of habitat quality. Habitat quality was categorized as poor, marginal, sub-optimal and optimal based on quartiles of the Qualitative Habitat Evaluation Index. The TVs were then used to designate tolerant species based on the upper 45th percentile. Two metrics were calculated with the BWQ data; percent of tolerant species based on TV by site and average TV of all individuals caught by site. These metrics were then compared to accepted metrics of fish community health such as the Index of Biotic Integrity (IBI) and individual metrics (percent tolerant species and number of sensitive species). For both metrics a positive correlation was found between the percent tolerant species based on TVs and percent of IBI tolerant species while a negative correlation was found with IBI score and number of sensitive species. Slight variations in species tolerance levels were observed. A positive correlation was found between percent tolerant species based on TVs and the percent of tolerant species from the IBI. A negative correlation was found when comparing percent of tolerant species based on TVs with number of sensitive species and overall IBI score. When comparing the species lists used for IBI and TV, more species were considered tolerant in the TV results. Low catch rates and sampling method could be responsible for these differences. As an alternative method to the IBI, the percent tolerant species based on TVs could help further emphasize results found in habitat assessment.

## ***Where do fishes occur in the Wabash River? A GIS approach using bathymetry, water velocity, sediment, and woody debris***

*Mark Pyron, Ball State University  
Reuben Goforth, Purdue University  
Scott Morlock, United States Geological Survey  
Moon Kim, United States Geological Survey  
Jayson Bengly, Purdue University*

Fish preferences for specific habitats have been documented for multiple ecosystems including rivers. However, the use of a Geographic Information System (GIS) to analyze and view fish distributions and habitat parameters provides numerous advantages over previous analyses. We collected channel bathymetry, water velocity, and streambed composition using an Acoustic Doppler Current Profiler (ADCP) deployed from a USGS boat and interfaced with a Differential Global Positioning System (DGPS) receiver, for a 10-km study reach of the Wabash River in Lafayette, Indiana. Within one week of collecting habitat data we used three boat electrofishers to simultaneously collect fishes through the same reach. Individual fish were assigned latitude-longitude coordinates when they were captured using GPS units. These data allow us to test multiple hypotheses ranging from asking if some species tend to co-occur less than expected (competition or predation), to testing for species habitat preferences, to testing for assemblage-level patterns. We collected 2,773 fishes in 44 species that will be presented with habitat data using three-dimensional graphics.

# Technical Session Abstracts

(In order of presentation)

Emerald/Blarney Room

## ***Population Characteristics of Flathead Catfish in the Wabash River, Indiana***

*Steven B. Donabauer, Indiana Department of Natural Resources*

Catfish are the third most pursued group of sport fishes in Indiana yet little is known of their current status in the Wabash River. The purpose of this study was to compare abundance, growth, condition, and survival of flathead catfish (FHC) *Pylodictis olivaris* in three differently regulated reaches of the Wabash River. Commercial and sport harvest is allowed in the lower (LWR) and middle (MWR) Wabash River, while only sport harvest is allowed in the upper Wabash River (UWR). Low-pulsed DC boat electrofishing was used to collect FHC, which were measured, weighed, and tagged in the field, and aged with a pectoral spine in the laboratory. A total of 338 FHC were sampled and median catch rates from the LWR, MWR, and UWR were 58, 32, and 8 fish/h, respectively. Although catch rates of FHC declined upstream, relative stock density indices indicated that memorable and trophy sized ( $\geq 860$  mm TL) FHC were proportionally more abundant in the UWR (13%) and MWR (6%) than in the LWR ( $< 1\%$ ). Mean total length of age-5 FHC between the UWR and MWR were similar (462 and 461 mm) and higher than observed in the LWR (382 mm). Mean relative weights for FHC were not biologically different throughout the Wabash River. Total annual survival was estimated to be 63%, 57%, and 44% in the UWR, MWR, and LWR, respectively. These results suggest current harvest regulations are insufficient for sustaining a quality FHC fishery and increased protection is warranted.

## ***Ecological Effects of Floods on the Middle Wabash River***

*Jennifer Pritchett, Ball State University*

*Mark Pyron, Ball State University*

Hydrologic impacts such as floods are a common influence on riverine biota. Floods are a natural occurrence in the Wabash River watershed. There have been two major floods in the last few decades, in 1985 and 1991, and a moderate flood in 2008. We examined fish assemblage variation for responses to major and minor flood events. We used the Indicators of Hydrologic Alteration (IHA) to identify flood events and we used an ordination approach, Reciprocal Averaging to analyze fish assemblages. Kendall's correlations of the fish assemblage pre- and post- moderate flooding were examined to evaluate variation between 2007 and 2008.



## ***Effects of time and bait selection on angler catch rates of flathead catfish in the upper Wabash River, Indiana.***

*Brecken Kennedy, Manchester College*

*Matt Burlingame, Manchester College*

*Andy Shepherd, N/A*

It is a common perception that anglers fishing for flathead catfish, *Pylodictis olivaris* can only be successful using live bait after dark. However, there is a paucity of research available to substantiate this claim. We conducted a study during the summer of 2009 on the Wabash River near Wabash, Indiana to determine angler catch rates for flathead catfish during daytime and nighttime periods using live bait and fresh cut bait. Two to three anglers using three standard catfishing poles each fished a particular section of river for a daytime (1 hr prior to sunrise to 1 hr after sunset) period and then into the night (1 hr after sunset to 1 hr prior to sunrise). During both periods, live and cut bait were fished on alternating poles. Total expended effort was 360.8 anglers-hrs and resulted in the capture of 28 flathead catfish. These fish ranged in length from 460 to 1045 mm. Overall mean catch rates for daytime and nighttime periods were 0.04 fish/angler-hr and 0.09 fish/angler-hr, respectively. Similarly, the overall mean catch rate using live bait was 0.08 fish/angler-hr compared to 0.03 fish/angler-hr using cut bait. However, nighttime mean catch rates using live bait (0.04 fish/angler-hr) and cut bait (0.05 fish/angler-hr) were nearly identical. Mean angler catch rates using live bait were also similar between daytime and nighttime periods (0.03 and 0.04 fish/angler-hr, respectively). Our results suggest that the long-held belief that anglers can only be successful catching flathead catfish at night using live bait may be somewhat unwarranted.

## ***Survey of Angling, Commercial Fishing, and Other Recreation on the Wabash River***

*Robert Ball, Indiana Division of Fish and Wildlife*

A survey of angling, other recreational use and commercial fishing on the lower 361 miles of the Wabash River was conducted from 2005 to 2006. The Wabash River from its mouth to Covington, Indiana was surveyed in 2005. The 2006 portion covered from Terre Haute to just above Logansport. One sector, Terre Haute to Covington, was repeated in 2006 to provide a measure of variability between years. The survey used roving and bus route techniques to estimate activity. Angler pressure of the Wabash decreased only slightly from 549 in 2005 to 546 h/mile in 2006. Angler catch rates in 2005 were 0.51 fish/h, increasing to 0.60 in 2006. Angler harvest declined from 235.2 fish/mi. in 2005 to 207.2 in 2006. Primary species harvested were channel catfish (178.5/mi. in 2005 and 115.5/mi. 2006), freshwater drum (18.8 and 57.6), blue catfish (18.1 and 3.6), flathead catfish (10.2 and 11.1), and shovelnose sturgeon (2.2 and 4.6). Differences in harvest between lower (2005) and upper (2006) segments of the river can be ascribed to differences in habitat and fishing pressure of the river segments. Commercial fishing was more important in the lower river surveyed in 2005, averaging 34 fish harvested/mi. Primary species in the commercial harvest were channel catfish (51%), flathead catfish (13%), buffalo (12%), freshwater drum (5%), and shovelnose sturgeon (4%). Recreational activities such as boating, jogging and camping totaled 607 and 708 h/mi in 2005 and 2006 respectively.



## ***Taking Stock: A five-year look at fish kills in Indiana***

*Jennifer Campbell-Allison, IDNR Fish & Wildlife*

When there is a fish kill in the State of Indiana, the Department of Natural Resources (IDNR) and the Department of Environmental Management (IDEM) investigate to determine whether it is due to a chemical release or natural causes. Fish kills represent a subset of all chemical spills in Indiana, and reflect events where the chemical concentration is sufficient to result in the death of fish and wildlife (aka. acute toxicity). Records for this type of incident were gathered from IDEM and IDNR databases for the period 2005-2009. These data were analyzed by contaminant type and region to characterize acute fishery damages in Indiana.

## ***How Good is Indiana's Bass Tournament Fishing?***

*Daniel Carnahan, Indiana Department of Natural Resources*

Black bass are one of the most sought after fish in Indiana and nationally have a big following attracting thousands of anglers to the fishing tournament scene. Indiana started monitoring bass tournaments statewide in 2006, primarily at the larger reservoirs and natural lakes. To date, 10 lakes are being monitored through a state enacted tournament permitting system. The tournament permit requires that the tournament data be sent back into the DNR for that tournament organizer to be eligible for the following year's tournament lake drawing. Other states also have bass tournament monitoring results that can be used to draw some general comparisons to Indiana. Tournament monitoring data from state to state varies as there are no standards; however some of the basic information reported from most states are number of anglers, total weight, big bass weights, hours fished, and number of tournaments.



***Using environmental DNA for aquatic surveillance and monitoring: lessons learned in the pursuit of the Asian carp invasion front***

*Andrew Mabon, Center for Aquatic Conservation, University of Notre Dame*

*Christopher Jerde, Center for Aquatic Conservation, University of Notre Dame*

*Lindsay Chadderton, The Nature Conservancy*

*David Lodge, Center for Aquatic Conservation, University of Notre Dame*

Detection of rare species is exceptionally difficult in aquatic environments, especially in deep (>2m) or fast flowing water. Typically, aquatic populations are estimated from measures of relative abundance, using mark-recapture or depletion electro-shocking methods where the target organism is at moderate to high densities. However, these approaches often perform poorly when the species is in low abundance or difficult to capture/recapture. To aid surveillance efforts for hard to detect or rare species, we have developed protocols that utilize cellular material shed by target organisms into the water column. Fishes, including Asian carp, slough DNA into the environment in the form of mucoidal secretions, feces, and urine. These biological materials can be held in suspension and transported, as DNA degradation is not instantaneous. Shed DNA in effect produces a plume that can be used to delineate site occupancy by the target organism. Our workgroup has developed techniques to analyze water samples for bighead and silver carp DNA, to detect the low densities of fish likely present at the invasion front in the Chicago Sanitary and Ship Canal and associated waterways. Through a series of steps, which includes water filtration, species-specific molecular amplification, and gel electrophoresis, we have been able to repeatedly detect DNA from bighead and silver Asian carp where other monitoring methods have failed to do so. In addition, we have developed various controls and quality assurance mechanisms to help eliminate false positives in detection through the process (water collection to data reporting). Future directions for this work include quantification of eDNA degradation to help determine DNA duration in the water column, methods to determine source populations of eDNA, and detection of other rare organisms in aquatic environments.



## ***Redside dace (Clinostomus elongatus) in Mill Creek, Wabash County, Indiana: A strategy research and augmentation.***

*Jacob Wenger, Manchester College*  
*Jerry Sweeten, Manchester College*

Redside dace (*Clinostomus elongatus*) is a small Cyprinid and niche specialist of clear, cool, relatively unaltered forested headwater streams with deep pools. It is state endangered in Indiana as well as in Michigan, West Virginia, Ohio, and Ontario, Canada. In Indiana it is found in only two watersheds (north central and south east). The north central watershed and the focus of this study is Mill Creek located in Wabash County. Mill Creek has a watershed area of 41.96 km<sup>2</sup> and land use within the watershed is 82% agriculture. A fourth order stream and approximately 13 km in length, Mill Creek lies on the south escarpment of the Wabash River Valley. The purpose of this four year study is to document the distribution, abundance, habitat, and ecological integrity of this species as well as develop genetic markers for comparison across regional populations. During the summer of 2009, seven sampling sites were selected throughout the Mill Creek watershed. Fish were collected using a three meter by one meter seine to determine ecological parameters and for genetic analysis. Preliminary data show redside dace widely distributed throughout much of Mill Creek where they are limited to pools about 1m in depth and areas with heavy shade from riparian vegetation. Index of biotic integrity scores ranged from 36 to 50 for each of the seven sample stations and qualitative habitat index evaluation (QHEI) scores ranged from good to poor. Spawning was observed once water temperature reached 10°C and continued until water temperature reached 16°C illustrating the need of this species for cool water.

## ***Middle Eel River initiative: A holistic approach to understanding temporal and spatial variability of a stream ecosystem***

*Matt Linn, Manchester College*  
*Jerry Sweeten, Manchester College*

The Eel River is a 177 km long, linear, low gradient stream located in the Eastern Cornbelt Ecoregion in north central Indiana. The river has a watershed of 1,310 km<sup>2</sup> and originates in Allen County where it flows southwesterly to its confluence with the Wabash River near Logansport in Cass County. Similar to other Midwest stream ecosystems, nonpoint source pollution and its effects on stream biota is a central management and research issue. In January 2009 Manchester College was awarded a 319 nonpoint source pollution grant from the Indiana Department of Environmental Management and began a four year study of the middle 48 km portion of the Eel River. Stream gages, equipped with automatic water samplers, data loggers, and pressure transducers, were installed at an upstream site, middle site, and downstream site along the mainstem of the Eel. Stream chemical, physical, and biological parameters as they relate to nonpoint source pollution both prior to and after remediation of high priority nonpoint source pollution sites will be examined. This holistic approach to temporal and spatial variability has led to preliminary baseline data on water chemistry, stream discharge and biotic integrity of the three mainstem sites and six tributaries. Elevated levels of total phosphorus (>5mg/L), total suspended solids (>500 mg/L), and E.coli (geometric mean > 125 CFU at all nine sample sites) were recorded. The Qualitative Habitat Evaluation Index (QHEI) ranged from 50 to 85 and the Index of Biotic Integrity (IBI) ranged from 40 to 50 across sites. Presences/absence mussel surveys were conducted at the upstream and middle mainstem sites. Eleven live species of mussels and eight species of weather dead shells were found. Of particular interest, was the discovery of live *Quadrula cylindrica cylindrica* within the study reach.

# ***Spatiotemporal dynamics of Indiana stream fish assemblages after five decades of environmental change***

*Stephen Jacquemin, Ball State University - Biology Department - Aquatic Biology and Fisheries Center*

*Mark Pyron, Ball State University - Biology Department - Aquatic Biology and Fisheries Center*

Indiana fish assemblages were examined using taxonomy and functional groups to assess temporal shifts in community structure and recent environmental relationships. Historic (1945) and recent (1996-2007) presence/absence data were compiled by sub-basin and analyzed with Nonmetric Multidimensional Scaling (NMS) ordination and by species richness. We used Canonical Correspondence Analysis to test taxonomic identity and functional group abundances in recent collections for explanation with environmental variables. We found a decrease in assemblage heterogeneity for recent assemblages and an increase in the number of tolerant species per sub-basin. Indiana streams are currently dominated by tolerant fishes with generalist life history strategies and low functional variation. The use of functional groups resulted in weaker relationships with environmental variables than analyses with taxonomic identities. Analyses using taxonomy resulted in strong assemblage explanation from stream size and flow variation, while analyses using functional groups resulted in strong assemblage explanation from habitat variation in substrates and flow. Analyses of recent assemblage structure using functional groups resulted in decreased assemblage variation among sub-basins than analyses using taxonomic identities. We found that fish assemblages of Indiana streams are structured primarily by habitat complexity and have been altered during the past 50 years through multiple disturbances including fragmentation, siltation, and species introductions.

## ***Long-term monitoring of fish assemblage response to a reach-scale urban stream restoration in northwest Indiana***

*Patrick Shirey, University of Notre Dame*

*Michael Brueseke, University of Notre Dame*

*Ashley Moerke, Lake Superior State University*

*Gary Lamberti, University of Notre Dame*

The fish community of Juday Creek on the University of Notre Dame campus in South Bend, IN, has been monitored annually since 1997 when the creek was relocated away from a golf course constructed by the university on land surrounding the creek. Juday Creek is a groundwater fed, third-order tributary of the St. Joseph River in the Lake Michigan watershed. The restoration project monitored in this study is an example of mitigating the effects of a golf course development on a stream already impacted by agriculture and urban development. The goals of the restoration were to 1) minimize the impacts of the golf course on stream biota, 2) increase stream habitat diversity, and 3) create a self-maintaining stream channel. Non-native brown trout have declined since stream relocation, but native fish species have persisted including creek chub, mottled sculpin, white sucker, blacknose dace, and Johnny darter. However, results suggest that urbanization at the watershed level has negatively impacted the stream, slowly diminishing the positive effects of reach reconstruction.



## ***Population dynamics of muskellunge in Lake Webster, 2005-2009.***

*Nathan Thomas, Indiana Department of Natural Resources*

Lake Webster is one of the premiere muskellunge (*Esox masquinongy*) fisheries in the Midwest and the brood source for muskellunge stocked in Indiana. Therefore, Division of Fish and Wildlife biologists have continued to monitor the status of this important fishery and since 2005, over 1,300 muskellunge have been implanted with Passive Integrated Transponder (PIT) tags to monitor changes in population density, growth rates, and mortality. Schnabel population estimates of adult muskies have ranged from 1.5/ac (2007) to 7/ac (2005) and have averaged 3.5/ac. Back-calculated growth rates obtained by cross-sectioned fin rays were similar among years and are comparable to nearby states, with muskies reaching legal size ( $\geq 36.0$  in) by age-6. Observed growth rates from recaptured muskies and PIT-tag information was variable. A composite catch-curve analysis incorporating catch data from all years estimated total annual mortality at 46% and indicated muskies were fully recruited to the sampling gear by age-4; however, a precipitous decline in survival after age-8 (42.0 in) was noted. Based on these results, Lake Webster continues to support a stable, high density muskie fishery. However, biologists should investigate the potential causes of increased mortality for older fish as well as develop new means to sample juvenile (age-0 to age-3) muskies not typically captured during broodstock sampling.

## ***Effects of Genistein on the modulation of stress and immunity in salmonids.***

*AMA Bashir, Indiana University-Purdue University Fort Wayne*

*Oyine Eja, Indiana University-Purdue University Fort Wayne*

*Ahmed Mustafa, Indiana University-Purdue University Fort Wayne*

Stress can have a profound effect on the health and well being of fish in aquaculture operations. A number of approaches have been tried to modulate this effect. The use of nutraceuticals showed promising results in this aspect. In this experiment we used Genistein as a new nutraceutical to investigate its role in providing tolerance to stress on two different salmonid species, steelhead salmon and coho salmon. Genistein is a soy isoflavones which has a variety of anti-cancer and anti-viral activity, but its role in stress response has not yet been studied. Fish were fed with Genistein as an additive and treated in two different conditions: controlled and stressed. In the stressed group the fish were crowded in tanks so that their optimal density for space is exceeded. Different physiological and biochemical parameters such as, condition factor, blood glucose, spleen somatic index (SSI), plasma protein, packed cell volume (PCV) and macrophage respiratory burst activity were recorded over a 10 week period. The data are now being analyzed. If this nutraceutical is found to be effective against stress response, it can be used in aquaculture industry to reduce stress related complexities such as, low growth rate, disease susceptibility, and high mortality.



## ***Creation of a glacial lakes status and trends monitoring program***

*Angela Grier, Indiana DNR*

*Steven Donabauer, Indiana DNR*

*Tomas Höök, Purdue University, Department of Forestry and Natural Resources*

*Carolyn Foley, Purdue University, Department of Forestry and Natural Resources*

Northern Indiana contains approximately 390 glacial lakes larger than 10 acres. These systems support diverse fish assemblages that sustain an array of economically and ecologically important gamefish. Moreover, these systems are taxed by the cumulative impacts of multiple stressors, including watershed development, shoreline development, and sediment and nutrient runoff. Unlike many more northerly glacial lakes, most of Indiana's natural lakes exist in largely agricultural landscapes and are thereby likely to respond differently to these stressors. Holistic and consistent approaches are necessary to facilitate future evaluation and management of these unique resources. Our long-term objective is to design a sampling program to efficiently monitor the status of lake fisheries and biological/chemical/physical habitat features, while simultaneously providing power to detect spatio-temporal variations of these lake features. To this end, we created a glacial lakes database containing a suite of these parameters that was then used to stratify lakes into 3 groups. In addition, during 2009 we conducted intensive feasibility surveys on 4 lakes: collecting fish, zooplankton, benthos, and water chemistry biweekly from spring stratification through fall turn-over. We collected the greatest diversity of fish species and sizes during June, implying that this may be an appropriate month for targeted community assessments. In addition, we documented pronounced spatio-temporal variation of zooplankton community structure, underscoring the difficulty of rapidly assessing this biotic component. Results of feasibility surveys will be combined with glacial lake database analyses to design a long-term status and trends monitoring program of Indiana's glacial lakes.

## ***Predicting Biological Impairment from Habitat***

*Jason Doll, Bureau of Water Quality*

Fish communities are often described in terms of biological impairment for the determination of water quality standards with the Index of Biological Integrity (IBI). In addition to point source stressors (e.g. CSO's and illicit discharges) and other anthropogenic influences the fish community is limited by available habitat. Therefore, accurate predictions of biological impairment based on habitat can be helpful when attempting to diagnose the source of the observed impairment. The objective of this study was to develop a predictive model of biological impairment based on habitat. Available habitat was evaluated with the Qualitative Habitat Evaluation Index (QHEI). Ordinal logistic regression was used to predict IBI ratings from QHEI scores. The Model was constructed using data from the Indiana Department of Environmental Management probabilistic monitoring design from streams in the Eastern Corn Belt Plain (training dataset). Validation of the model was conducted by predicting IBI ratings from data collected by the Bureau of Water Quality from 2002 through 2009 (validation dataset). The model correctly classified 79% of the training dataset and 82% of the validation dataset as impaired or not impaired. The model is most beneficial when evaluating the misclassified sites, particularly the sites which are predicted to be non-impaired while they were observed to be impaired. These sites clearly have sufficient habitat to sustain a healthy fish community. Therefore it can be concluded that the observed biological impairment is due to chemical exposures (e.g. point source discharges) and follow-up chemical surveys should be conducted.





Dr. Jerry Hamelink, Bob Johnson, Larry Lehman, Max Henschen, and Dave Isaacs

1979



Left: Frank Lockard      Right: unknown

No Lite Beers Here!



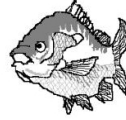
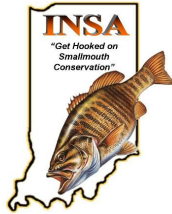


Joe Janisch, Incoming President, accepts presidents gavel from  
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