Illinois Chapter of the American Fisheries Society, 55th Annual Conference

February 21 - 23, 2017, Stoney Creek Hotel & Conference Center, Moline, IL

Plenary Session

Peering into the Future of Fisheries and Positioning Ourselves for Success

Presenter: Doug Austen Executive, Director of the American Fisheries Society

ORAL PRESENTATIONS

Tuesday, 1:40 - 3:20 PM – Management session

Past, Present, and Future of the Fisheries Division

Presenter: Stephenson, Dan IDNR Fisheries, One Natural Resources Way, Springfield, IL 62702; Phone: 217-524-4111; Email: Dan.Stephenson@illinois.gov

Abstract:
Illinois DNR Fisheries has a rich and proud legacy. This talk will showcase the ups and downs of the Fisheries Division, where we are now, and challenges in the future.

Keywords:
Fisheries Illinois DNR

Fox Chain O Lakes Walleye - A Historical Perspective: Management Happens

Presenter: Jakubicek, Frank IDNR Fisheries, 8916 Wilmot Road, Spring Grove, IL 60081; Phone: 815-675-2319; Email: frank.jakubicek@illinois.gov

Abstract:
Fisherman consider walleye "Lake Steak" and many target and harvest walleye every chance they get. The Chain probably contains one of the few native populations of walleye in the State and have been detected in surveys of our earliest Fisheries Biologist's. Expansion of the population has taken place because of the hard work and dedication of a handful of pioneers who began the process and the practical regulations, stocking consistency and Can-Do attitudes of all those who followed!

Keywords:
Walleye Fox Chain

Managing Illinois' Largest Reservoirs

Presenter: Hooe, Mike IDNR Fisheries, 11731 St Hwy 37, Benton IL 62812; Phone: 618- 393-6732; Email: MIKE.HOOE@illinois.gov

Abstract:
Biologists with the IDNR Division of Fisheries manage hundreds of impoundments statewide. The largest of these lakes are the three Army Corps of Engineers reservoirs, Carlyle, Rend, and Shelbyville. While originally constructed for commercial reasons the recreational value of these reservoirs has arguably become their most valuable asset. Managing the recreational fisheries in these large reservoirs presents

several unique challenges. Habitat, user conflicts, interspecific competition, invasive species, and angling pressure are some of the major challenges facing biologists as they attempt to maximize the recreational benefits these large reservoirs provide.

Keywords:
impoundments reservoirs

Aquatic Plant Management in Southern Illinois Lakes and Ponds--Helpful hints for assisting private water owners with "allergy problems"

Presenter: Bickers, Chris Illinois Department of Natural Resources Fisheries , 9053 Rt 148, Suite B, Marion, IL 62959; Phone: 618-993-7094 ; Email: chris.bickers@illinois.gov

Abstract:
Aquatic plants are a necessity for maintenance of “healthy” lakes and ponds with balanced fish populations, but keeping plant coverage at desirable levels can be a challenge. This presentation will provide helpful hints for aquatic plant management through discussion of a biologist’s experiences with assisting private water owners.

Keywords:
Aquatic vegetation aquatic plant management

Trends in Reported Commercial Fish Harvest in Illinois over the last sixty five years

Presenter: Maher, Rob J Illinois Department of Natural Resources Fisheries, 918 Union Street, Alton, IL 62002; Phone: 618-462-0362; Email: rob.maher@illinois.gov

Abstract:
The state of Illinois has managed a viable commercial fishing industry for many decades. Using a format established by William Starrett and Sam Parr in 1950, harvest statistics have been compiled annually to the present day. This presentation will utilize these data to examine trends in the harvest of several key species of fish as well as trends in license sales. The impact that non-native fishes have had on the current and historic fishery will also be discussed.

Keywords:
Commercial harvest commercial licenses

Tuesday, 3:40 - 5:20 PM

Morgan Shoal: underwater mapping and the fishes of Chicagos forgotten coral reef

Presenter: Willink, Philip W Shedd Aquarium, 1200 South Lake Shore Drive, Chicago, IL 60605; Phone: 312-692-3374; Email: pwillink@sheddaquarium.org

Co-authors and Affiliations:
Jeremy S Tiemann, Illinois Natural History Survey
Ethan J Kessler, University of Illinois
James K Bland, Shedd Aquarium
Samantha D Hertel, Loyola University

Abstract:
Morgan Shoal is a rocky outcrop in Lake Michigan located a couple hundred meters from the shoreline east of 48th Street in the Kenwood neighborhood, Chicago. The outcrop is Silurian (Niagaran) dolomite bedrock in roughly 4 to 20 feet (1.2 to 6.1 meters) of water, depending upon the water level of Lake Michigan. It is the site of the Silver Spray shipwreck, part of which is often visible above water. There are several ongoing or proposed development projects along the Chicago lakefront. Additional information is essential in making informed decisions. Surveys were primarily conducted in the Spring, Summer, and Fall from August 2015 to August 2016. Nineteen species of fishes were documented. In November, Lake Trout that had recently spawned were common. Whether they spawned over Morgan Shoal, or spawned elsewhere then travelled to the site to forage on Round Goby is unknown. Longnose Suckers preparing to spawn were abundant in the spring. Yellow Perch were present during all sampling periods. Physical habitat was surveyed by side scan sonar and direct observations by divers. Morgan Shoal is not just a rock. It is a three-dimensional rock outcrop with horizontal surfaces, vertical surfaces, smooth surfaces, crevices, nooks and crannies, surrounded by smaller bits of rubble and boulders and sand flats. This complex habitat heterogeneity, combined with a solid foundation that does not get washed away by Lake Michigan, is the basis of the Morgan Shoal ecosystem. Proximity to shore, seasonal water temperature, and other abiotic attributes influence Morgan Shoal biodiversity.

Keywords:
sidescan Lake Michigan reef

Nearshore Zooplankton Communities in Lake Michigan and Implications for Non-native Introductions

Presenter: Reed, Emily M University of Illinois at Urbana Champaign, 1816 S Oak St, Champaign, IL 61820; Phone: 248-990-2259; Email: emreed@illinois.edu

Co-authors and Affiliations:
Sara M Thomas, Michigan Department of Natural Resources
John H Chick, Illinois Natural History Survey
Sergiusz J Czesny, Illinois Natural History Survey

Abstract:
Nearshore regions in the Great Lakes provide an important transition zone from the watershed to offshore waters and serve as spawning and nursery habitat for many fish. Zooplankton communities are an integral component of nearshore systems, both as nutrient cyclers and food sources for higher trophic levels. However, recent anthropogenic alterations and invasive species introductions have dramatically changed species assemblages in the Great Lakes, including within zooplankton communities. To better understand the role of zooplankton within critical nearshore areas, we compared community assemblages around Lake Michigan over two years, including harbors, drowned river mouth lakes, open-water locations, and Green Bay. This nearshore zooplankton community assessment can help determine energy available to consumers within Lake Michigan's food web and provide insights to emerging community structures in this dynamic system. In particular, our findings highlight how zooplankton communities have the potential to hinder or facilitate Asian carp establishment in the Great Lakes.

Keywords:
Zooplankton Asian Carp Nearshore

Angler perceptions and preferences in the southern Lake Michigan fishery

Presenter: Golebie, Elizabeth J Illinois Natural History Survey, Human Dimensions Research Unit, 1816 S Oak Street, Champaign, IL 61820; Phone: 412-708-6950; Email: golebie2@illinois.edu

Co-authors and Affiliations:
Craig A Miller, Illinois Natural History Survey
Sergiusz J Czesny, Illinois Natural History Survey

Abstract:
Understanding beliefs of diverse groups of anglers is essential to developing successful management strategies. Cluster analysis can reveal the existence of distinct groups of anglers that act in similar ways, which allows managers to anticipate reactions of each of these groups to changes in the fishery and to avoid conflicts between the groups. The goal of this study was to develop an understanding of different types of anglers who target salmonid species in the southern Lake Michigan fishery and how they may differ in their perceptions of the fishery. During the 2015 Illinois Natural History Survey and Indiana DNR creel surveys of Lake Michigan, anglers were invited to participate in this study and those who agreed were sent a mail survey or a link to a Qualtrics version of the survey. Cluster analysis of eight variables measuring experience, investment, lifestyle, and resource use produced five subgroups of anglers among which fishery perceptions were compared using one-way ANOVA. Differences were found in angler perceptions of population changes of Chinook salmon and lake trout, angler beliefs of what is responsible for those changes, and angler preferences for stocking lake trout. Though non-response and avidity biases limit inferences to populations in general, this study provides insight into angler subgroups in southern Lake Michigan and underscores the importance of acknowledging these groups when considering management plans.

Keywords:
Lake Michigan angler perceptions cluster analysis

Notes on Salmonid Stomach Contents from 2015 in Lake Michigan

Presenter: Happel, Austin Illinois Natural History Survey, 1816 S Oak street, Champaign, IL 61820; Phone: 260-413-2355; Email: happel2@illinois.edu

Co-authors and Affiliations:
Sergiusz Czesny, Illinois Natural History Survey
Jacques Rinchard, The College at Brockport
Matthew Kornis, US Fish and Wildlife Service
Charles Bronte, US Fish and Wildlife Service

Abstract:
The food web of Lake Michigan has been altered by many invasive species which has created gaps in our knowledge of how energy flows through the system. Current acoustic and trawl estimates indicate a sparse prey base compared to predator populations. In an effort to better understand how top predators utilize prey resources, stomachs were processed from angler caught salmonids throughout the 2015 fishing year. In brief, we noted many terrestrial invertebrates in stomachs of steelhead trout and Coho salmon, a specialization on alewife by Chinook salmon, and mixed round goby and alewife

consumption by lake and brown trout. We also evaluate spatial and temporal differences in diet compositions of the five salmonid species. This data provides more current descriptions of diets of angler caught fishes in Lake Michigan and offers insights in to how top predators fit into this restructured food web.

Keywords:
Lake Michigan salmonid diet

Aquaculture and Fish Importation Regulations: Protecting Aquatic Resources in Illinois

Presenter: Ruebush, Blake C Illinois Department of Natural Resources, 1252 W Washington Street, Pittsfield, IL 62363; Phone: 630-360-4182; Email: blake.ruebush@illinois.gov

Abstract:
Establishing and maintaining relevant natural resources laws through statute and administrative rule is vital for protecting aquatic resources in Illinois. The Illinois Department of Natural Resources (IDNR) Aquatic Nuisance Species and Aquaculture Programs focus on regulating aquatic resources protected by the Fish and Aquatic Life Code, mitigating established aquatic nuisance species, and preventing the invasion of those that pose a threat to Illinois. The Aquatic Life Approved Species List is established to identify aquatic life categories that are approved for activities such as aquaculture, transportation, stocking, importation and/or possession in the State of Illinois. These activities are regulated through licenses, facility and importation permits, health certification requirements, and facility inspections. The production of aquatic life for food and stocking purposes is permitted through the IDNR Aquaculture Permit. In 2016, IDNR issued 74 Aquaculture Permits. Twenty eight facilities were authorized to produce Tilapia (Oreochromis spp.), and two were authorized to raise Barramundi (Lates calcarifer), Restricted Species that require additional authorizations. Along with Illinois aquaculture, fish importation also accounts for fish destined for pond stockings and food markets. In 2016, 264 fish importation permits were issued to licensed fish importers. Permit types included VHS-Susceptible Species, Salmonid, and Restricted Species Transportation Permits. Triploid Grass Carp, commonly used for aquatic vegetation control, are permitted with a Restricted Species Transportation Permit. Triploid Grass Carp regulations are currently being reviewed, and revisions are proposed for 2017.

Keywords:
Aquaculture Fish Importation Regulations

<u>Wednesday, 8:30 - 9:50 AM</u>

Population dynamics of Sauger and simulated effects of minimum size limits in the Kaskaskia and Ohio Rivers

Presenter: Seibert, Kasey L Southern Illinois University Carbondale, 251 Life Science 2, Carbondale, IL 62901; Phone: 618-317-6225; Email: kasey.yallaly@siu.edu

Co-authors and Affiliations:
Gregory Whitledge, Southern Illinois University Carbondale
Neil Rude, Southern Illinois University Carbondale
Jay Herrala, Kentucky Department of Fish and Wildlife Resources
Craig Jansen, Indiana Department of Natural Resources

Abstract:
The Kaskaskia and Ohio Rivers support important recreational Sauger fisheries and are currently managed with different size limits; there is a 356-mm minimum length limit for Sauger in the Kaskaskia River, but no minimum length limit for Ohio River Sauger. Differences in size limits may be partly responsible for observed differences in Sauger size structure between these two rivers over multiple years of sampling. Therefore, we sought to evaluate population demographics of Sauger in five pools of the lower Ohio River and in the lower Kaskaskia River and simulate effects of current and potential minimum size limits on Sauger fisheries. Sauger were collected via nighttime boat electrofishing in early winter 2014-2016 and aged using otoliths. Age and size structure of Sauger in the Ohio River was small with a minimum relative stock density (MIN-RSD) based on 356-mm size limit of 10. The Kaskaskia River Sauger population had a larger size and age structure with a MIN-RSD of 44. All populations exhibited fast growth rates and high annual mortality. Population modeling indicated that the current 356-mm minimum size limit for Sauger in the Kaskaskia River is sufficient at preventing growth overfishing and is likely resulting in the larger size structure of Sauger when compared to the Ohio River. Based on available exploitation estimates, implementing a 356-mm minimum size limit in the Ohio River is predicted to increase relative abundance of larger fish and prevent growth and recruitment overfishing that are likely occurring in the absence of a minimum length limit.

Keywords:
Sauger regulations population dynamics

Identifying Recruitment Sources Dispersal and Movement of Sauger in the Ohio River Using Otolith Microchemistry

Presenter: Loubere, Alex D Southern Illinois University Carbondale, 1125 Lincoln Dr, Carbondale, IL 62901; Email: alexander.loubere@gmail.com

Co-authors and Affiliations:
Devon C Oliver, Southern Illinois University Carbondale
Neil P Rude, Southern Illinois University Carbondale
Gregory W Whitdledge, Southern Illinois University Carbondale

Abstract:
Sauger are a recreationally important species in the Ohio River basin and population assessment and monitoring is needed in order to provide accurate and useful management recommendations for management agencies to maintain the integrity of the fishery. The objectives of this study are to use stable isotope and trace element analyses of otoliths to identify principal recruitment sources and inter-river movement patterns of Ohio River Sauger. Water data collected over several years indicate differences in chemistry between the Ohio River and its tributaries, allowing us to distinguish tributary versus river natal recruitment. Sauger were collected from the lower six pools of the Ohio River during November and December of 2014 and 2015, measured for length and weight, and their sagittal otoliths extracted for ageing and chemical analyses. Identification of the principal sources of Sauger recruitment to the fishery in each of the lower Ohio River navigation pools will facilitate conservation of important natal habitats for this species and contribute to assessment of the most appropriate spatial scale for managing Sauger stocks.

Keywords:

Otolith microchemistry sauger Ohio River

Effect of Elevated Nutrients and Sediments on Growth of Juvenile Black and White Crappie

Presenter: Bogner, David University of Illinois, Kaskaskia Biological Station, 1235 CR 1000N, Sullivan, IL 61821; Phone: 217-621-7627; Email: dbogner2@illinois.edu

Co-authors and Affiliations:
David Wahl, Illinois Natural History Survey

Abstract:
Anthropogenic influences can cause dramatic increases in turbidity through sediment and nutrient inputs to lakes and reservoirs. Increased nutrients can affect fish growth via increased productivity whereas increased sediments can decrease reactive distance and reduce feeding rates. Our objective was to evaluate the effect of increased nutrients and sediments on growth of juvenile Black Crappie (Pomoxis nigromaculatus) and White Crappie (Pomoxis annularis). We selected these species as they exhibit similar feeding ontogeny and co-occur in many systems but are hypothesized to respond to turbidity differently with Black Crappie being more negatively affected. We examined growth in mesocosms with nutrient and sediment additions over a four week period using a full factorial model of nutrients and sediments. We detected a significant effect of sediment on change in weight. Black Crappie expressed greater growth than White Crappie except in the presence of increased sediment. Our results highlight the importance of parsing out the drivers of increased turbidity to better understand the effects on fish growth.

Keywords:
Turbidity Crappie Growth

Foraging of Juvenile Crappies in Turbidity: The Difference is Black and White

Presenter: Andree, Sara R University of Illinois Urbana Champaign, 920 Waterview Way, Apt H, Champaign, IL 61822; Phone: 219-973-6361; Email: andree2@illinois.edu

Co-authors and Affiliations:
David H Wahl, Illinois Natural History Survey

Abstract:
Environmental conditions during early life can impact foraging behaviors, and thus growth and survival, especially in aquatic systems where influential factors like turbidity may fluctuate rapidly. Black (Pomoxis nigromaculatus) and white (P. annularis) crappies have been hypothesized to respond strongly and distinctly to changes in turbidity, with black crappies often thought to respond more negatively than white crappies. To compare effects of three representative turbidity levels (0, 25, and 50 NTU) on juvenile crappie foraging, controlled experiments were used to quantify 1) overall consumption and size selectivity of a single prey type (Daphnia) and 2) prey type selection, total consumption, and energetic value of diets when three distinct prey types (Daphnia, Chaoborus, and Chironomus) were offered. Unexpectedly, black crappies exhibited universally greater diet biomass than white crappies. Black crappies also displayed relatively higher prey consumption and were more size selective of a single prey type, while white crappies were decreasingly selective and maintained similar overall consumption. Both species showed similar selection patterns among three prey types in all turbidity levels, preferring

Chaoborus and avoiding Chironomus. However, black crappies also avoided Daphnia, while white crappies consumed them without preference. Overall, turbidity did not appear to impair the foraging of juvenile crappies. Instead, observed differences in growth and survival likely result from increased foraging activity in turbidity, which may result in increased energy expenditure for similar foraging return, leading to reduced growth and possibly increased exposure to predators.

Keywords:
crappie foraging turbidity

Wednesday, 10:20 - 11:40 AM

To go with the flow? How stream discharge influences mussel survival and persistence

Presenter: Stodola, Alison P Illinois Natural History Survey, 1816 S Oak Street, Champaign, IL 61820; Phone: 217-300-0969; Email: alprice@illinois.edu

Co-authors and Affiliations:
Scott J Chiavacci, Illinois Natural History Survey
Kirk W Stodola, Illinois Natural History Survey
Jeremy S Tiemann, Illinois Natural History Survey

Abstract:
Freshwater mussels are often described as flow dependent. However, stream discharge is subject to stochastic variation, which is sometimes seen in extreme forms of flooding or persistent drought. Under changing climates and altered landscapes, variability in flow may be increasing. Little is known about the true effect of such events on freshwater mussel persistence or survival, let alone how mussels are influenced by moderate variation over time. Two projects have revealed the flow conditions are linked to declines in persistence and survival of mussels. In one study, we investigated the primary factors influencing mussel presence in the greater Chicago area, with special emphasis on Ellipse and Spike. Our analyses indicated that low flow duration and number of high pulse flows were important predictors of species' persistence. Further, the negative impact of pollutant dischargers in the watershed on Ellipse presence was exacerbated during periods of low flow. In another study, we used a mark-recapture approach to estimate survival of 4000 individually marked Clubshell and Northern Riffleshell translocated to the Salt Fork and Middle Fork Vermilion rivers. We found that survival of both species during a five-year period declined by nearly 2 times following a high flow event. Furthermore, survival differed between species, with Clubshell nearly five times more likely to survive compared to Northern Riffleshell. Understanding the role of flow on survival and persistence of mussels remains a monumental challenge for freshwater mussel conservation, as each species may respond uniquely to variations in flow rates, and low flow events may compound impacts like temperature or dilution rates of pollutants.

Keywords:
mussels flow suvival

Americas Newest Invader? - Discovery of a Third Corbicula in Illinois

Presenter: Tiemann, Jeremy S. Illinois Natural History Survey, 1816 South Oak Street, Champaign, IL 61820; Phone: 217-244-4594; Email: jtiemann@illinois.edu

Co-authors and Affiliations:
Amanda E Haponski, University of Michigan Museum of Zoology
Sarah A Douglass, Illinois Natural History Survey
Mark A Davis, Illinois Natural History Survey
Taehwan Lee, University of Michigan Museum of Zoology
Kevin S. Cummings, Illinois Natural History Survey
Diarmaid Ó Foighil, University of Michigan Museum of Zoology

Abstract:
The genus Corbicula consists of moderately-sized freshwater clams native to Asia, Africa, and Australia, and contains some of the most successful aquatic invasive species. The genus has both sexual and asexual forms with the former restricted to Asia, whereas the latter clones have invaded North and South America and Europe. Corbicula taxonomy is muddled, as is the number of taxa that have invaded the New World. Recent work suggests three morphotype taxa, or Forms, exist in North and South America. Here, we report on a fourth taxa, Form D, recently discovered in the Illinois River. This new taxon was found co-occurring with Forms A and B. Our main objective was to document the occurrence of this new invasive and perform an analysis of its distinctiveness from sympatric Forms using shell phenotype characteristics and genetic markers. Results showed that the three Forms were distinguishable using shell phenotype and nuclear 28S ribosomal DNA sequences. Individuals were unambiguously assigned to one of three discrete shell phenotypes, Form A, B, or D, with Form D specimens uniquely characterized by fine pinkish-rust colored rays and white nacre with purple teeth. Likewise, 28S genotypes identified three distinct morphs, with Form D differing from Forms A and B by 2-6 base pairs. In contrast, Form D was distinguishable from Form B via mitochondrial markers but shared an identical mtDNA haplotype with sympatric Form A. This latter result could stem from androgenetic capture of Form A eggs by invasive Form D sperm, a rare form of inheritance previously inferred for co-occurring Corbicula clones. Further morphological, ecological and genomic analyses is required to establish the significance of our preliminary findings.

Keywords:
Invasive Exotic mussels

Effects of seventeen beta estradiol on sunfish metabolism and body shape

Presenter: Parajulee Karki, Neeta Eastern Illinois University, 50 University Apartments, Charleston, IL 61920; Phone: 217-778-1367; Email: nparajuleekarki@eiu.edu

Co-authors and Affiliations:
Robert Colombo, Eastern Illinois University Charleston IL
Karen F Gaines, Embry Riddle Aeronautical University Daytona FL
Anabela Maia, Eastern Illinois University Charleston IL

Abstract:
Fish habitats are increasingly contaminated with estrogenic compounds, including 17β estradiol (E2). E2 causes adverse effects on the reproductive system of male fish; however, their effects on fish metabolism, morphology and histopathology of liver tissues are less known. The objective of this study is to evaluate the effects of E2 exposure on the basal and stressed metabolic rate, changes in body shapes, and histological changes in the liver tissues of sunfish species. Fish were held individually in ten

gallon tanks under two treatments with varying estradiol concentrations (40 and 80 ng/l) and one control group (no E2). The duration of E2 exposure was 21 days, with E2 replenished every week. Basal and maximum aerobic scopes were measured using closed respirometry. Lateral pictures of the fish were taken before and after exposure. Our results showed that females had 19% higher basal metabolic rates than males before exposure but not after exposure, indicating convergence of basal metabolism in the two sexes. Aerobic scope increased only in control males which could be related to aggressive male displays and higher allocation of resources to gonad development. We observed the reduction in operculum size and decrease in head size in exposed individuals but not in the control. E2 exposure caused some morphological changes in male related characters in sunfish which eroded male dimorphic characters. Histological examination of liver tissues showed that there was a disintegration of hepatocytes in the E2 exposed liver tissues. Our research highlights negative effects of estradiol that are more widespread than simple gonadal alterations.

Keywords:
metabolism morphology sunfish

Caudal Fin Abnormalities Influence a Condition Index for Catostomid Species from the Sangamon River

Presenter: Hoster, Bethany Eastern Illinois University; Email: bhoster@eiu.edu

Co-authors and Affiliations:
Robert Colombo, Eastern Illinois University

Abstract:
As a result of human activity, wastewater treatment effluent and agricultural runoff can alter the water quality of rivers. The Sangamon and Embarras Rivers, located in Central Illinois, are both surrounded by agricultural lands. The Sangamon River is also impacted by wastewater treatment effluent from the Sanitary District of Decatur which serves 100,000 people, two hospitals, and several industrial users. Abnormal caudal fins have been observed in several Catostomid species in the study reach of the Sangamon River. Due to the presence of endocrine disrupting compounds and mutagenic compounds in agricultural runoff and wastewater treatment effluent, the condition of fishes was investigated in the Sangamon River and a stretch of the Embarras River not impacted by effluent. River Carpsucker (Carpiodes carpio), Shorthead Redhorse (Moxostoma macrolepidotum), and Smallmouth Buffalo (Ictiobus bubalus) were sampled in 2016 to assess the condition of these fishes. Gonadosomatic index and relative weight were used to estimate condition. Shorthead Redhorse had the highest relative weight among species for both rivers and were in better reproductive condition in the Embarras River. No differences in reproductive condition were found for River Carpsucker or Smallmouth Buffalo, but fishes from the Embarras River had higher relative weights. Using standard and total lengths, we found River Carpsucker and Smallmouth Buffalo from the Sangamon River have significantly longer caudal fins than those from the Embarras River. No difference in caudal fin length was found for Shorthead Redhorse. Longer caudal fins may cause relative weight to decrease. Additional analyses will be conducted to determine if any other morphological abnormalities are present in these fishes.

Keywords:
Caudal fin Catostomidae relative weight

Wednesday, 1:00 - 2:20 PM

Rising water temperatures correspond with changes in the fish assemblage of a large river

Presenter: Gibson Reinemer, Daniel Illinois Natural History Survey, 704 N Schrader, Havana, IL 62644; Phone: 703-967-1756; Email: danielkgr@gmail.com

Co-authors and Affiliations:
Kirsten Bouska, USGS
Alison Anderson, Illinois Natural History Survey
John Chick, Illinois Natural History Survey
Andrew Casper, Illinois Natural History Survey

Abstract:
Rapidly warming temperatures in rivers shift and contract cooler thermal conditions upstream. To track shifting temperatures, thermally-sensitive river fishes must shift their distributions. Although much of the attention on the effects of climate change has focused on coldwater species in montane rivers, lowland rivers are also warming. Here, we show that the velocity of climate change in large rivers can exceed that of montane rivers. Using a long-term monitoring program, we show that warming temperatures over several decades correspond with large changes in the fish assemblage of a large river. As water temperatures have warmed, warmwater species are replacing coolwater species.

Keywords:
Climate change fish assemblage long term

Evaluating the age structure of selected sportfish populations in the La Grange Reach of the Illinois River

Presenter: Solomon, Levi Illinois Natural History Survey, 704 N Schrader Ave, Havana, IL 62644; Phone: 309-543-6000; Email: soloml@illinois.edu

Co-authors and Affiliations:
Daniel Gibson Reinemer, Illinois Natural History Survey
Kristopher Maxson, Illinois Natural History Survey
Rich Pendleton, Illinois Natural History Survey
Jim Lamer, Western Illinois University
Cory Anderson, USFWS- Wilmington
Eli Lampo, Western Illinois University
Rebekah Haun, Illinois Natural History Survey
Andrew Casper, Illinois Natural History Survey

Abstract:
Knowing the age structure of populations of fishes can provide a great amount of information related to their management, including insights into potential stressors affecting those populations. For example, an absence of specific year classes, or groups of year classes, can allow biologists to look back at past conditions and evaluate why reproduction/recruitment was lacking and guide further research and management. Over the past five years, 2,304 sagittal otoliths from four species of fishes (yellow bass, white bass, bluegill, and black crappie) have been collected from the La Grange Reach of the Illinois River by the Upper Mississippi River Restoration Program's Long Term Resource Monitoring (LTRM)

element. Results indicate that all four populations of fishes are consistently dominated by younger year classes, with very few fish of either species living past age two. Only 5.4% of white bass collected from 2012-2015 are age two or more, while only 4.9% of bluegill collected are ages three or older. In addition, growth rates of species observed in the La Grange Reach are faster than in other populations documented in the literature. While it is generally known that our large Midwestern rivers face a multitude of stressors (invasive species, sedimentation, altered hydrology, etc.), knowing what stressor is preventing these species from growing to older, potentially larger, size classes should be a priority

Keywords:
sportfish age Illinois River

Differing spatiotemporal trends in larval fish communities in tributaries of two large river systems

Presenter: Pesik, Jordan J. Eastern Illinois University, Charleston, IL 61920; Phone: 651-278-0320; Email: jjpesik@eiu.edu

Co-authors and Affiliations:
Daniel Roth, Eastern Illinois University
Scott Meiners, Eastern Illinois University
David Wahl, Illinois Natural History Survey
Robert Colombo, Eastern Illinois University

Abstract:
Little is known about larval fish communities in riverine systems. Since larval fish assemblages have been shown to vary on localized spatial and temporal scales, we were interested in comparing assemblages within and among tributaries of large rivers to better understand their ecology in tributaries and importance to the larger system. Two river systems were included in this study. The Wabash River is the longest unimpounded river East of the Mississippi River. In comparison, the Illinois River is a large and highly impounded river. Three major tributaries of each river were selected for sampling (Mackinaw, Spoon and Sangamon Rivers from the Illinois River system; Embarras, Little Wabash and Vermilion Rivers from the Wabash River system). Fish larvae were collected biweekly at three sites from each tributary. Three gears were used in larvae collection. We identified 22,905 larvae representing eleven families of fishes. Though tributaries of the Wabash River produced about five times as many larvae as tributaries of the Illinois River, nonmetric multidimensional scaling of proportional abundance data indicated the overall assemblage structures were very similar between the two systems. However, temporal shifts in assemblage structuring between the two systems were apparent, suggesting the impounded nature of the larger river may impact aspects of the reproductive ecology of fishes in its tributaries. We still need to elucidate the large scale abiotic differences between these two river systems influencing larval fish abundance and structure.

Keywords:
Larval fish Illinois River NMDS

Population Characteristics Connectivity and Recruitment Sources of Spotted Bass in Southern Illinois

Presenter: Abell, Nicholas J Southern Illinois University, 1221 Sanpat Ln, Apt D, Carbondale, IL 62902; Phone: 618-534-1135; Email: nickabell7@siu.edu

Co-authors and Affiliations:
Devon C Oliver, Southern Illinois University
Neil P Rude, Southern Illinois University
Gregory W Whitledge, Southern Illinois University

Abstract:
Naturally occurring chemical markers within calcified structures have proven useful for determining environmental history of fishes. Differences in chemical signatures within lotic networks are reflected within structures such as otoliths, fin rays, and spines. In this study, we are using fin ray microchemistry to determine environmental history and age estimates derived from sectioned fin rays to characterize population demographics of stream-dwelling Spotted Bass in southern Illinois. Spotted Bass were collected from southern Illinois streams using a variety of gear types in 2014. In 2015 and 2016, Spotted Bass were collected from the Ohio River and several tributaries by electrofishing to allow for comparison of population characteristics among these environments. Age estimates derived from sectioned fin rays were used to compare population age composition, growth characteristics, and mortality rates between the Ohio River and its tributaries. Spotted Bass sampled from the Ohio River generally reached older age, larger size, and displayed slower growth and lower mortality rates than the tributary populations. Consistent differences in water chemistry parameters among tributaries and the Ohio River enable movement among these environments to be detected. A discriminant function analysis of fin ray Sr:Ca and Ba:Ca core data was performed to classify an environment of origin to unknown origin fish. Results indicated that 100% of Spotted Bass captured in the Ohio River had originated in the Ohio River, and that 86% of Spotted Bass captured in tributaries had originated in tributaries.

Keywords:
Spotted Bass microchemistry demographics

Wednesday, 2:50 - 3:50 PM

An Update to the Fishes of Champaign County IL

Presenter: Sherwood, Josh Illinois Natural History Survey, 1816 S Oak St, Champaign, IL 61820; Phone: 217-244-2157; Email: jsherwo2@illinois.edu

Abstract:
With data spanning over 100 years, the Fishes of Champaign County is a comprehensive, long term investigation into the changing fish communities of east-central Illinois. The same 120 sites across the county have been sampled four times since 1928 and have been added to data from an additional 40 sites sampled in the 1890's. Data from these surveys have produced a unique perspective into not only the fish communities of the region, but changes to instream habitat, and more recently, land use/cover. Results from our survey observed two state-listed species that had not been seen in the county since the first surveys, and one that had not been documented in any of the county-wide surveys. We also observed notable improvements in the fish communities of streams that had been plagued by chronic pollution. Our analysis of in-stream habitat indicate a general trend away from small streams of various substrate types towards wider, deeper streams with a more uniform substrate. It is our hope the data and analyses of these surveys can provide managers with valuable information to further restoration efforts using a historical prospective.

Keywords:

fish long term alterations

Assessing the distribution of Iowa Darters in streams of northern Illinois

Presenter: Stites, Andrew J Illinois Natural History Survey, 1816 S Oak Street, Champaign, IL 61820; Phone: 618-670-9989; Email: stites1@illinois.edu

Co-authors and Affiliations:
Joshua L Sherwood, Illinois Natural History Survey
Jeremy S Tiemann, Illinois Natural History Survey

Abstract:
Populations of the state-listed Iowa Darter (Etheostoma exile) have been declining in Illinois for more than a century. However, recent observations in headwater streams of northern Illinois with no previous records of Iowa Darters exposed the need to reevaluate its distribution within the state. We used MaxEnt, generalized linear, and random forest models, along with target field surveys, to estimate the historical and current distribution of Iowa Darters in Illinois. Our model of the historic distribution in Illinois estimates that Iowa Darters were sporadically located in northeastern Illinois, focused around the Chicago metro and suburban region. Using the current distribution model, we selected and sampled 30 potential sites representing low, medium, and high probabilities of having darters. Our efforts led to the discovery of nine new Iowa Darter localities. We used our findings to revise the distribution model, which showed the range of Iowa Darters in Illinois has substantially decreased from its historic range. However, areas of suitable habitat do still exist. Sampling and monitoring of these areas could guide potential conservation efforts and lead to additional populations.

Keywords:
Distribution Modeling Threatened Species

Monitoring demographics of a commercially exploited population of Shovelnose Sturgeon

Presenter: Thornton, Jessica L Eastern Illinois University, 503 Buchanan Ave., Charleston, IL 61920; Phone: 217-433-1733; Email: jlthornton4@gmail.com

Co-authors and Affiliations:
Les D Frankland, Illinois Department of Natural Resources
Craig Jansen, Indiana Department of Natural Resources
Jana Hirst, Illinois Department of Natural Resources
Robert E Colombo, Eastern Illinois University

Abstract:
The shovelnose sturgeon population in the Wabash River provides an important recreational sport and commercial caviar fishery for both Illinois and Indiana. In fact, it is one of the last commercially viable populations for roe harvest. The Wabash offers vital habitat for shovelnose sturgeon whose conservative life history includes an age at maturation of 5 to 7 years. Previous studies have shown that increased harvest pressure in this species can slow maturation and result in recruitment overfishing. Therefore, it is important to closely and continuously monitor exploited populations. Over the past decade, shovelnose sturgeon were sampled with boat electroshocking, hoop nets, gill nets, and driftnets. Fish captured between 2005 and 2015 had an overall average fork length of 666.8 ± 0.58mm,

and an average weight of 1194.34 ± 3.17g. The mean relative weight was 87.5 g, falling within the target range of 80-90, but over the years, condition has shown a significant decline with the most recent figures at the low end of the target range. The overall proportional size structure indices for quality, preferred, memorable, and trophy size fish were 100, 98, 70, and 1 respectively. Gravid FIV females, the fish directly impacted by roe harvest, also showed a decline in both condition and mean fork length over time. Despite commercial harvest, the demographics of this population remain relatively stable, though most recent data have shown a decline in physiological condition. Further monitoring is necessary to maintain a sustainable population and support continued sport and commercial fishing in the Wabash River.

Keywords:
sturgeon demographics commercial

Thursday, 8:40 - 10:20 AM

Asian Carp Removal Project in the Upper Illinois River

Presenter: Widloe, Justin Illinois Department of Natural Resources, 13608 Fox Road, Yorkville, IL 60560; Phone: 815-278-1174; Email: justin.widloe@illinois.gov

Co-authors and Affiliations:
Tristan Widloe, Illinois Department of Natural Resources
Blake Bushman, Illinois Department of Natural Resources
Nathan Lederman, Illinois Natural History Survey
Seth Love, Illinois Natural History Survey

Abstract:
Asian carp are thriving in the Mississippi River Basin, resulting in deleterious changes to native ecosystem structure and function, as well as billions of dollars of economic impact. Today, the leading edge of the Asian carp population is approximately 47 miles downstream of Lake Michigan and 10.5 miles downstream of the Electrical Dispersal Barrier. In response to the threat posed to the Great Lakes by Asian carp, the Illinois Department of Natural Resources (IDNR) established the Asian Carp Removal Project. The primary goal of the project is to reduce the number of Asian carp in the Upper Illinois River as well as constrain and confine the leading edge of the population through controlled and contracted commercial fishing. Since 2010, the IDNR has fished approximately 1,800 miles of commercial gill nets, trammel nets and seines, as well as 1,442 net nights of hoop nets and Great Lakes style pound nets. In 2016, the IDNR utilized the Chinese unified fishing method to remove nearly 100,000 pounds of Bighead and Silver Carp from Hanson Material Services West Pit, with an estimated removal of 50-80% of the Asian carp present at the start of the two week event. Through the project's combined efforts, over 5 million pounds of Asian carp have been removed to date. This has resulted in a reduction in both the estimated density of the leading edge of the Asian carp population as well as the likelihood of their upstream migration towards the Electric Dispersal Barrier and Lake Michigan.

Keywords:
Asian carp Upper Illinois River Commercial fishing

Quantification of daily otolith increments in young of year Asian carp

Presenter: Szott, Emily A Western Illinois University, 1200 N Western Ave, Thompson Hall 335, Macomb, IL 61455; Phone: 708-745-0978; Email: ea-szott@wiu.edu

Co-authors and Affiliations:
James T Lamer, Western Illinois University
Thomas Plate, Western Illinois University
Brent Knights, USGS – UMESC
Jon Vallazza, USGS-UMESC
James Larson, USGS-UMESC
Levi Solomon, Illinois Natural History Survey
Rich Pendleton, Illinois Natural History Survey
Andy Casper, Illinois Natural History Survey
Jun Wang, Shanghai Ocean University

Abstract:
Silver and bighead carp are invasive species established throughout the Mississippi River Basin. Despite the research and resources dedicated to their management, information on young of year Asian carp is still lacking. Here, daily incremental growth annuli from otoliths are used to estimate age and birth dates of young of year Asian carp. We collected young of year Asian carp from the La Grange Reach of the Illinois River following a spawning event in August 2014. Total length of each fish was measured, and the fish separated into 5 mm length groups (15-79 mm). Otoliths were extracted, mounted to slides, polished, photographed, and aged. Otolith microstructure was validated using young of year Asian carp from Chinese aquaculture. Preliminary results show the collected Asian carp range from 31 to 110 days old, placing their birthdays between April 18 and July 6, 2014. Age frequency peaks suggest multiple or sustained spawning events in the Illinois River, and relate birth dates to Illinois River stage and water temperature data. Simple linear regression was used to determine if the length of a young of year Asian carp could be used to predict the age. Ultimately, the results from this study may help in the understanding and management of young of year Asian carp.

Keywords:
Asian carp otoliths aging

Assessing Movement of Adult Silver Carp and Bighead Carp in the Upper Illinois Waterway System Using GPS Satellite and Radio Telemetry

Presenter: Mathis, Andrew T Western Illinois University, 900 Linden Lane, Apartment 407, Macomb, IL 61455; Phone: 815-488-7045; Email: at-mathis@wiu.edu

Co-authors and Affiliations:
James T Lamer, Western Illinois University
Brent Knights, United States Geological Survey
Kevin Irons, Illinois Department of Natural Resources

Abstract:
Invasive silver carp and bighead carp have established populations throughout the Illinois River. Efforts to prevent invasion into the Great Lakes rely on a comprehensive monitoring program. Despite a wealth of information on Asian carp movement, a finer-scale approach to understand real-time movements and habitat use would strengthen management efforts. We are testing GPS tags to determine patterns of

movement, identify potential feeding and spawning areas, and inform commercial removal efforts in the Upper Illinois River. To optimize and determine the feasibility of this technology, data logging tags (manually tracked with radio telemetry) were tethered to bighead and silver carp species in raceway and field experiments. Fifteen field-deployed tags have been recovered and have returned 1,441 individual waypoints. We have demonstrated the use of this technology to monitor Asian carp and we began testing remotely-accessed, real-time, ARGOS-linked prototypes in Fall 2016. Fine-scale accuracies, fast acquisition speeds, and the ability to gather real-time data make GPS transmitters an ideal tool, and is the first use of GPS technology to track fish in riverine systems.

Keywords:
Asian carp telemetry satellite

Effects of Elevated Carbon Dioxide on Fish in Flowing Water

Presenter: Schneider, Eric V Grad Student Research Tech at Univ of Illinois, 1406 South Maple Street, Urbana, IL 61801; Phone: 240-671-4514; Email: schneid@illinois.edu

Co-authors and Affiliations:
Caleb T Hasler, University of Illinois Post Doc
Cory D Suski, University of Illinois Associate Professor

Abstract:
Aquatic invasive fishes in the Midwest have a potential for wide-ranging impacts due to the interconnectedness of watersheds. Of particular concern is the artificial connection between the Mississippi River basin and the Great Lakes via commercial shipping waterways, specifically the Chicago Area Waterway System. Bigheaded carps have established themselves in the upper reaches of the Illinois River, and significant efforts have been made to prevent their further spread towards Lake Michigan. Currently, three electric barriers are in place and serve to prevent fish passage through this waterway. To provide redundancy and increase the likelihood of stopping the spread of carp into the Great Lakes, carbon dioxide (CO2) is being investigated as a potential nonphysical barrier. Here, we first review some of the work that has been done to define the potential of CO2 as a fish barrier, as well as highlight several projects related to the potential impacts of CO2 on fish behavior. We also detail recent experiments designed to define the responses of fish in flowing to CO2 exposure. Together, data help define the potential for CO2 to act as a non-physical deterrent to fish movement, and highlight work that has been done to refine and guide application.

Keywords:
carbon dioxide carp barrier

Spatial, temporal, and abiotic factors influencing Asian carp reproduction in large river tributaries

Presenter: Roth, Daniel R Eastern Illinois University, 600 Lincoln Avenue, Charleston, IL 61920; Phone: 630-915-8159; Email: drroth@eiu.edu

Co-authors and Affiliations:
Jordan Pesik, Eastern Illinois University
David Wahl, Illinois Natural History Survey
Robert Colombo, Eastern Illinois University

Abstract:
Invasive Asian carps of the genus Hypophthalmichthys pose significant ecological risks to ecosystems throughout much of the Midwestern United States. These two species, Bighead and Silver Carp, have spread extensively throughout many large rivers including the Illinois and Wabash River basins. Monitoring reproduction and early life stages of these fishes is critical in identifying factors that promote their spread into novel ecosystems. The goal of our study was to monitor abundance of early life stages of Asian carps in major tributaries of the Illinois and Wabash Rivers using a multi-gear approach. From March through October of 2016, we sampled larval fish and eggs using both active and passive ichthyoplankton nets, and quatrefoil light traps. We found considerable variation in occurrences of larval Asian carp among tributaries over wide spatial, temporal, and environmental ranges. Most notably, the highest abundance of Asian carp was detected in the lower 30 miles of the Little Wabash River, from April through September. Abundance of larval Asian carp varied by gear type and developmental stage, indicating selectivity between life stages. Logistic regression analyses showed discharge and temperature promote larval Asian carp occurrence. Further investigation is necessary to identify additional factors driving larval Asian carp abundance in large-river tributaries. Identification of these factors in the introduced ranges of these species offers insight into the likelihood of invasion to novel ecosystems, such as the Great Lakes. Ultimately this may allow research and prevention efforts to be allocated to areas of highest vulnerability, thereby protecting the ecological and economic resources they possess.

Keywords:
Invasive Carp Larval

Thursday, 10:40 - 11:40 AM

Median fin shape and function in basal bony fish

Presenter: Maia, Anabela Eastern Illinois University, 600 Lincoln Ave, Charleston, IL 61920; Phone: 857-756-0873; Email: amresendedamaia@eiu.edu

Co-authors and Affiliations:
Kaitlyn Hammock, Eastern Illinois University
Austin Parrish, Eastern Illinois University
Carl Favata, Eastern Illinois University

Abstract:
Fin evolution has allowed for the diversification of fish morphology and subsequent exploration of new habitats. Basal bony fish have elongated body shapes where the pectoral and pelvic fins have a basal position and contribute little to thrust. Less is known about the role of median fins, especially anal and dorsal fins. We examined sturgeon and gar in terms of diversity in median fin morphology with a geometric morphometrics approach. Additionally, in the lab, we swam gar and sturgeon to determine the role of median fins during steady and unsteady swimming. Geometric morphometrics was successful in separating basal fish species based on median fin morphology. Our kinematic data show that gar and sturgeon use the dorsal and anal fins in phase to augment thrust from the caudal fin during steady swimming. During acceleration, dorsal and anal fins are also actively recruited. Despite their markedly different fin morphologies, gar and sturgeon display similar median fin kinematics. Our study shows that

basal fish rely heavily on median fins for locomotion, and diversification of fin shape might have important evolutionary implications to distribution and ecology.

Keywords:
gar sturgeon morphometrics

Explaining differences in fish assemblages using side-scan sonar

Presenter: Parker, Jerrod Illinois Natural History Survey, 1910 Griffith DR, NRSA 652, Champaign, IL 61801; Phone: 217-300-0997; Email: jlparke2@illinois.edu

Co-authors and Affiliations:
Drew Costenbader, Illinois Natural History Survey
John Epifanio, Illinois Natural History Survey
Yong Cao, Illinois Natural History Survey

Abstract:
Biotic assemblages are structured by their environment. Rivers are large continuous environments. Conventional underwater habitat surveys in non-wadeable rivers are often prohibitively time intensive. In the spring of 2015 we used side-scan sonar to record underwater images of the Illinois portion of the Kankakee River. One pass was made along each shoreline of the river. The video was converted into rasterized images. Field surveys were used to construct a known habitat training dataset. Manual classification was performed to calculate the area of bedrock, large woody debris, rock (i.e., rubble/cobble and gravel), sand, silt, and embedded rocks for a 500m long 80m wide portion of the river at each of 25 nearshore fish survey locations. We used distance based linear models to assess the ability of habitat to explain differences in the fish assemblages and used linear regressions to examine their ability to explain differences in sportfish abundance and condition. We found underwater habitat explained some of the fish variability among sites and a greater amount of variability when analyzed at a reach level. We conclude that side-scan sonar is relatively rapid and inexpensive method to accurately assess underwater habitat composition. These surveys could greatly benefit habitat and fish restoration efforts, and flow alteration impact assessments.

Keywords:
Habitat River Diversity

Developing a Standardized Methodology for Determining Site Specific Estimates of Detection Range and Probability of Acoustic Transmitters

Presenter: Oliver, Devon C Southern Illinois University, 251 Life Science II Southern Illinois University, Carbondale, IL 62901; Phone: 607-382-5702; Email: dolive3@siu.edu

Co-authors and Affiliations:
Matt V Lubejko, Southern Illinois University
Andrea E Lubejko, Southern Illinois University
Gregory W Whitledge, Southern Illinois University
James E Garvey, Southern Illinois University

Abstract:

Acoustic telemetry is a popular tool to monitor fish movements in rivers. However, methods for determining detection range and signal detection probability near acoustic receivers in rivers are limited. Signal detection range and probability are often inferred from previous work or calculated over a linear distance using receivers independent of those within the study array. While this may be practical in environments with homogeneous habitats (e.g., oceans and lakes), it may lead to inaccurate estimates in river systems where physical features of the river channel or noise interference from water movement may influence signal detection. The goal of this study was to develop a standardized methodology for calculating site specific signal detection probabilities and ranges for acoustic receiver arrays in rivers.
In 2015, we drifted test tags (Vemco V13 and V16) along multiple transects within a receiver array in the Illinois river and used ArcMap 10.4 to determine the two-dimensional detection range of each receiver and detection probability within that range. Average detection range was 0.06 km2 (.01) for V13 transmitters and 0.11 km2 (.03) for V16 transmitters. Detection probability within receiver range was 77.6% (2.2%) for V13 transmitters and 76.7% (1.8%) for V16 transmitters. The shape of the detection range was often not uniform and differed among receivers, illustrating limitations of assuming uniformity of detection range and probability in all directions around a receiver. We expect that our methodology will be useful for assessing coverage and detection probability for telemetry studies in other rivers.

Keywords:
Telemetry Detection River

POSTER PRESENTATIONS

1. Upstream passage of bigheaded carps at Illinois River lock and dam structures

Presenter: Abeln, Jen L Southern Illinois University Carbondale, 1125 Lincoln Dr Rm 251, Carbondale, IL 62901; Phone: 217-280-0184; Email: jlabeln@siu.edu

Co-authors and Affiliations:
Matthew V Lubejko, Southern Illinois University Carbondale
Alison A Coulter, Southern Illinois University Carbondale
Gregory W Whitledge, Southern Illinois University Carbondale
James E Garvey, Southern Illinois University Carbondale

Abstract:
Dams can isolate populations and hinder migration of native fishes, but can also limit range and population expansion of invasive species. Bigheaded carps are advancing upstream in the Illinois River and represent a potential threat to the Great Lakes due to artificial connectivity to Lake Michigan. While electric barriers and harvest are important tools to limit upstream spread of bigheaded carps, dams along the Illinois River may provide additional control points. We investigated the five lower lock and dam structures on the Illinois River using acoustic telemetry of bigheaded carps to determine effectiveness of these structures for preventing upstream passage during normal operations. The two downstream dams are Chanoine wicket dams and the three upstream dams are gated gravity dams. Wicket dams allow for “open river” conditions at high water conditions, thus allowing more opportunities for fish to pass upriver. Gated dams may have higher water velocities and present “open river” conditions only during extreme high water. Telemetry detections were used to determine passage avenue (lock vs. dam) and number of upstream passages through each dam. Bigheaded carps passed

upstream through wicket dams more frequently than gated dams. Passage through the lock was more common at wicket dams, while passage through the dam was more common at gated dams. Potential enhancement of lock and dam structures as impediments to upriver movement of bigheaded carps should focus on the gated dams and should include strategies to limit fish passage through dam spillways in addition to lock chambers.

Keywords:
Asian carp Dams Illinois River

2. Validating Aging Structures in Asian Carp

Presenter: Anderson, Charmayne Western Illinois University, 309 Young Street, Colchester, IL 62326; Phone: 715-299-8977; Email: cl-anderson3@wiu.edu

Co-authors and Affiliations:
James T Lamer, Western Illinois University
Brent Knights, Upper Midwest Environmental Sciences Center USGS
Jun Wang, Shanghai Ocean University
Levi Solomon, Illinois Natural History Survey
Andy Casper, Illinois Natural History Survey

Abstract:
Silver carp (Hypophthalmichthys molitrix) and bighead carp (Hypophthalmichthys nobilis) have invaded most of the Mississippi River and its tributaries. Although fish age is routinely used to inform management decisions, aging structures for bighead and silver carp have not been validated against known-age fish to ensure accuracy and utility. We used known-age fish reared in Chinese aquaculture and collected from the LaGrange Reach of the Illinois River (tracked annually from a strong 2014-year class) to validate aging structures from bighead carp and silver carp. We removed vertebrae, lapillus otoliths, pectoral spines, and postcleithra from each individual. Each structure was sectioned and prepared accordingly. Annuli were counted and each annulus will be measured from the focus using Leica S8APO Stereoscope and measuring software to determine back-calculated growth. By using both field and aquaculture reared individuals we will be able to validate several Asian carp aging structures and determine the most reliable structure for age and growth estimates.

Keywords:
Asian Carp Invasive Species Illinois River

3. Age and Growth of Smallmouth Bass of the Mackinaw River

Presenter: Costenbader, Drew A Illinois Natural History Survey, 1816 S Oak St, Champaign, IL 61820; Phone: 603-275-0657; Email: drewcostenbader@gmail.com

Co-authors and Affiliations:
Jerrod Parker, Illinois Natural History Survey
John Epifanio, Illinois Natural History Survey

Abstract:

Smallmouth bass (Micropterus dolomieu) is one of three Micropterus species native to Illinois. Along with largemouth bass, they are one of the most popular sportfish. Recent concerns have arisen regarding the health of smallmouth populations in the Mackinaw River, Illinois. The goal of this study is to examine and describe the current condition of the smallmouth bass population within the Mackinaw River. The Mackinaw River is a 5th order Illinois River tributary originating in Sibley and flowing for 214km to its confluence near Pekin. In Fall 2016 a combination of 3-probe DC-barge and one dipper DC-boat electrofishing were used to collect smallmouth. Fish were weighed, measured, pit-tagged, and scales were collected. Scales were aged by four readers and consensus was used to demarcate annuli. The distance of each annuli from the focus was measured and used to back-calculate length at age. Relative weight and condition factor were also assessed. These data were used to compare the Mackinaw River population to a known healthy population in the Kankakee River. Results will be used in a larger ongoing study to detect possible factors that may be negatively impacting the population's health.

Keywords:
Smallmouth Bass Fish Aging Mackinaw River

4. Age and Growth Demographics of Asian Carp in the Upper Mississippi River

Presenter: Cox, Cortney Western Illinois University, 900 Linden Ln. Apt. 56, Macomb, IL 61455; Phone: 573-248-4200; Email: cl-cox@wiu.edu

Co-authors and Affiliations:
James T. Lamer, Western Illinois University
Greg Whitledge, Southern Illinois University
Brent Knights, United States Geological Survey
Kevin Irons, Illinois Department of Natural Resources

Abstract:
Fish age and growth can be used to infer density-dependent competition, resource availability, age at maturity, and habitat suitability. Understanding these dynamics are especially important when assessing the impacts of invasive species. Bighead and silver carp are invasive species that have established throughout much of the Mississippi River Basin. Lock and Dam 19 on the Mississippi River has slowed their upstream migration and delayed their establishment in the Upper Mississippi River. Aging structures obtained from populations above Lock and Dam 19 allow us to determine growth rates and age at maturity in these recently established and poorly understood, low-density populations. Using commercial fishing methods, we have collected length and weight data from 2695 silver carp and 655 bighead carp. Pectoral spines, post-cleithra, and vertebrae have been removed from 496 silver carp and 336 bighead carp, 30 fish per each 50mm size class, to quantify age and growth from bighead carp and silver carp in pools 16-19 on the Mississippi River.

Keywords:
invasive asian carp growth

5. Spatial and Temporal Trends in Fish Communities of the Lower Wabash River

Presenter: Hine, Eric C Eastern Illinois University, 600 Lincoln Avenue, Charleston, IL 61920; Phone: 309-357-0550; Email: echine@eiu.edu

Co-authors and Affiliations:
Cassi Moody-Carpenter, Eastern Illinois University
Evan Boone, Eastern Illinois University
Leslie D. Frankland, Illinois Department of Natural Resources
Tim Edison, Illinois Department of Natural Resources
Scott Meiners, Eastern Illinois University
Robert Colombo, Eastern Illinois University

Abstract:
The lower Wabash, which forms the southeastern border of Illinois with Indiana, is a unique system in that it is part of a 411-mile stretch of free-flowing river and supports a well-used commercial and sport fishery. From Mt. Carmel, Illinois, to its confluence with the Ohio River, the discharge of the Wabash River is effectively doubled by the confluence of the White River. This hydrological change may influence fish communities above and below the confluence through added flow, nutrients, and sediments. To determine the variation in fish communities between these reaches of the Wabash River, we used pulsed-DC electrofishing at random sites above and below the confluence from 2010-2015. All fish were identified to species, but aggregated to the family taxonomic level for analyses. We expect to see variation in fish communities above and below the confluence based on the family-level tolerance of flow. We used non-metric multidimensional scaling to plot this variation and found that reach had no significant effect on the observed fish communities. However, time period, year, and flow were significant factors influencing variation, with time period and year showing the highest influence. Further research will identify other environmental vectors (i.e. temp, depth, Secchi, etc.) and their influence on variation in fish communities.

Keywords:
communities Wabash River Confluence

6. Physiological status of silver carp in the Illinois River: An assessment of fish at the leading edge of the invasion front

Presenter: Jeffrey, Jennifer D University of Illinois, 1102 S Goodwin Ave, C512 Turner Hall, Urbana, IL 61801; Phone: 217-419-0796; Email: jjeffrey@illinois.edu

Co-authors and Affiliations:
Cory D Suski, University of Illinois

Abstract:
Bigheaded carp escaped into the Mississippi River from fish farms in the US in the 1970's. Since then, bigheaded carp have theoretically had access to the entire Mississippi Basin, but their distribution has been uneven and their abundance remains lower in the more northern compared to southern parts of their range. In the Illinois River, a concern is the potential access of bigheaded carp into Lake Michigan via the Chicago Area Waterway System (CAWS). However, the leading edge of the invasion front has not moved substantially closer to the Lake Michigan over the past few decades, which begs the question as to what could be preventing or dissuading bigheaded carp movement within the CAWS. The goal of the current study was to use physiological tools to define external factors that may be preventing the movement of bigheaded carp within the Illinois River. To accomplish this, we sampled silver carp at locations close to the leading edge of the invasion front as well as three locations away from the leading

edge, during the late summer and fall. Fish were sampled for blood and liver and their physiological status was assessed with the hypothesis that fish at the leading edge would show physiological signatures different from those at the core of the population. Plasma variables were measured to assess the stress and nutritional status of fish and RNAseq technology was used to assess differential gene expression in the liver. Our results will help to expand our understanding of why silver carp have not moved closer to Lake Michigan, and more broadly, our understanding of invasion biology.

Keywords:
Bigheaded carp invasive species physiology

7. Competitor, prey, or both: Evaluating the contribution of non-native species to juvenile yellow perch diets

Presenter: Jonasen, Kacie L Illinois Natural History Survey, 1816 S Oak St, Champaign, IL 61820; Phone: 847-636-3759; Email: jonasen1@illinois.edu

Co-authors and Affiliations:
Joshua D Dub, ECS Federal LLC
Sara C Thomas, Michigan Department of Natural Resources
Sergiusz J Czesny, Lake Michigan Biological Station

Abstract:
The expansion of invasive round goby Neogobius melanostomus has contributed to dramatic changes in the southwestern Lake Michigan ecosystem. Evaluations of habitat and invertebrate prey preferences revealed significant dietary overlap between round goby and juvenile yellow perch Perca flavescens; however, the examination of round goby as potential prey for juvenile yellow perch has not adequately been explored. In this study, regression analysis was used to establish relationships between cleithrum length and total length for five common nearshore fish species: yellow perch, round goby, alewife Alosa pseudoharengus, spottail shiner Notropis hudsonius, and rainbow smelt Osmerus mordax. Each species exhibited a strong correlation between these biometrics, allowing further application of these relationships to juvenile yellow perch diet analysis. Cleithra extracted from partially digested prey fishes in juvenile yellow perch stomachs were measured and used to estimate prey fish total length, and in turn, prey fish weight. Juvenile yellow perch were found to consume other yellow perch, alewife, and round goby. Average weight of round gobies consumed (0.27g) was substantially smaller than that of yellow perch (0.82g) and alewife (3.56g), yet round goby represented 96.7% of fish consumed, and 80.2% of fish weight consumed, emphasizing the importance of small round gobies as prey for juvenile yellow perch. This method of prey fish weight estimation improves upon past methods of diet analysis by permitting accurate descriptions of dietary overlap and competition between these species and evaluating round goby not only as a potential competitor for juvenile yellow perch, but also as novel prey.

Keywords:
Yellow Perch Round goby Diet

8. Effects of Spring Flooding on Young of Year Centrarchidae Recruitment

Presenter: Kobler, Dakota Illinois Natural History Survey, 704 North Schrader Ave, Havana, IL 62644; Phone: 309-543-6000; Email: dmkobler@gmail.com

Co-authors and Affiliations:
Elizabeth Dix, Illinois Natural History Survey
Daniel Gibson Reinemer, Illinois Natural History Survey
Levi Solomon, Illinois Natural History Survey
Kristopher Maxson, Illinois Natural History Survey
Andrew Casper, Illinois Natural History Survey

Abstract:
The La Grange Reach of the Illinois River boasts a diverse range of habitats, including many backwaters, subject to annual flooding events. These habitats support an abundance of fish species, many of which are desired by recreational and commercial fishermen. Of specific importance to recreational fishermen are Centrarchid sportfish, which utilize the shallow backwaters as overwintering habitat and as nest building sites during spawning events. Warming water temperatures act as a trigger for spawning in the spring; however, Centrarchid sportfishes have been known to spawn throughout the summer and into early fall. Beginning in 1993, fish communities in the La Grange Reach have been monitored using a multi-gear approach as part of the Upper Mississippi River Restoration (UMRR) Program's Long Term Resource Monitoring (LTRM) element. Using these data, we analyzed trends in young of year (YOY) Centrarchid populations using day electrofishing and mini-fyke data collected in backwaters from 1993-2015. In particular, we looked at patterns of recruitment among YOY Centrarchid sportfish in response to springtime flooding events.

Keywords:
Spring Flooding Young of Year Centrarchidae

9. Larval Fish Community Survey of Pools 19, 18, and 17 of the Upper Mississippi River

Presenter: La Hood, Boone M Department of Biological Sciences WIU, 1 University Circle, Macomb, IL 61455; Phone: 309-219-3999; Email: bm-lahood@wiu.edu

Co-authors and Affiliations:
James T Lamer, Department of Biological Sciences WIU
Kevin S Irons, Division of Fisheries Illinois DNR

Abstract:
We used quadrafoil light traps to sample and monitor larval fish recruitment in Pools 19, 18, and 17 of the Upper Mississippi River. These traps are illuminated with chemical light sticks and exploit the positively phototactic swimming behavior of post-yolksac larval fish and are effective for sampling both native and invasive fish species. We began deploying traps when water temperatures reached 17C and continued sampling until water temperatures again fell to below 17C. Over the course of 58 sampling days we set 649 traps for a total of 1,995 trap hours. We targeted woody, vegetated, and coverless habitats in backwater areas with little to no flow. All of the organisms collected in the traps were preserved in a formalin fixative or 95 percent ethanol and brought back to the lab for sorting and identification. In addition to assessing the community composition of native fish species we also looked for evidence of invasive fish species recruitment.

Keywords:
Asian carp Larvae

10. Reproductive potential of Silver and Bighead carp in the Upper Mississippi River

Presenter: Lenaerts, Allison Western Illinois University, 1 University Circle, Macomb, IL 61455; Email: aw-lenaerts@wiu.edu

Co-authors and Affiliations:
James T. Lamer, Western Illinois University
Cortney Cox, Western Illinois University
Kevin Irons, IL DNR
Alison Coulter, Southern Illinois University

Abstract:
Invasive silver carp (Hypophthalmichthys molitrix) and bighead carp (H. nobilis) are abundant throughout most of the Mississippi River Basin and are very prolific spawners. Abundance of these species in the Upper Mississippi River above Lock and Dam 19 is lower than in other invaded areas of the Mississippi River Basin. Understanding the reproductive potential (i.e., gonadalsomatic index (GSI) and fecundity) of these low density, poorly understood populations is important to inform Asian carp management in the Upper Mississippi River. We examined and compared GSI of silver carp (n= 470) and bighead carp (n=200) among pools 17-20 of the Mississippi River. Eggs samples were taken from the anterior, middle, and posterior of one ovary from silver (n=105) and bighead (n=56) to examine fecundity. There is not a significant difference between anterior, middle, and posterior samples among pools. Total egg count is not significantly different between pools indicating that data can be pooled. Silver carp have an average of 811 eggs per gram (sd=128.581, se±24.595), and bighead carp have of 465 eggs per gram (sd=140.292, se±36.744) across all pools. GSI is not significantly different between pools for bighead carp females or silver carp males. Bighead male GSI is significantly different between pools 17 and 18 (P=0.028) and between pools 18 and 19 (P=0.004). Female silver carp GSI is significantly differently different between pools 17 and 19 (P=0.0207), pools 17 and 20 (P=0.002), and pools 18 and 20 (P=0.006).

Keywords:
Asian carp reproduction

11. Assessing the Impact of Asian Carp Removal in the Upper Illinois River on a Native Planktivore

Presenter: Love, Seth A Illinois Natural History Survey, Silver Springs State Park, 13608 Fox Rd, Yorkville, IL 60560; Phone: 315-604-2086; Email: salove@illinois.edu

Co-authors and Affiliations:
Nathan J Lederman, Illinois Natural History Survey
Rebekah L Haun, Illinois Natural History Survey
Jason A DeBoer, Illinois Natural History Survey
Andy F Casper, Illinois Natural History Survey

Abstract:
Bighead (Hypophthalmichthys nobilis) and Silver Carp (H. molitrix) are planktivorous fish species that have invaded many aquatic systems throughout the Midwestern United States. Consequently, Asian Carp control plans have been implemented to reduce Asian Carp densities and inhibit expansion. Management plans in the upper Illinois River have focused on preventing the establishment of Asian Carp populations in the Laurentian Great Lakes through the construction of an electric fish barrier near

Romeoville, IL and intensive contractual harvest. Since 2010, approximately 2,267 metric tons of Bighead and Silver Carp have been removed. However, limited information is available on how removal has impacted native fish populations, like Gizzard Shad (Dorosoma cepedianum) which are a native planktivore and an important prey for native sportfish species. We analyzed Long Term Electrofishing data to determine how Gizzard Shad condition has changed since Asian Carp invasion and removal efforts. We analyzed Gizzard Shad relative weight among three periods (pre-establishment, post-establishment, and removal) using a 2-way ANOVA, with the upper Illinois River as the treatment group and the lower Illinois River as the control group. Overall, Gizzard Shad condition decreased in the upper and lower river when Asian Carp invaded, but has increased in the upper river since contractual removal began. However, Gizzard Shad condition continued to decrease in the lower river, where no contractual removal occurred. This information provides support for current upper Illinois River removal efforts, and we encourage managers in other basins to investigate similar control efforts to protect important fish populations within their jurisdictions.

Keywords:
Invasive Species Illinois River Contracted Harvest

12. Common Snapping Turtle Sportfish Monitoring and Assessment In Illinois

Presenter: Mainor, Katie Western Illinois University, 1 University Circle, Macomb, IL 61455; Phone: 678-920-8618; Email: k-mainor@wiu.edu

Co-authors and Affiliations:
James T Lamer, Kibbe Field Station Western Illinois University
Mike McClelland, Illinois Department of Natural Resources

Abstract:
Common snapping turtles (Chelydra serpentina) inhabit waterways throughout Illinois and are harvested recreationally for sport and consumption. Seasons and bag limits are in place, but additional data are needed to identify management objectives for common snapping turtle harvest in Illinois. We will use mark and recapture (survival), size structure, sex ratio, and fecundity data to populate stage-based life tables needed to inform better management practices and harvest regulations for common snapping turtles in Illinois. We measured carapace and plastron dimensions, recorded sex and weight, and marked all trapped turtles (n=356) with passive integrated transponder (PIT) tags from seven locations in Illinois. Demographic structure varied between populations, but combined data resulted in sex ratios of 57% male, 34% female, and 8% Juveniles. Data from 2015-2016 will be presented using stage-based life tables, mark-recapture population estimates, and population prediction models based on the demographic rates of each population. The models will be made to replicate long term impacts of harvest scenarios

Keywords:
Common snapping turle harvest regulations

13. In Search of the Elusive Community Boundary: Evaluating Spatial and Temporal Heterogeneity of Stream Fish Assemblages

Presenter: Metzke, Brian Illinois Natural History Survey, 1 Natural Resources Way, Springfield, IL 62702; Phone: 217-557-9251; Email: brian.metzke@illinois.gov

Abstract:
An assumption of stream fish assemblage evaluations is that they are representative not only of a surveyed reach, but sometimes the associated stream segment or until the next survey location is encountered. However, the spatial and temporal boundaries of the fish community represented by an assemblage are unclear. This study evaluates assemblage similarity at increasing space and time intervals in an effort to identify the extent to which a surveyed assemblage is valid for characterizing a stream. There was no clear trend of fish assemblage similarity across spatial scales, but similarity decreased as time between surveys increased. This study suggests there is a relatively short temporal extent to a fish assemblage evaluation. There also is some evidence that a spatial boundary exist, although that limit could not be detected using the employed methods.

Keywords:
fish assemblage heterogeneity

14. Recruitment Sources of Silver Carp in the Ohio River

Presenter: Schiller, Aaron L Southern Illinois University Carbondale, 1125 Lincoln Drive, Room 251, Carbondale, IL 62901; Phone: 262-689-6234; Email: aaron.schiller@siu.edu

Co-authors and Affiliations:
Gregory W Whitledge, Southern Illinois University Carbondale

Abstract:
Knowledge of natal environments and dispersal of Silver carp (Hypothalmichthys molitrix) inhabiting the Ohio River and its tributaries would be a significant aid to creating sustainable population control guidelines for established and emerging Asian carp populations. Recent studies have indicated that harvesting fish of all sizes is necessary to achieve recruitment overfishing and limit expansion of invading bigheaded carp. However, there is little knowledge of the principal natal environments supporting the emerging bigheaded carp population in the Ohio River basin. There is also a need to assess the role of tributaries as nursery sites to increase understanding of dispersal patterns and better target young fish. Therefore, the goal of this study was to identify recruitment sources and determine nursery habitat utilized by Silver carp in the Ohio River by analyzing otolith core trace element and isotopic compositions relative to ambient water elemental and isotopic measurements. Fish were collected from the Ohio River and its tributaries from 2014-2016 and water samples were taken during summer 2012-2016. Water samples maintained temporal stability and spatial differentiation for the Ohio River and tributaries during the sampling period. Preliminary data suggest most Silver carp hatch in the tributaries and are using a variety of nursery habitats for their first year of life. Results will be utilized to shape management guidelines for targeting and removing spawning and young bigheaded carp.

Keywords:
Silver carp Otolith Recruitment

15. Ontogenetic Diet Shifts of Blue Catfish using stable isotope analysis

Presenter: Stanley, Ashley L Western Illinois University, 1 University Circle, , Macomb, IL 61455; Phone: 309-264-5154; Email: AL-stanley@wiu.edu

Co-authors and Affiliations:
James T Lamer, Kibbe Field Station Western Illinois University

Mark W Fritts, US Fish and Wildlife Service LaCrosse

Abstract:
Blue catfish are predatory fish native to the Mississippi River Basin and valued as an economic and ecological resource. Traditional diet studies are limited by spatial and temporal variation empty stomachs and lethal or invasive techniques. Here we use stable isotopes to test for ontogenetic diet shift in blue catfish. We followed fishing tournaments from Pool 20 to Memphis Tennessee on the Mississippi River received catfish samples from LTRMP monitoring in pool 26 and received samples from Southern Illinois University's LTEF sampling. At each tournament we weighed and measured blue catfish and biopsied a 6 mm muscle plug. The biopsy plugs were prepared and sent to Southern Illinois University's stable isotope lab for analysis with a mass spectrometer. We found that blue catfish are consuming similar diet items across all locations sampled. Blue catfish did not shift to just a piscivorous diet but shifted to a higher variety of diet items at 200mm.

Keywords:
stable isotopes diet bluecatfish

16. Impacts of Silver Carp Decomposition on Nutrient Pathways in Native Communities

Presenter: Tristano, Elizabeth P Southern Illinois University, 1125 Lincoln Drive, Life Science II Room 251, Carbondale, IL 62901-6504; Phone: 330-612-6220; Email: etristano@siu.edu

Co-authors and Affiliations:
James E Garvey, Southern Illinois University

Abstract:
Invasive species may significantly impact nutrient cycling processes in ecosystems which they invade. Invasive fishes may increase dissolved nutrients during decomposition, particularly at high biomass, which may increase nutrient concentrations in aquatic systems, as well as productivity. This study examined the impacts of invasive fish decomposition on aquatic systems, using invasive Silver Carp (Hypophthalmichthys molitrix) as a model species. Because silver carp make up a high proportion of the biomass in Midwest rivers, such as the Illinois River, it is important to understand how their decomposition affects nutrient availability and production. To evaluate the effects of decomposition, silver carp carcasses in 1.5mm2 mesh bags were placed in pond mesocosms at both high (eight carcasses) and low (four carcasses) densities and allowed to decompose. Treatment ponds, as well as no-fish control ponds, were sampled weekly to assess dissolved NH4, NO3, and PO4 concentration, chlorophyll a concentration, and zooplankton density. The silver carp carcasses remained in the ponds for two weeks, at which time the flesh had decomposed. The study variables were monitored for an additional two weeks after carcass decomposition. We predict that dissolved nutrient concentrations increased in the presence of silver carp carcasses, leading to an increase in chlorophyll a concentration, followed by higher zooplankton densities. Such fluctuations may significantly alter riverine food webs.

Keywords:
silver carp decomposition nutrient cycling