ILLINOIS CHAPTER AMERICAN FISHERIES SOCIETY

2017 ILLINOIS REPORT

TO THE

NORTH CENTRAL DIVISION AFS

RIVERS AND STREAMS TECHNICAL COMMITTEE

Respectfully submitted

March 15, 2017

COMMERICAL FISHING

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

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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

Monitoring demographics of a commercially exploited population of Shovelnose Sturgeon

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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

DAM REMOVAL

Dam It! State's Budget Impasse Stalls Dam Removal Projects

The State of Illinois' inability to pass a budget over the last 20 months has stripped vital funding for social services, university students, and a host of others dependent upon these financial resources. Illinois' aquatic fauna are not immune to this pain, as several badly needed dam removal projects already approved and previously funded have been put on hold. In northeast Illinois, only the Dempster Avenue Dam on the Des Plaines River was removed in 2016. Only two of the original 11 dams remain on this stream. The remain-ing two are held up by the budget impasse along with two planned removals on the Fox River at North Aurora and Carpentersville, as well as three dams on the North Branch of the Chicago River.

Downstate, the Ellsworth Park Dam on the North Fork Vermilion River and the Danville Dam on the Vermilion River are both slated for removal. Permitting and contracts were in place at the time of the initiation of the budget impasse in June 2015. An intergovern-mental agreement with the City of Danville is about to expire, and an amendment to extend the agreement will be brought to a vote by the Danville City Council in the near future. Dam removal funds have not been re-appropriated, and the IDNR's funding obligation will terminate on June 30, 2020 if the work is not completed by that date.
(Contributed by IDNR Fisheries Stream Biologists Steve Pescitelli and Trent Thomas)

ECOLOGY

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

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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

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

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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

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

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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

An Update to the Fishes of Champaign County IL

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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

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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

Median fin shape and function in basal bony fish

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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

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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

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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

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

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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

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

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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

HABITAT RESTORATION

TNC's Emiquon Preserve Reconnected to Illinois River Amid Controversy

Last July (2016), The Nature Conservancy announced it had completed a hydrologic connection between its Emiquon East Unit, a 6700 acre restored floodplain parcel, and the nearby Illinois River. TNC acquired Emiquon in 2000 with the aim of restoring part of the vast and biologically rich Thompson Lake wetland complex which had been leveed, drained and converted to agriculture around 1920. Since then, TNC has been working with multiple conservation partners (IDNR, USDA-NRCS, INHS, USFWS, UIS) toward ecological restoration of the wetland's natural communities and functions.

The restoration plan has not been without controversy, however. The Conservancy's decision to expose Emiquon to the river's flood pulse regime was met by opposition by several of its

partners, most notably IDNR, due to the potential for exposing the preserve to the high sediment loads and exotic species (notably Asian carp) now borne by the river. Despite this, TNC announced in 2015 they would pursue the connection unilaterally using their own funding.

The project design incorporated needs of the local drainage district to rid nearby farm fields of floodwaters. It comprises two gated, concrete pathways through the levee with the capacity to allow (or prevent) water moving in either direction. Pumps are available for active drawdown when the Illinois River is above the level needed for gravity drainage. Four sampling bays were incorporated where scientists can monitor water quality and the movements of plants and animals between Emiquon and the river.

"It's always been our goal to have Emiquon contribute to the ecological health of the river" according to TNC ecologist Doug Blodgett, who added "After 15 years in the making, this is a big step forward for Emiquon, the Illinois River, and conservation science". At present, Emiquon hosts thousands of migratory waterfowl, some 40 species and native fish and a plethora of other native plant and animal species. Time will tell whether the decision to reconnect Emiquon with the still degraded Illinois River will help or hinder this historic restoration effort.
(Adapted from The Nature Conservancy's July 2016 press release).

INVASIVE SPECIES

Chinese "Unified Fishing Method" Shows Promise in Asian Carp Fight

Last year (March 2016), IDNR Fisheries personnel led a trial run of a technique long employed to harvest Asian carp in their native China. The "Unified Fishing Method" is so named because it employs a variety of gear and techniques to drive, concentrate and eventually capture large numbers of these invaders. It utilizes aspects of the carp's schooling behavior and can be adapted to a particular waterbody's bathymetry to maximize capture success.

The pilot project was undertaken in a shallow 500 acre backwater lake, Hanson Materials gravel pit, connected to the upper Illinois River near Morris, IL. The effort involved a cadre of state and federal biologists, commercial fishers and college students with multiple boats and literally miles of netting. The method consists of driving fish with a series of net sets (block seine, gill and trammel) and blocking their escape to the river. Fish were funneled toward one end of the lake over a two week period with many nets being lifted and reset in the process.

Carefully orchestrated boat movement helps to move the carp but care must be taken not to overexcite them and cause an aerial "stampede". One area of concentration was a relatively deep, central basin where many fish were caught by gill and trammel nets. As the effort progressed, electrofishing boats were employed to drive fish along with revving motors and pounding of the boat hulls. The mission culminated in the remainder of the carp concentrated in the lake's shallow east end where they were literally rounded up by boats hauling nets similar to a purse seining operation.

Over 13,000 Asian carp (93% silver carp) were captured representing 63% of all fish caught. Nearly all of the native "bycatch" species were released unharmed in stark contrast to previous efforts involving rotenone. The 96,000 lbs of Asian carp collected in two weeks made up over a quarter of the poundage collected from the lake in all of 2015. IDNR biologist Kevin Irons said the success would have been even higher had unseasonably warm water temperatures likely increased escape rates. Although time consuming and manpower intensive, the Unified Fishing Method shows great promise in significantly reducing Asian carp densities and will be deployed again in 2017. *(Excerpted from multiple sources on Asian Carp Regional Coordinating Committees' website at www.asiancarp.us)*

Asian Carp Removal Project in the Upper Illinois River

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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

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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

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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

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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

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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

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

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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

Validating Aging Structures in Asian Carp

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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

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

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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

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

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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

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

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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

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

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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

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

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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

Recruitment Sources of Silver Carp in the Ohio River

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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

Impacts of Silver Carp Decomposition on Nutrient Pathways in Native Communities

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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

MUSSELS

INHS Researchers Document Success in Relocating Mussels

Relocating freshwater mussels from the path of a bridge construction site to a safer zone upstream is proving to be a time- and cost-effective conservation practice. Mussel survival rate after relocation is high, according to new research from the University of Illinois' Prairie Research Institute (PRI). Temporary dams erected for bridge construction alter silt and water levels in the river, and mussels are crushed from large equipment. Both common and endangered mussel species are at risk.

Historically, about 80 freshwater mussel species inhabited Illinois streams. Only about 55 species remain today. Populations have declined largely because humans have changed river habitats. While relocation of mussels over short distances is preferred to minimize damage to mussel communities, its effectiveness in terms of recovery and survival is not well known.
In a three-year study, aquatic ecologist Jeremy Tiemann and colleagues at the Illinois Natural History Survey, a division of PRI, relocated 100 mussels upriver during a reconstruction project on the Interstate 90 bridge over the Kishwaukee River in northern Illinois.

The team tagged individuals of two common mussel species, the Mucket and Plain Pocketbook, with microchips, and used an underwater radio receiver to locate the mussels without disturbance. Tagged mussels were monitored monthly in the spring and summer months of 2013–2015. The team lost the signals of 17 mussels, which may have moved or been swept out of the study area. Overall, the survival rate was high, with most deaths occurring during the first two months after relocation.

Tiemann said "The mortality we recorded in 2013 may have resulted from stress following the recent drought when the river started to return to its normal levels, as well as relocation to an unfamiliar habitat". The researchers used a statistical model to predict survival rates, which indicated that 93 percent of the relocated Mucket species and 71 percent of the Plain Pocketbooks remained alive three years after relocation. "Our data suggest that short-distance relocation is a viable tool for mussel conservation," Tiemann said.

Mussels can live more than 50 years and play a vital role in improving river conditions. "We call them livers of the rivers because they purify water, removing bacteria, particles, and pollutants," Tiemann said. "Their filtering capacity can be compared to a water treatment plant, because a single mussel can filter 8 or more gallons of water a day. They do their part to clean up the environment."

Considering that mussels occur in aggregations, the amount of water being filtered increases exponentially. Some sites in the Mississippi River support millions of mussels in a small area. This study was funded by the Illinois State Toll Highway Authority and was published in the journal *Freshwater Mollusk Biology and Conservation.*

(Media contact: Jeremy Tiemann; jtiemann@illinois.edu; 217-244-0802)

Mississippi River Mussel Relocation Moves T&E Species Out of Harm's Way

MOLINE — A weekslong effort to relocate mussels in the path of the planned Interstate 74 bridge is complete, with more than 140,000 mussels moved. Three federally endangered mussel species were identified in the bridge project area, as were some state-listed species. Their status required they be moved to nearby parts of the river that experts identified as mussel habitat.

The total was about 140,600 mussels moved, Heidi Woeber, a U.S. Fish and Wildlife Service biologist, said on Wednesday. About 900 of the federally endangered species were found in the target area. Most of these — 755 — were Higgins eye. There were 107 sheepnose and 24 spectaclecase. Though fewer than their common cousins — about 20 species expected to make up the bulk of the relocation — the endangered mussels in the target area are important overall to the survival of their declining species, Ms. Woeber said previously. Removal was done by hand by divers working in poor underwater visibility. That meant the divers from Ecological Specialists, a company specializing in the work, collected common and rare mussels alike.

The project began in early August. The work was completed in the last week of October, according to an email from Emily Robbins, a mussel expert for Ecological Specialists. The removal was aimed at mussels deemed most at risk by the bridge project, Mary Kay Solberg, senior environmental specialist for the Iowa Department of Transportation, has said. Those in less threatened portions of the construction zone will remain but will be monitored. Construction of the actual bridge is scheduled to begin in 2017, and is expected to open in 2020, with the existing bridge to be demolished the following year. The $1.2 billion project is a joint effort of Illinois and Iowa. Ms. Woeber said Ecological Specialists is planning a followup sweep this

spring in the area just cleared. Another mussel removal effort is scheduled for the area around the old bridge prior to its demolition. That relocation will likely happen in 2020. The mussels that were moved will be monitored in their new homes as well, to measure what impacts the relocation has had on them, according to Ms. Woeber. *(Anthony Watt, awatt@qconline.com Nov 3, 2016)*

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

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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

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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

REINTRODUCTIONS

Alligator Gar Re-introductions Resume with Public Support

After a two year hiatus, the Illinois Dept. of Natural Resources resumed its stocking of alligator gar into the state's lakes and rivers in 2016. Over 1600 fish averaging around 10" in length were released in September into three previously stocked waters (Powerton Lake, Illinois River-Sanganois SFWA, Kaskaskia River) and a "new" home, Horseshoe Lake-Madison Co. The latter was selected due to its ancestral connection to the Mississippi River, high fertility and abundant prey (gizzard shad and Asian carp).

The 2016 stockings brings the statewide total to over 7400 alligator gar stocked in Illinois waters since the program's inception in 2010. While too early to declare the recovery plan a success, evidence of survival and impressive growth rates have appeared in recaptures by researchers. One collection from Powerton Lake in 2015 yielded nine gar averaging 51" long and 36 pounds; these fish were only six years old. Recreational fishers are starting to reap benefits as well, with two hook and line captures in an Illinois River backwater in 2013 and an inadvertent harvest by a bowfisher on the Kaskaskia River floodplain lake two years later.

The re-introduction effort has been accompanied by ample public outreach in the way of newspaper articles, television and radio interviews, and sports shows. A live display of recently captured adult gar has proven to be an annual hit at the Illinois State Fair's Conservation World, with thousands of fairgoers coming by to look at the ancient predators and learn about them. The only noteworthy note of discontent, in fact, has been on the Kaskaskia River where citizens were concerned about the gar's impact on recreational boating and fishing. About 80 of them were educated by fisheries professionals at a public meeting last summer.

The positive statewide support for the gar program was echoed by the Illinois House of Representatives last June when they issued a Joint Resolution (HJ0141) supporting the re-introduction of alligator gar into our waterways and urging IDNR to continue and expand these efforts for the betterment of Illinois, aquatic ecosystems, and, eventually, its sportfishers. With this support in hand, IDNR Fisheries plans further gar stockings in 2017 and beyond coupled with ongoing research on their long term survival, fitness and growth, dietary habits and impacts on other species.

SPORTFISH MANAGEMENT

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

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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

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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

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

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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

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

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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

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

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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

Effects of Spring Flooding on Young of Year Centrarchidae Recruitment

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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

Ontogenetic Diet Shifts of Blue Catfish using stable isotope analysis

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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

WATER QUALITY

Settlement Reached in Chicago Waterways' Phosphorus Battle

After years of contentious debate and litigation, Chicago's Metropolitan Water Reclamation District (MWRD) has reached an agreement with six environmental groups regarding phosphorus discharges into the Chicago Area Waterways System (CAWS). The District's phosphorus effluent has long been implicated in fueling excessive algae growth, leading to the degradation of aquatic life (mainly through increased oxygen demand) along with significant aesthetic and recreational impairment within the Chicago River and its tributaries.

The settlement, reached January 19, 2017, creates a joint Nutrient Oversight Committee made up of scientists and engineers tasked with finding recommendations on reducing phosphorus inputs. The District commits to meeting a phosphorus effluent limit of 0.5 mg/l by 2030, and the committee will study the feasibility of eventually attaining 0.1 mg/l in its discharge. MWRD will also partner with IEPA in an extensive monitoring of nutrient conditions in the CAWS and downstream waters such as the Des Plaines River.

The agreement resolves two separate lawsuits, the first dating back to 2011, filed by a cadre of environmental groups charging the District with violating Clean Water Act permits at three of its wastewater treatment plants. In one of the suits, MWRD agreed to pay over $1.7 million in attorney's fees. Ann Alexander, a spokesperson for one of the plaintiffs (Natural Resources Defense Council), said "Our local waters have been a poster child for the national problem of phosphorus pollution, but now we have a chance to be a model for the solution. If you can fix this in a waterway with a reputation like the Chicago River, it means you can clean up any river". *(Excerpted from articles by Ariel Wittenburg, E&E News, and Alex Ruppenthal, WTTW)*

REPORT OF POLLUTION-CAUSED FISH KILL

IL DEPT OF NATURAL RESOURCES – DIV OF FISHERIES
2016

Date	Waterbody	County	Cause	Fish killed	Fish value	Invest cost	Total cost	Miles
3/09	Mash Ck	Richland	AGR	1,146	$145.67	$1,018.92	$1,164.59	3.1
8/6-7	Cedar Fk & Cedar Ck	Warren & Knox	AGR	36,084	$24,532.14	$3,273.17	$27,805.31	9.1
9/12-13	Yellow Ck	Stephenson & Jo Daviess	AGR	45,679	$12,163.90	$3,619.17	$15,783.07	3.7

NUMBER OF FISH KILLS INVESTIGATIONS: 3 INVESTIGATION COST: $7,911.26

NUMBER OF FISH KILLED: 82,909 TOTAL VALUE OF FISH: $36,841.71

TOTAL MILES AFFECTED: 15.9 TOTAL COST: $44,752.97