

**ABSTRACTS FOR THE SPRING MEETING
OF THE SOUTHERN DIVISION
OF THE AMERICAN FISHERIES SOCIETY**

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New Life for a Tailwater Trout Fishery: Case study of water-quality conditions below Tenkiller Ferry Reservoir

Jim Burroughs; Oklahoma Department of Wildlife Conservation, Porter, Oklahoma 74454;
jb_odwc@hughes.net

Xin Jin; Oklahoma Cooperative Fish & Wildlife Research Unit, Oklahoma State University,
007 Agriculture Hall, Oklahoma State University, Stillwater, Oklahoma 74078;
xin.jin@okstate.edu

Shannon K. Brewer; U.S. Geological Survey, Oklahoma Cooperative Fish & Wildlife Research
Unit, 007 Agriculture Hall, Oklahoma State University, Stillwater, Oklahoma 74078;
shannon.brewer@okstate.edu

Josh Johnston; Oklahoma Department of Wildlife Conservation, Porter, Oklahoma 74454;
johnston_odwc@hotmail.com

Brandon Brown; Oklahoma Department of Wildlife Conservation, Porter, Oklahoma 74454;
madtom@itlnet.net

Abstract- Tenkiller Ferry is a 5,220 ha reservoir on the Illinois River in eastern Oklahoma that was impounded for flood control and hydroelectric power. Rainbow trout were established as the primary mitigation for the loss of the warm-water fishery in the lower Illinois River. No instream flow standards or water storage have been allocated to support the trout fishery; however, the fishery was historically maintained by dam leakage and donation of water rights. Recently, the dam leak was corrected and donated waters are in jeopardy. Less reliable water resulted in an increase in violations of state water-quality standards. Trout stockings were suspended in 2011 for the second time in 60 years as a result of insufficient water quantity and quality. Concern from local anglers and some state and federal legislators coupled with two documented fish kills in 2011 led to the development of two new engineering options and increased inter-agency cooperation in an attempt to prevent future fish kills. Temperature and dissolved-oxygen conditions were collected continuously through the summer months at several locations from the dam downstream approximately 10 km. Flow, dissolved oxygen, and temperature data were used to calibrate a model predicting dissolved oxygen as a function of discharge to recommend a summer minimum flow. Cooperation by both agencies to obtain feasible management options will allow continued sustainability of this economically-important fishery.

Presenter: Jim Burroughs
Contact Person: Same
Type of Presentation: Oral

Comparison of the precision of ages from three techniques and back-calculated lengths for introduced blue catfish

Michael D. Homer Jr., Georgia Cooperative Fish and Wildlife Research Unit, The University of Georgia, 180 East Green Street, Athens, GA 30602 mhomerjr29@gmail.com

Cecil A. Jennings, U.S. Geological Survey, Georgia Cooperative Fish and Wildlife Research Unit, The University of Georgia, 180 East Green Street, Athens, GA 30602 jennings@warnell.uga.edu

James T. Peterson, U.S. Geological Survey, Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, 104 Nash Hall, Corvallis, Oregon 97331-3803 jt.peterson@oregonstate.edu

ABSTRACT.- Age and growth information is used to understand life history and ecology of catfish populations and monitor their trends. Such information is useful for evaluating the success of establishment of introduced populations. Prior studies have validated age determination methods for various catfishes, but none have been validated for blue catfish. We compared precision of age estimates and back-calculated growth after using one lethal and two non-lethal age determination techniques for introduced blue catfish in Georgia. Blue catfish (n=153) were collected by experimental gillnets set overnight at 12 standardized stations at Lake Oconee, Georgia. Two non-lethal techniques requiring the pectoral spines (articulating process and basal recess) and one lethal technique requiring lapilli were used to determine the ages of the fish. The Frasier-Lee method was used to back-calculate growth for each fish. Hierarchical linear models were used to compare precision of back-calculated length estimates and growth among the three techniques. Two readers found the highest precision for otolith-based age assignments (83.5%) and lowest for basal recess cross-sections (71.4%). The models indicated that back-calculated length was variable among fish from ages 1-3 for the techniques compared; otoliths and basal recesses yielded variable lengths at age-8.. Our study suggests the articulating process and otolith techniques would be adequate for age determination of blue catfish.

Presenter: Cecil Jennings

Contact Person: same

Type of Presentation: Poster

A Comparison of Reproductive Potential of Red Snapper Natural and Artificial Habitats in the Northern Gulf of Mexico

Hilary Glenn; Department of Oceanography and Coastal Sciences, LSU, Baton Rouge, Louisiana, 70803; hglenn1@tigers.lsu.edu

Dannielle Kulaw; Department of Oceanography and Coastal Sciences, LSU, Baton Rouge, Louisiana, 70803; dannielle.kulaw@me.com

James H. Cowan, Jr.; Department of Oceanography and Coastal Sciences, LSU, Baton Rouge, Louisiana, 70803; jhcowan@lsu.edu

Abstract- Few quantitative studies of red snapper (*Lutjanus campechanus*) reproduction have been conducted on the offshore natural hard bottom (NH) banks in the northern Gulf of Mexico. Information on reproductive potential is important to management of this valuable fishery and can help identify stock recovery or signs of overexploitation. The first goal of this study was to better understand the reproductive effort of red snapper in offshore NH habitats, using the gonadosomatic index (GSI). GSI is indicative of the amount of energy a fish invests in reproduction per body weight; thus a larger GSI corresponds with a greater reproductive effort. The second goal was to explore possible differences in red snapper reproduction between NH sites and artificial habitats (AH). Comparing these two habitats is important because while most studies of red snapper come from AHs, NH habitats are thought to be the historic centers of abundance for the species. Quarterly samples of red snapper were taken from three NH sites and three AH sites, using vertical long lines and single hook lines. All female red snapper were measured for total length, total weight, and eviscerated body weight. Ovaries were removed, weighed, and preserved for preparation of histological slides. GSI was plotted against time to examine seasonal changes in reproductive effort among sites and differences between habitats were assessed using ANOVA. As expected, GSI was greatest during the known peak months of spawning seasons (June, July, and August) at all sites.

Presenter: Hilary Glenn

Contact Person: Same

Type of Presentation: Poster

Investigating the Relationship Between Smallmouth Bass Recruitment and Flow Characteristics in Ozark Streams

Brandon Brown; Oklahoma Department of Wildlife Conservation, Porter, OK 74454;
madtom@itlnet.net

Shannon Brewer; USGS Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University, Stillwater, OK 74078; shannon.brewer@okstate.edu

Jim Burroughs; Oklahoma Department of Wildlife Conservation, Porter, OK 74454;
jb_odwc@hughes.net

Josh Johnston; Oklahoma Department of Wildlife Conservation, Porter, OK 74454;
johnston_odwc@hotmail.com

Abstract - A paucity of information exists about the recruitment dynamics of smallmouth bass in general and certainly for genetically-distinct populations such as Neosho smallmouth bass. The Neosho subspecies *Micropterus dolomieu velox* is native to the Arkansas River basin of northeast Oklahoma, southeast Kansas, southwest Missouri, and northwest Arkansas. We began a multi-year project in autumn 2012 to evaluate the temporal and spatial dynamics of smallmouth bass recruitment and the possible relation among reproductive success, age-0 survival and stream-flow dynamics. Five Ozark streams were sampled in late September and early October using visual-observation techniques. Densities of young-of-year fish were estimated in different hydraulic channel units and then a combined density was calculated by weighting densities via the proportion of channel units available throughout the reach. U.S. Geological Survey stream gauge records were summarized using the Hydrological Index Tool and analyzed to determine relationships among smallmouth bass densities and a variety of flow characteristics. We present a summary of our first year results and present the next step of evaluating the use of side-scan sonar for detecting smallmouth bass nests. Ultimately, recruitment will be assessed using both the adult and juvenile life stage relative to flow dynamics.

Presenter: Brandon Brown
Contact Person: Same
Type of Presentation: Oral

**Identifying the Current Distribution of Shovelnose Sturgeon
in Eastern Oklahoma: The First Assessment at the
Southwestern Extent of the Species Range**

Josh Johnston; Oklahoma Department of Wildlife Conservation, Porter, Oklahoma 74454
johnston_odwc@hotmail.com

Shannon K. Brewer; U.S. Geological Survey, Oklahoma Cooperative Fish & Wildlife Research
Unit, 007 Agriculture Hall, Oklahoma State University, Stillwater, Oklahoma 74078;

Brandon Brown; Oklahoma Department of Wildlife Conservation, Porter, Oklahoma 74454;

Jim Burroughs; Oklahoma Department of Wildlife Conservation, Porter, Oklahoma 74454;
jb_odwc@hughes.net

Abstract - Shovelnose sturgeon, a potamodromous species, and a species of special concern to Oklahoma, is native to the Arkansas, Little, and Red rivers and major tributaries in Oklahoma. Several reservoirs are thought to limit the distribution and overall success of this species in Oklahoma; however, targeted sampling efforts for this species have been limited. Drought conditions and additional dam proposals have highlighted the necessity of increasing our understanding of Oklahoma's shovelnose sturgeon populations. Recently confirmed observations and anecdotal evidence suggests sturgeon populations may be more significant than anticipated. To better understand the sturgeon populations within these highly altered systems, we propose a two-step process. First, we will determine the distribution of sturgeon in major river systems of eastern Oklahoma. Neighboring state agencies and universities have had success sampling adult sturgeon using specialized trotlines. We have adapted these techniques and will use a stratified random sampling strategy to document presence in the fragmented Arkansas River basin of Oklahoma. Captured individuals will be PIT tagged and injected with oxytetracycline as an initial attempt to increase our understanding of population size, movements, and growth. Following our initial assessment, we will design follow-up studies to begin evaluating habitat and flow dynamics related to the persistence of these fragmented populations. This will be the first assessment of this kind for populations at the southwest edge.

Presenter: Josh Johnston

Contact Person: Same

Type of Presentation: Oral

**Diet of red snapper on natural hard-bottom banks
in the northwestern Gulf of Mexico**

Brittany D. Schwartzkopf; Department of Oceanography and Coastal Sciences, Louisiana State University, Baton Rouge, LA 70803; bschwa6@tigers.lsu.edu

James H. Cowan Jr.; Department of Oceanography and Coastal Sciences, Louisiana State University, Baton Rouge, LA 70803; jhcowan@lsu.edu

Abstract. - Little is known about red snapper (*Lutjanus campechanus*) life history on natural substrate in the northern Gulf of Mexico; this project seeks to provide information about their diet on Louisiana shelf-edge banks. Red snapper were collected twice per quarter from May 2011 to October 2012, from four banks on the LA shelf: Jakkula, McGrail, Bright, and the East Cameron Artificial Reef Planning Area, which differ in the amount of hard substrate and distance from shore. Standard methods were used for removal of the stomach and examination of stomach contents. Diet composition was enumerated using: percent frequency of occurrence, percent composition by number, percent composition by weight, and percent index of relative importance. Differences in the diet of red snapper were determined using permutation analysis of variance (PERMANOVA). Results show that diets at Jakkula, McGrail, and Bright are statistically different than the diet at East Cameron. The diet at Jakkula, McGrail, and Bright consisted of fish, crabs, and shrimp of similar proportions, though the species consumed varied, while the diet at East Cameron consisted of a large number of pteropods (*Cavolinia* sp.), with lesser contributions by crabs and fish. Habitat type may contribute to differences seen; the bottom substrate at East Cameron is composed of lithified-delta mud, whereas medium sand is found at Jakkula, and coral and coarse gravel dominate McGrail and Bright. Determining the prey consumed by red snapper on natural reefs, that represent a gradient in the amount of hard substrate present, will provide new insight about habitat utilization.

Presenter: Brittany Schwartzkopf

Contact Person: Same

Type of Presentation: Oral

***Hydrilla* impacts on dissolved oxygen and fish habitat
quality in two Florida lakes**

Erin Bradshaw Settevendemio; Fisheries and Aquatic Sciences Program, School of Forest Resource and Conservation, University of Florida, Gainesville, Florida 32653;
ErinLBradshaw@ufl.edu

Michael S. Allen; Fisheries and Aquatic Sciences Program, School of Forest Resource and Conservation, University of Florida, Gainesville, Florida 32653; msal@ufl.edu

Michael D. Netherland; Center for Aquatic and Invasive Plants, Agronomy Department, University of Florida, Gainesville, Florida 32653; mdnether@ifas.ufl.edu

Abstract.- The fast growth and dense structure of some macrophyte species can alter water chemistry and impact fish habitat quality and quantity. Hydrilla *Hydrilla verticillata* is an invasive aquatic weed which exhibits rapid growth and may contribute to low dissolved oxygen concentrations (hypoxia, DO <2.0 mgL⁻¹) during warm summer months. We evaluated the spatial and temporal dynamics of dissolved oxygen in three habitat types: open water, edge of hydrilla beds, and the dense hydrilla bed interior, in two Florida lakes. Our results showed that habitat type, month, and depth all significantly influenced dissolved oxygen and up to 100% of the water column was severely hypoxic in dense and edge habitat types in late summer in the small lake; however, no hypoxia was found seen in the large lake. These results suggest that lake morphology and size may influence the impacts of hydrilla on water quality. Additionally, increasing edge habitat may not greatly influence DO concentrations or improve fish habitat quality unless substantial open water area adjacent to dense beds is maintained for adequate water cycling and alternative refuge for fish during late summer in small, heavily-infested lakes.

Presenter: Erin Bradshaw Settevendemio
Contact Person: Same
Type of Presentation: Oral

Development of methods for non-lethal health assessment of the red drum inside NASA's Kennedy Space Center no-take fisheries reserve

Carla Garreau; NASA Ecological Program, Inomedic Health Applications, Mail code: IHA-300, Kennedy Space Center, FL 32899; carla.m.garreau@nasa.gov

Ruth Francis-Floyd; Department of Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, P.O. 100136 Gainesville, FL 32610-0136; rffloyd@ufl.edu

Louis J. Guillette, Jr.; Department of Obstetrics and Gynecology and the Hollings Marine Laboratory, Medical University of South Carolina, Charleston, SC 29412; guillett@musc.edu

Eric Reyier; NASA Ecological Program, Inomedic Health Applications, Mail code: IHA-300, Kennedy Space Center, FL 32899; eric.a.reyier@nasa.gov

Roy Yanong; Tropical Aquaculture Laboratory, SFRC-FAS, IFAS/University of Florida, Mail code: 1408 24th St. SE, Ruskin, FL 33570; rpy@ufl.edu

Abstract - Despite significant value of the Florida red drum (*Sciaenops ocellatus*) fishery, a lack of sex and stress hormone data are available. Current non-lethal health assessment programs do not collect this information. This was the first study to assess sex and stress hormones for adult red drum in Florida, with the goal of developing protocols defining "health" and providing baseline data. This project incorporated the Stock Enhancement Research Facility (SERF) external health index with blood chemistry analysis of glucose, cortisol, 11-ketotestosterone (11-KT) and 17 β -estradiol (E₂). Red drum (n=126) were collected from NASA's Kennedy Space Center waters, the oldest fully protected no-take fisheries reserve in the United States, during three different reproductive periods to evaluate seasonal variation and effect of reproductive activity on stress response. Fish in all periods scored near or above the "healthy" level for the SERF health index. The lower scores were attributed to wild fish having more parasites than cultured fish. On average condition factor ranked all fish as excellent-exceptional. Glucose, cortisol, and E₂ levels were significantly different among reproductive periods. Cortisol values ranged between 0.93 – 1.25 ng/ml, well below typical 10 ng/ml found in teleosts. 11-KT was significantly elevated during the reproductive period for both sexes. Blood collection occurred in less than three minutes and may have minimized the glucose and cortisol response associated with handling. Results from this study illustrate the potential value of future comparisons of red drum near the study area, the range of the species, and as a model for other sciaenids.

Presenter: Carla Garreau
Contact Person: Same
Type of Presentation: Oral

**Distribution patterns of fish species associated with
northwest Gulf of Mexico shelf-edge banks**

Todd A Langland; Department of Oceanography and Coastal Science, Louisiana State University, Baton Rouge, LA; tlangl8@lsu.edu

James H. Cowan, Jr.; Department of Oceanography and Coastal Science, Louisiana State University, Baton Rouge, LA; jhcowan@lsu.edu

Abstract- The Gulf of Mexico Fishery Management Council designated fifteen natural reefs and banks in the northwestern Gulf of Mexico as habitat areas of particular concern in 2005. Despite this management-driven designation, little is known about the fish communities associated with these features aside from a generalized species composition. This study provides new information about the bank-level distribution of fish species associated with northwestern Gulf of Mexico shelf-edge banks. Information about how different species of fish utilize these natural features will greatly benefit management, as well as provide insight into what aspects of habitat result in differential use by a variety of species. Video footage was collected via remotely operated vehicle surveys at random locations on three prominent banks. Videos were analyzed for species composition, abundance, and predominant habitat type observed over the course of the survey. We found that the predominant benthic biotic habitat type within which a survey was conducted played a significant role in the species and relative abundances observed (PRIMER ANOSIM $R=0.53$, $p=0.014$). Results show that similarity indices based upon species composition and abundance were strongest between similar habitat types. Using SIMPER analysis we were able to describe which species contribute most to the observed similarities, as well as which drive the differences seen between habitats. These results may be attributable to the relationship between community diversity and habitat complexity, a factor that differs greatly between the various habitat types found on hard bottom banks.

Presenter: Todd Langland
Contact Person: Same
Type of Presentation: Poster

Economic Value of Recreational Fishing on Lake Guntersville, Alabama

Christopher McKee; Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, Alabama 36849; cem0040@auburn.edu

Terry Hanson; Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, Alabama 36849; hansontr@auburn.edu

Steve Sammons; Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, Alabama 36849; sammosm@auburn.edu

Abstract. - Recreational fishing in Alabama is a major source of revenue to communities surrounding popular fishing destinations as well as a source of tax revenue to local, state and regional governments. Statewide economic data on recreational angling allow fishery managers and administrators to recognize the broad impacts recreational fishing has to offer. However, more specific economic data on individual water bodies and targeted fish species are helpful to administrators and managers for proper characterization of the fisheries under their purview. We estimated the economic impact of recreational fishing expenditures and tax revenues generated for the four major recreational fisheries (black bass, crappie, catfish, and sunfish) at Lake Guntersville, Alabama to the local towns, counties, and State. We also estimated the recreational angling effort, catch, and harvest rates for each of the four major sport fisheries. Through October 2012 there have been 1.17 million hours of recreational angling effort by boat anglers and 142,300 hours of effort by bank anglers, which translates into over 200,000 angler fishing days and approximately \$13.4 million in direct related expenditures. Of this effort, 66% of anglers targeted black bass, 19% crappie, 6% sunfish, 3% catfish, and 5% were fishing for anything or other fish. Forty-two percent of the anglers that fished Guntersville were residents of the three counties surrounding the reservoir, 27% were nonlocal Alabama residents, 15% were from border-states, and 16% were from non-border states. Data collected during this project will be valuable to policymakers in justifying their management of recreational fisheries, resolving user conflicts, and aiding in promoting Lake Guntersville as a significant recreational fishery to the state.

Presenter: Christopher McKee
Contact Person: Same
Type of Presentation: Oral

**A Classification System for Large U.S. Reservoirs
and its Application to the Southeast**

Boxrucker, Jeff, Reservoir Fisheries Habitat Partnership, 9321 E. State Highway 9, Norman, OK 73026, jboxrucker@sbcglobal.net

Rebecca M. Krogman, U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Post Office Box 9691, Mississippi State, MS 39762
rebecca.krogman@gmail.com

L.E. Miranda, U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Post Office Box 9691, Mississippi State, MS 39762 smiranda@cfr.msstate.edu

Abstract.- In order to prioritize conservation efforts, the Reservoir Fish Habitat Partnership needs information regarding the condition of reservoir fish habitats, and reservoir classification provides a framework within which to assess fish habitat condition. Using a combination of ecologically-based spatial partitioning and cluster analysis, we developed a classification system for large U.S. reservoirs. First, we conducted a survey of fisheries biologists to evaluate habitat of reservoirs ≥ 100 ha in the U.S. Questions covered numerous habitat attributes – including availability, water quality, water regime, and degradation processes – as well as selected aspects of the fish community and recreational fishery. A total of 1,276 useable responses were received. Second, we examined several extant systems of spatial partitioning reflecting ecological differences among regions (i.e., Omernik's Level II and III ecoregions, EPA Wadeable Streams Assessment [WSAs], and Landscape Conservation Cooperatives). Using habitat variables from the survey, we conducted cluster analysis within each region of each partitioning system. Our goal was to balance recognition of inherent ecological differences and recognition of natural groups within the data. Our final classification system utilized WSAs and yielded 22 unique reservoir classes that showed various types and levels of habitat impairment. Reservoir class characteristics for the Southeast are presented.

Presenter: Jeff Boxrucker

Contact Person: Same

Type of Presentation: Oral

Prioritizing Reservoir Habitat Restoration Efforts Using the Reservoir Fisheries Habitat Partnership's Assessment Data

Boxrucker, Jeff, Reservoir Fisheries Habitat Partnership, 9321 E. State Highway 9, Norman, OK 73026, jboxrucker@sbcglobal.net

Rebecca M. Krogman, U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Post Office Box 9691, Mississippi State, MS 39762
rebecca.krogman@gmail.com

L.E. Miranda, U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Post Office Box 9691, Mississippi State, MS 39762 smiranda@cfr.msstate.edu

Abstract.- The Southwest District of the U.S. Army Corps of Engineers recently signed a Memorandum of Understanding with Bass Pro Shops and the National Fish and Wildlife Foundation that addressed, among other issues, aquatic habitat impairments in the respective reservoirs. The Reservoir Fisheries Habitat Partnership (RFHP) was asked to provide a priority listing of reservoirs based on the extent of aquatic habitat impairments. Sixty-four reservoirs in Arkansas, Kansas, Missouri, Oklahoma, and Texas were ranked based on data from a nationwide survey of reservoir managers assessing the degree of impairment of 52 habitat variables. These data were combined into an "Index of Relative Habitat Impairment" to give a numerical value to the suite of impairments. The top five impaired reservoirs in the SW District were Hugo (OK), Navarro Mills (TX), Bardwell (TX), Great Salt Plains (OK), and B.A. Steinhagen (TX). Generally, habitat degradation related to siltation was prevalent among the listed reservoirs. Lack of aquatic vegetation, sedimentation, loss of cove habitat due to depositional filling, turbidity, seasonally mistimed water level fluctuations, excessive littoral mudflats, and insufficient structure were aquatic habitat issues in 52%, 34%, 28%, 27%, 27%, 24%, and 20%, respectively.

Presenter: Jeff Boxrucker

Contact Person: Same

Type of Presentation: Oral

Effects of Temperature, Salinity, and Suspended Solids on the Development and Buoyancy of Arkansas River Shiner Eggs

Julia S. Mueller; Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, Texas 79409-2120; julia.mueller@ttu.edu

Timothy B. Grabowski; U.S Geological Survey, Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, Texas 79409-2120; t.grabowski@ttu.edu

Shannon K. Brewer; U.S Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University, Stillwater, Oklahoma 74078-3051; shannon.brewer@okstate.edu

Thomas A. Worthington; Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University, Stillwater, Oklahoma 74078-3051; tomas.worthington@okstate.edu

Abstract.- Arkansas River shiner (ARS) *Notropis girardi* is a threatened pelagic broadcast-spawning cyprinid native to the Arkansas River drainage in the Great Plains eco-region. Populations of ARS have declined likely due to alteration and fragmentation of habitat, which limits the ability of ARS to successfully reproduce. However, changes in other physiochemical factors such as temperature, conductivity, and suspended solids, may affect egg buoyancy and developmental rate and thus influence the minimum stream fragment length and current velocities necessary for successful reproduction. We used a full factorial experimental design to assess the effects of temperature, total dissolved solids (TDS), and total suspended solids (TSS) on the buoyancy and developmental rate of ARS eggs and larva. The minimum current velocity necessary to keep ARS eggs in suspension increased with elevated TDS, increased with elevated TSS, but also was inversely related to temperature. Unsurprisingly, developmental rate was primarily correlated to temperature in the range tested (20-28°C). However, TDS and TSS also seem to influence developmental rate. These findings will aid in identifying of areas that can support successful reproduction in pelagic-spawning cyprinids, such as ARS, and provides critical data for developing models predicting the effect of further anthropogenic disturbances.

Presenter: Julia S. Mueller

Contact person: Same

Type of presentation: Oral

**A New Drainage Basin Distributional Record for Brawley's Fork Crayfish,
Cambarus williami, in Tennessee**

John W. Johansen; Department of Biology, Box 5063, Tennessee Technological University,
Cookeville, TN 38505; jwjohansen42@students.tntech.edu

Hayden T. Mattingly; Department of Biology, Box 5063, Tennessee Technological University,
Cookeville, TN 38505; hmattingly@tntech.edu

David I. Withers; Tennessee Department of Environment and Conservation, Division of Natural
Areas, Natural Heritage Program, Nashville, TN 37243; david.withers@tn.gov

Abstract.- Brawley's Fork Crayfish, *Cambarus williami* Bouchard and Bouchard, is one of more than 80 crayfish species native to Tennessee. *Cambarus williami* was previously documented from a single watershed, East Fork Stones River (EFSR), in the Nashville Basin physiographic province of middle Tennessee. Its current AFS status (Endangered) and Heritage rank (G1, S1) are indicative of this restricted range. However, in September 2012 we collected a single Form II male from the Barren Fork portion of the neighboring Collins River (CR) drainage to the southeast of EFSR. The collection site was located in Bullpen Creek in Cannon County, approximately 6.1 air km southeast of the nearest documented EFSR population. Subsequent visits to this stream yielded additional individuals, including Form I males, and indicated that an established population exists in Bullpen Creek. This discovery expands the known range and elevational extent of *C. williami* to a new drainage (CR) and physiographic region (Eastern Highland Rim). We plan to conduct additional surveys of the CR to determine the distribution and abundance of *C. williami* within its new drainage. Such surveys will be necessary to inform any re-evaluation of the species' current conservation status.

Presenter: Hayden Mattingly

Contact Person: Same

Type of Presentation: Poster

New Crayfish Diversity in the Collins River Drainage of Tennessee

John W. Johansen; Department of Biology, Box 5063, Tennessee Technological University, Cookeville, TN 38505; jwjohansen42@students.tntech.edu

Hayden T. Mattingly; Department of Biology, Box 5063, Tennessee Technological University, Cookeville, TN 38505; hmattingly@tntech.edu

Brianna C. Zuber; Department of Biology, Box 5063, Tennessee Technological University, Cookeville, TN 38505; bczuber42@students.tntech.edu

Abstract.- Tennessee is home to more than 80 described crayfish species, and that number continues to increase as new taxa are discovered and described within the state. During summer and autumn 2012, we collected two undescribed taxa in the Barren Fork portion of the Collins River drainage. Based on general body morphology and color patterns, these taxa appear to be closely related to each other and are tentatively assigned to subgenus *Gremicambarus* within genus *Orconectes*. *Orconectes* (*G.*) sp. A occurs in the Pocahontas Branch watershed in Coffee County and *O.* (*G.*) sp. B occurs in the Lewis/McMahan Creek watershed in Cannon County. The two taxa are easily distinguished using the gonopodal structure of Form I males and other morphological features. We intend to describe the new taxa and conduct additional surveys of their distribution and abundance. Nothing yet is known regarding their life history, ecology, or conservation status.

Presenter: John Johansen

Contact Person: Hayden Mattingly

Type of Presentation: Poster

**Intra-annual variation in river-reservoir interface fish assemblages:
implications for fish conservation and management in regulated rivers**

David L. Buckmeier; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, 5103 Junction Highway, Mountain Home, Texas 78058; david.buckmeier@tpwd.state.tx.us

Nathan G. Smith; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, 5103 Junction Highway, Mountain Home, Texas 78058; nate.smith@tpwd.state.tx.us

B. Paul Fleming; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, 5103 Junction Highway, Mountain Home, Texas 78058; paul.fleming@tpwd.state.tx.us

Kristopher A. Bodine; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, 5103 Junction Highway, Mountain Home, Texas 78058; kris.bodine@tpwd.state.tx.us

Abstract.- While much is known about the fish assemblages, habitats, and ecology of rivers and reservoirs, there has been limited study of the fish assemblages in transitional habitats between these lotic and lentic habitats. Data describing these river-reservoir interface (RRI) fish assemblages are needed to guide integrated management efforts of river-reservoir ecosystems. The aim of these efforts is to recommend flows for natural river function, conserve native riverine fish assemblages, and maintain reservoir sport fisheries. We used a multi-gear approach to assess the fish assemblages of four RRIs in the Colorado River Basin, Texas. In addition to characterizing RRI fish assemblages using species richness and evenness metrics, and habitat-use guilds, we used a multivariate approach to evaluate intra-annual shifts in species composition and abundance. All RRIs had high species richness and evenness values, and included both macrohabitat generalist and fluvial species. River-reservoir interfaces also contained high proportions of the fish species available within each river-reservoir ecosystem, ranging from 55 to 80%. Observed intra-annual shifts in RRI fish assemblages resulted from changes in abundance of dominant species rather than changes in species composition, with abundance of most species increasing from early spring to summer. Fish species responsible for intra-annual shifts included mostly floodplain and migratory species, suggesting both use of littoral habitats within RRIs and migration through RRIs to river and reservoir habitats. The diversity of fishes found within RRIs highlights the importance of including these areas in future conservation and management efforts of river-reservoir ecosystems.

Presenter: David Buckmeier

Contact Person: Same

Type of Presentation: Oral

Adult Spawning Habitat and Survival, Movement, and Nursery Habitat of Stocked Juvenile Muskellunge in Middle Tennessee Streams

Lila Warren; Tennessee Cooperative Fishery Research Unit, Tennessee Tech University, Cookeville, Tennessee 38505; lilawarren@gmail.com

Phillip Bettoli; USGS Tennessee Cooperative Fishery Research Unit, Tennessee Tech University, Cookeville, Tennessee 38505; pbettoli@tntech.edu.

Abstract: Southern U.S. muskellunge populations have not been well studied; the most recently published study on riverine muskellunge in Tennessee dates back to the 1950s. The muskellunge fishery in the upper Caney Fork River watershed above Great Falls Dam in middle Tennessee is gaining popularity as a trophy fishery; anglers have reported catches of fish longer than 1,300 mm total length in recent years. Muskellunge have been stocked into that system since the 1980s but there is no information on natural reproduction or post-stocking survival, movement, or habitat selection. Objectives of this study are to 1) describe survival and dispersal of recently-stocked juvenile muskellunge; 2) identify and describe muskellunge spawning and nursery habitats; and 3) determine whether natural reproduction is occurring. Survival and dispersal of stocked fish is being monitored by radio-telemetry. Muskellunge nursery habitat was characterized by sampling wild juvenile muskellunge using seine-hauls, backpack electrofishing, and boat electrofishing gear and subsequently describing the substrate and vegetation at collection sites. Muskellunge spawning habitat was identified by direct observation and using traditional ecological knowledge from local fishing guides and biologists; characteristics of those habitats were subsequently quantified.

Presenter: Lila Warren

Contact Person: Same

Type of Presentation: Oral

Microhabitat and Crappie Gradients in Reservoir Coves

Levi Kaczka; Mississippi State University, Starkville, Mississippi 39759;
lkaczka@cfr.msstate.edu

Steve Miranda; Mississippi Cooperative Fishery Research Unit, Mississippi State University,
Starkville, Mississippi 39759; smiranda@cfr.msstate.edu

Abstract.-We collected age-0 crappies *Pomoxis* spp. over 4 years in coves of four flood-control reservoirs in northwest Mississippi, to test if fish displayed longitudinal gradients in distribution that paralleled longitudinal gradients in habitat composition. Crappies were collected with trap nets placed approximately equidistant along the length of coves during late summer. Composition of five land cover types was estimated longitudinally along 500-m sections and at two water levels. Catch rates increased towards the rear of coves, differed among years and reservoirs, but the longitudinal pattern persisted. Similarly, habitat composition changed longitudinally along coves, with the strongest correlations indicating a front-to-rear decrease in non-vegetated mudflats and increase in herbaceous material. Additionally, significant decreases in shoreline slope and depth occurred in a front-to-rear direction. Our results indicate that habitat composition gradients occur in coves of northwest Mississippi flood-control reservoirs, and that these gradients may influence a similar gradient in age-0 crappie distribution. While the biotic interactions behind the gradients may be less clear, we speculate that water level is the main factor influencing the observed gradients in habitat composition and fish. Management to benefit age-0 crappies may consider habitat improvement along cove shorelines and water level regimes that foster growth of herbaceous plants.

Presenter: Levi Kaczka
Contact: Same
Type of presentation: Oral

**Effects of Environmental Contaminants on Gene Expression Endpoints
in Fishes of the Great Lakes**

Cassidy M. Hahn; West Virginia University, Division of Forestry and Natural Resources,
Morgantown, WV 26506

Luke Iwanowicz and Vicki S. Blazer; U.S. Geological Survey, Leetown Science Center, Fish
Health Branch, 11649 Leetown Road, Kearneysville, WV 25430

Patricia Mazik; U.S. Geological Survey, West Virginia Cooperative Fish and Wildlife Research
Unit, West Virginia University, Morgantown, WV 26506

Abstract. -Environmental monitoring of the Great Lakes watershed has recently shifted focused from legacy compounds to a new class of compounds collectively referred to as contaminants of emerging concern (CECs). Perhaps one of the best studied classes of CECs is that of the endocrine disrupting compounds (EDCs). The proposed work aims to study the effects of such contaminants on pelagic smallmouth bass and largemouth bass, and the benthic brown bullhead and white sucker throughout the Great Lakes Basin and is centered on Great Lakes Areas of Concern (AOCs). Using next generation sequencing technologies to identify biomarker genes in these non-model species expression analysis was conducted. In additional, genomic DNA will be used to conducted microsatellite analysis. The significance of these analyses will be discussed.

Presenter: Cassidy Hahn
Contact Person: Same
Type of Presentation: Oral

Population Characteristics of Shovelnose Sturgeon in the Arkansas River

Craig Jansen and Joseph Stoeckel; Arkansas Tech University, Russellville, AR 72801;
cjansen@atu.edu

Abstract. - Recent closure of several sturgeon fisheries and increased caviar prices could cause additional fishing pressure on the remaining fishable populations of sturgeons. The goal of this study was to develop baseline information on the Arkansas River population of shovelnose sturgeon *Scaphirhynchus platorynchus* to effectively manage the species in Arkansas. I sampled fish from March to November 2011, using experimental gill nets, experimental flag nets, and trotlines. Ninety-four fish were captured from four pools of the Arkansas River. Catch per unit effort (CPUE) in Pool 1 was over five times higher than any of the other pools. Shovelnose sturgeon fork length ranged from 425 to 676 mm (median = 487) and weight ranged from 241 to 1139 g (median = 412). Relative weight declined significantly with increasing distance of pool from the Mississippi River ($P < 0.001$). Age ranged from 3 to 16 years (median = 5). The growth equation for the population was $l_t = 680.6[1 - e^{-0.176(t + 0.702)}]$, and fish in Pool 12 exhibited the slowest growth. In general, the Arkansas River population is relatively smaller and slower growing than other shovelnose sturgeon populations. The current minimum length limit of 533 mm for commercial fishers allows individuals to spawn at least once before they are potentially harvested, but shovelnose sturgeon may need multiple spawning events to produce a strong year class capable of sustaining the population. If commercial harvest continues, I strongly recommend that supplementary data be collected to help ensure that regulations will maintain a sustainable fishery.

Presenter: Craig Jansen

Contact Person: Same

Type of Presentation: Oral

**Urban Land-Use Effects on Salt Marsh Resident
Cyprinodontiformes in the Gulf of Mexico**

Madeline Wedge; School of Forestry and Wildlife Sciences, Auburn University Auburn AL
36830; mew0027@auburn.edu

Chris Anderson; School of Forestry and Wildlife Sciences, Auburn University Auburn AL
36830; andercj@auburn.edu

Abstract-Urban land-use has been shown to impact fish communities by altering community structure, decreasing abundance, and increasing pollutant exposure. However, research in how urban land-use (specifically shoreline development) affects resident salt marsh fish communities is lacking. These resident fish are an important food source for a number of economically valuable fish species, thus it is important to understand how urban land-use can impact salt marsh resident fish. This study focuses on urban land-use effects on salt marsh resident Cyprinodontiformes in *Juncus roemerianus*-dominated salt marshes around Wolf Bay, Perdido Bay, and Pensacola Bay in Alabama and Florida. Fish collected from urban salt marshes ($\geq 30\%$ urban land use within 500m of tidal creeks) and reference salt marshes (0% urban land use) were evaluated for differences in species richness, abundance, and length-weight relationships when possible. Two common salt marsh residents, *Fundulus grandis* and *Poecilia latipinna*, were evaluated further for differences in condition as measured by liver weight:body weight ratios and caloric density. Abundance and diversity showed strong seasonal and salinity influences. *F. grandis* from urban creeks were smaller compared to those from reference creeks. *P. latipinna* from urban creeks and reference creeks were similar in size. Liver weight:body weight ratios were similar for both species in urban and reference creeks. *P. latipinna* from urban creeks had lower caloric density compared with those from reference creeks. *F. grandis* from urban and reference creeks had similar caloric density. These results indicate that complex interactions associated with season, water salinity, and species are contributing to the condition, abundance, and diversity of these fish.

Presenter: Madeline Wedge

Contact: Same

Type of Presentation: Oral

**The Freight Train is Coming: Tales of the Integrated
Licensing Process in Virginia**

John R. Copeland, Virginia Department of Game and Inland Fisheries, 2206 South Main Street, Suite C, Blacksburg, VA 24060; Email: John.Copeland@dgif.virginia.gov

Scott M. Smith, Virginia Department of Game and Inland Fisheries, 1132 Thomas Jefferson Road, Forest, VA 24551; Email: Scott.Smith@dgif.virginia.gov

A. L. LaRoche III, Virginia Department of Game and Inland Fisheries (Retired), 1435 Wolf Creek Drive, Vinton, VA 24179; Email: blaroche3@cox.net

William B. Kittrell Jr., Virginia Department of Game and Inland Fisheries, 1796 Highway Sixteen, Marion, VA 24354; Email: Bill.Kittrell@dgif.virginia.gov

Abstract:- Two hydropower projects in Virginia were recently relicensed under the Federal Energy Regulatory Commission's (FERC) Integrated Licensing Process (ILP). The ILP places responsibility on state natural resource agencies for ensuring a favorable outcome. Notable aspects of the ILP include: (1) The potential for active participation by FERC staff and increased interaction with applicant and stakeholders at all stages of the process; (2) Increased public participation in the pre-filing consultation; (3) Strict schedules with firm deadlines; (4) All issues are set up front, so issues cannot "pop up" late in the process; and, (5) Study plan duration is typically limited to one year, unless there is a compelling reason to extend studies into a second year. Other aspects of the ILP are similar to the FERC's Traditional and Alternative Licensing processes. We did not have the advantage of a designated employee for relicensing or preliminary training, so we employed the following procedures: (1) Taking a team approach to relicensing; (2) Using one biologist as a lead contact for each FERC project; and, (3) Keeping our administrators informed about the progress and key issues in our relicensing projects. In addition, we identified our agency's issues and concerns before the first pre-application meeting. Advance preparation of written management plans for the Smith Mountain/Leesville Project guided development of study plans during the ILP. At the Claytor Project, written management plans were not entered into the ILP process. As an alternative, the fisheries biologist at this project collected preliminary data to help justify study plans.

Presenter: John R. Copeland

Contact Person: Same

Type of Presentation: Oral

**Effects of Cold Winters on the Genetic Diversity
of Spotted Seatrout in Charleston Harbor, SC**

Tim O'Donnell; College of Charleston, Graduate Program in Marine Biology, Charleston, SC 29412; odonnellcofc@gmail.com

Michael R. Denson; SC DNR, Marine Resources Research Institute, Charleston, SC 29412; densonm@dnr.sc.gov

Tanya Darden; SC DNR, Marine Resources Research Institute, Charleston, SC 29412; dardent@dnr.sc.gov

Abstract.- Spotted seatrout are recreationally important fish that have been harvested in South Carolina for centuries. Spotted seatrout in SC have recently suffered substantial declines in relative estuarine abundance during cold winters of 2000, 2009, and 2010 when water temperatures dropped below their tolerance threshold. As these population declines may result in genetic bottlenecks and their repetitive occurrence over a short time scale could reduce their adaptive potential, we estimated the genetic diversity and effective population size (N_e) of the Charleston Harbor spotted seatrout population at six time points related to recent cold winters using a suite of 13 microsatellite markers. After correcting for sample size, the average number of alleles per locus showed no response to fluctuations in CPUE. Alternatively, gene diversity and heterozygosity were influenced by fluctuations in CPUE, with a delayed response time of approximately 1-2 generations. N_e remained stable at high levels at all times points. These results imply that while spotted seatrout may suffer loss of genetic diversity after a population decline, their short generation time and resiliency in the wild allows them to recover during population growth and maintain relatively high levels of diversity.

Presenter: Tim O'Donnell

Contact Person: Same

Type of Presentation: Oral

**An assessment of the striped bass fishery in
the Arkansas River system in Oklahoma**

Kurt Kuklinski, Oklahoma Fishery Research Laboratory, Oklahoma Department of Wildlife Conservation, Norman, Oklahoma 73072; kkuklinski@odwc.state.ok.us

Abstract- The striped bass (*Morone saxatilis*) population in the Arkansas River system in Oklahoma is a valuable resource to anglers and to the Oklahoma Department of Wildlife Conservation (ODWC). ODWC annually collects broodstock striped bass from this system to produce about 1 million fingerling hybrid striped bass (*Morone saxatilis* female x *M. chrysops* male) which are stocked into Oklahoma reservoirs. Recent county and municipal proposals to impound the Arkansas River in the Tulsa area could threaten this self-sustaining population of striped bass. Prior to 2009, the size structure and age structure of this population was unknown, and the connectivity of the river system and its tributaries as it relates to striped bass remained unknown. Striped bass size and age structure from this population were analyzed in 2009 using 602 fish collected at five locations along the river. Striped bass were found to grow fast (mean length = 692mm at age-5) and live relatively long (to age-13), while catch curve analysis revealed an annual mortality rate of 0.349. Beginning in 2010, striped bass were collected and implanted with Passive Integrated Transponder (PIT) tags then released to investigate population size and possible connectivity of the multiple tailwaters and river reaches of the Arkansas River system. To date, 808 striped bass have been PIT tagged and 40 fish have been recaptured. Current Chapman-modified Schnabel mark and recapture methods estimate the population of striped bass at 3674 fish combined among the five sampling locations. Data collected for this project have been used to justify a regulation change for striped bass in Oklahoma, reducing the daily creel limit from 15 to 5 striped bass per angler.

Presenter: Kurt Kuklinski

Contact Person: Same

Type of Presentation: Oral

**Spawning habitat choices by river chubs indicate
response to “flashy” tailwater hydrology**

Brandon K. Peoples; Department of Fish and Wildlife Conservation. Blacksburg, VA 24061.
bpeoples@vt.edu

Ryan A. McManamay; Oak Ridge National Laboratory. Oak Ridge, TN 37831.
mcmanamayra@ornl.gov

Donald J. Orth; Department of Fish and Wildlife Conservation. Blacksburg, VA 24061.
dorth@vt.edu

Emmanuel A. Frimpong; Department of Fish and Wildlife Conservation. Blacksburg, VA 24061.
frimp@vt.edu

Abstract.-We examined spawning micro- and mesohabitat preferences of river chubs *Nocomis micropogon*, a gravel-mound nesting minnow, in the Cheoah River downstream of Santeelah Dam in Graham County, NC. In May 2009, nest dimensions, substrate sizes, depth, and flow velocities of 79 nests were compared to transect measurements; substrate sizes on nests were compared to pebble counts in 4 m² quadrats adjacent to nests. Depth, bed slope, and proportions of bedrock outcrops (i.e. surrogate for velocity shelters) were calculated for each of 59 individual mesohabitats (pool/riffle/run) in ArcGIS using spatial layers derived from aerial and LIDAR imagery. Average gravel diameters of nests were significantly smaller than adjacent particles; nests were placed in significantly shallower depths and lower velocities than average ($p < 0.0001$ for all). Multiple logistic regression indicated that chubs preferred to place nests in shallower runs with moderate, homogenous slopes and high proportions of bedrock outcrops. Near the dam, nests were placed closely behind velocity shelters such as boulders and bedrock outcrops, and were typically built beneath overhanging vegetation. These relationships diminished with downstream distance from the dam ($p = 0.04$ and 0.01 , respectively). After a two-day dam release approximately 10 times that of base flow, 27 re-measured nests were obviously “flattened”, being significantly wider ($p = 0.029$) and lower ($p = 0.001$) after the discharge. Spawning habitat choices may be a mechanism to cope with rapidly changing flow. Because over 30 North American cyprinids rely on *Nocomis* nests for reproduction, frequent nest alteration by variable dam discharges may have negative community-wide effects on fishes’ reproductive success.

Presenter: Brandon K. Peoples
Contact Person: Same
Type of Presentation: Oral

**Survey and Status of Mussels and Mussel Habitat in
the Poteau River in Southeastern Oklahoma**

William Ray; Oklahoma Department of Wildlife Conservation, 1801 N. Lincoln Blvd.,
Oklahoma City, Oklahoma 73105; wray@zoo.odwc.state.ok.us

Curtis Tackett; Oklahoma Department of Wildlife Conservation, 1801 N. Lincoln Blvd.,
Oklahoma City, Oklahoma 73105; ctackett@odwc.state.ok.us

Don Groom; Oklahoma Department of Wildlife Conservation, 6733 SW HWY 1, Wilburton,
Oklahoma 74574; dgroom@sbcglobal.net

Abstract: Freshwater mussels are one of the most threatened faunas globally. The Ouachita Region of Oklahoma contains five small rivers, including the Poteau River, identified by the Oklahoma Comprehensive Wildlife Conservation Strategy that are a Very High Priority Conservation Landscape with 19 freshwater mussel species identified as Species in Greatest Conservation Need. The Poteau River contains over 30 species of mussels of which there are 11 species identified as species of Greatest Conservation Need including 5 Tier I species, 2 Tier II species, and 4 Tier III species. Since continued mussel harvest and degrading water quality of Wister Reservoir have the potential to negatively affect downstream water quality, habitat, and diversity of mussel and fish populations in state designated mussel sanctuaries, surveys were conducted to updated distribution and status data of these sensitive species. Mussels were identified at each of the survey sites although mussel abundance varied greatly ranging from a 13 species to a single species. Catch per unit effort (mussels per survey minute) was 2.41. None of the Tier I mussel species of concern previously identified in this watershed were collected during this study. We collected 15 of the 23 species identified by Vaughn and Spooner in 2004 and 11 of the 18 species identified by Isley in 1925.

Presenter: William Ray

Contact Person: Same

Type of Presentation: Oral

Estimating Gulf of Mexico sturgeon mortality and movement rates

Merrill Rudd; University of Florida, Gainesville, Florida 32653; mrudd@ufl.edu

Rob Ahrens; University of Florida, Gainesville, Florida 32653; rahrens@ufl.edu

Bill Pine; University of Florida, Gainesville, Florida 32653; billpine@ufl.edu

Stephania Bolden; NOAA/NMFS Southeast Regional Office, St. Petersburg, Florida 33701, stephania.bolden@noaa.gov

Abstract – Species with large migrations encounter varying threats and habitat quality across their range, subjecting populations to differential mortality. Gulf sturgeon inhabit estuarine and marine environments in the winter months, returning with high fidelity to their natal rivers to spawn in the summer but occasionally emigrating to other river drainages. Gulf sturgeon are listed as threatened as one distinct population, but riverine populations are recovering more successfully in the eastern Gulf than the western Gulf. The 2009 stock assessment identified high uncertainty in Gulf sturgeon mortality and movement rates, initiating a standardized acoustic telemetry program in 2010. This study uses river-mouth acoustic detections of Gulf sturgeon to resolve uncertainties in these key parameter estimates for an updated stock assessment. We collapse detections into monthly discrete “captures”, using a multistate model in Program MARK to estimate survival, detection probability, and movement rates. Our analysis quantifies the probability of fish emigration between regions of the Gulf, previously only presented as single outlier occurrences. These results will have significant management implications for Gulf sturgeon and the analysis framework can be applied to other species within meta-populations.

Presenter: Merrill Rudd

Contact Person: Same

Type of Presentation: Oral

ABSTRACT 13029

Genetic Tool for Age Estimation of Atlantic Sturgeon Using Telomeres

Daniel Farrae; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
farraed@dnr.sc.gov

Matt Walker; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
walkerm@dnr.sc.gov

Steve Arnott; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
arnotts@dnr.sc.gov

Michael R. Denson; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
densonm@dnr.sc.gov

Tanya Darden; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
dardent@dnr.sc.gov

Abstract- Accurate monitoring and management of fish populations frequently relies on age-structure analysis. For sturgeons, age is most commonly estimated by evaluating annual calcium deposition on fin spines, otoliths, and other bony structures. Although conventional methods provide excellent information, their invasive and/or lethal nature is unappealing for protected species. Recently, a non-destructive method of aging individuals has been developed which exploits the relative length of degenerative DNA regions known as telomeres. As telomere-based research has originated in the medical field, most work to date has been conducted on short-lived organisms and individuals maintained in controlled laboratory conditions. We isolated telomeres from endangered Atlantic sturgeon fin clips for which age estimates were generated from fin spines (ages ranged from 0 to 28). Correlations of telomere fragment lengths and age estimates varied from $\sim 0.60 R^2$ for univariate analyses to $\sim 0.89 R^2$ for multivariate analyses. Although the predictive power of these models was significant ($p < 0.001$), the application may be limited as much of the correlation was concentrated on younger individuals with most variation occurring with older fish. Our challenge is to attempt to determine if that variation is a result of true telomere length or another confounding factor. Our initial research shows promise for using telomeres as a genetic aging tool in wild fish populations.

Presenter: Daniel Farrae
Contact Person: Same
Type of Presentation: Oral

**Evaluation of Habitat Utilization, Recruitment Bottlenecks
and Movement of Coastal Striped Bass Populations
Using Cultured Animals and Genetic-Based Identification Tools**

Tanya Darden; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
dardent@dnr.sc.gov

Daniel Farrae; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
farraed@dnr.sc.gov; Karl Brenkert; SC DNR, Marine Resources Research Institute, Charleston,
SC 29412; brenkertk@dnr.sc.gov; Justin Yost; SC DNR, Marine Resources Research Institute,
Charleston, SC 29412; yostj@dnr.sc.gov; Matt Perkinson; SC DNR, Marine Resources Research
Institute, Charleston, SC 29412; perkinsonm@dnr.sc.gov; Michael R. Denson; SC DNR, Marine
Resources Research Institute, Charleston, SC 29412; densonm@dnr.sc.gov

Abstract. - Our project addresses responsible methodology to re-establish a population of striped bass in a coastal river via the implementation of a comprehensive assessment of habitat, evaluation of water quality parameters using continuous recording devices, an electrofish survey to facilitate identification of species assemblages in the river, and evaluation of habitat partitioning by size class and season. Replicated experiments in the laboratory were conducted to test temperature tolerances by size classes from production facilities with different salinity profiles and correlate the results with water quality and distribution data collected in the field. We also applied genetic data from the Santee-Cooper source population, Ashley River recapture data and life history information to develop an individual-based model of striped bass population genetics. The model demonstrates how different stocking methods, including the current research design implemented as part of our project, affect the amount of genetic variation within and among striped bass populations. The methodology is projected for 50 years of stocking and identifies appropriate strategies to maintain genetic diversity within the Ashley River and minimize departure in genetic structure between neighboring populations. We have identified available habitat, species' environmental tolerances, and stocking strategies that incorporates genetic forecasting to ensure population health. The resulting plan is a valuable tool and can serve as a model for striped bass restoration efforts in other systems.

Presenter: Tanya Darden

Contact Person: same

Type of Presentation: Poster

Low-Temperature Tolerance of Juvenile Spotted Seatrout in South Carolina

Katie Anweiler; Graduate Program in Marine Biology, College of Charleston, Charleston, South Carolina 29424; kanweile@gmail.com

Michael Denson; SC Department of Natural Resources, Charleston, South Carolina 29412; densonm@sc.dnr.gov

Abstract.- Spotted seatrout are vulnerable to winter mortality when air temperature drops, causing shallow water to chill rapidly. Management of spotted seatrout should be based on a thorough understanding of the magnitude of winter mortality. We used the chronic lethal method to determine temperatures that are lethal to spotted seatrout when exposed to a -1°C/day change in temperature. Spotted seatrout ($n=24$) were found to experience loss of equilibrium at a mean (\pm SD) temperature of $3.57^{\circ} \pm 0.24^{\circ}\text{C}$, and mortality at $3.08^{\circ} \pm 0.31^{\circ}\text{C}$. We also evaluated how spotted seatrout are affected by prolonged, sub-lethal temperatures, and by temporary cooling and warming periods. We used a modified acclimated chronic exposure (ACE) method, which allowed acclimation to changing temperatures (-1°C/day) until a pre-determined base temperature was reached. The ACE method was performed with both static and fluctuating temperatures, at base temperatures of 5.25° and 4.25°C . These experimental temperature regimes mimic the natural variability observed in the environment. Fish ($n=23$, $n=23$) exposed to a stable temperature of 5.25°C for 5 days displayed 4% mortality (11% loss of equilibrium) on average, while fish ($n=23$, $n=23$) exposed to temperatures that fluctuated $6.5^{\circ} - 4.0^{\circ}\text{C}$ displayed 7% mortality (22% loss of equilibrium) on average. In contrast, fish ($n=23$) exposed to a temperature of 4.25°C for 5 days displayed 100% mortality (100% loss of equilibrium), and fish ($n=23$) exposed to temperatures that fluctuated $5.5^{\circ} - 3.0^{\circ}\text{C}$ displayed 87% mortality (100% loss of equilibrium).

Presenter: Katie Anweiler

Contact Person: Same

Type of Presentation: Oral

**Artificially inducing a false annulus by starvation
on age 0 Alligator Gar *Atractosteus spatula***

Richard Snow; Oklahoma Department of wildlife Conservation, Oklahoma Fishery Research Lab, Norman, Oklahoma 73072; rsnow@odwc.state.ok.us

Chas Patterson; Oklahoma Department of wildlife Conservation, Oklahoma Fishery Research Lab, Norman, Oklahoma 73072; cpatterson@odwc.state.ok.us

Abstract. - Accurate age and growth information is essential in successful management of a fish population and for a complete understanding of life history. Otoliths from adult Alligator Gar (*Atractosteus spatula*) have shown what is described as a checks or false annulus prior to the first annulus. We investigated these checks to determine if they are influenced by starvation. Verification of a check or false annuli in age 0 alligator gar would give managers more confidence in age determination of adult as well as age 0 gar. We explored differences in annulus formation between alligator gar on a starvation diet and a normal diet. All fish were marked with 700 mg/L of OTC to give a reference point. Eight round tanks were divided into fourths to give 16 replicates of each group. The control group was given a diverse diet in which no energy would have to be expended to feed. The experimental tanks were given 2 g of food a week for 20 days and then fed with the same parameters of the control group for another 20 days. Gar in each unit were measured to the nearest mm weekly and sacrificed after 40 days. To determine if a check was created, otoliths were pulled and placed in separate vials. Data analysis is on going.

Presenter: Richard Snow
Contact Person: Same
Type of Presentation: Oral

**Nuclear evidence of population structure in Alabama shad (*Alosa alabamae*)
and its conservation and management implications.**

Bryant R. Bowen; Georgia Department of Natural Resources, Waycross, GA 31051;
Bryant.Bowen@dnr.state.ga.us

Joshua R. Ennen; TN-SCORE, University of Tennessee, 2450 EJ Chapman SW Suite 201,
Knoxville, TN 37996; jennen81@gmail.com; Brian R Kreiser; The University of Southern
Mississippi, Hattiesburg, MS 39406; brian.kreiser@usm.edu; Paul F. Mickle; USM Gulf Coast
Research Lab, Ocean Springs, MS 39564; paul.mickle@usm.edu; Stephen T. Ross; University of
New Mexico, Albuquerque, NM 8713; stross@unm.edu; William T. Slack; USACE
Environmental Laboratory, Vicksburg, MS 39180; Todd.Slack@usace.army.mil; Jake Schaefer,
The University of Southern Mississippi, Hattiesburg, MS 39406; jake.schaefer@usm.edu;
;Susan B. Adams; USDA-Forest Service, Oxford, MS 38655; sadams01@fs.fed.us

Abstract: Anthropogenic effects on the environment have caused population declines in many diadromous species. Some of these impacts include loss of essential habitat, migration barriers, and poor water quality resulting from degradation of the watershed. Our goal was to use microsatellite markers as ecological tools to explore the population structure and genetic diversity of Alabama shad throughout their existing range and establish some sort of baseline genetic data for conservation management decisions. Genetic techniques have proven to be useful tools in conservation biology by delimiting stock structure in other anadromous species such as salmon and sturgeon, as well as the closely related American shad. Population structure in Alabama shad (n=491) was estimated using 16 microsatellite loci designed for other *Alosa* spp. Our analyses detected shallow, but significant, population structure across the range at higher levels than previous allozyme and mtDNA restriction fragment length polymorphism analyses had revealed. These data should prove useful in informing future management decisions and provide the tools needed to monitor wild populations and guide future restoration programs if deemed necessary.

Presenter: Bryant R. Bowen
Contact Person: Same
Type of Presentation: Oral

**Use of underwater video cameras to assess fish communities
in dense submersed aquatic vegetation**

Kyle L. Wilson; Fisheries and Aquatic Sciences Program, The University of Florida, 7922 NW 71st Street, Gainesville, FL 32653, E-mail: wilson23@ufl.edu

Micheal S. Allen; Fisheries and Aquatic Sciences Program, The University of Florida, 7922 NW 71st Street, Gainesville, FL 32653, E-mail: msal@ufl.edu

Michael D. Netherland; US Army Engineer Research and Development Center , 7922 NW 71st Street, Gainesville, FL 32653, E-mail: mdnether@ufl.edu

Abstract.- Underwater video cameras (UVC) provide a potentially effective and non-lethal technique to sample fish communities in dense submersed aquatic vegetation (SAV). Fish may inhabit areas of dense SAV, but these areas have traditionally been difficult to access with most sampling gears (e.g., electrofishing, trap nets). Without statistically valid fish samples in dense SAV, management can be misinformed regarding the habitat quality for fish. We developed methods for using an UVC-system to estimate fish abundance in dense SAV. Our study used three 0.405 ha experimental ponds that were 100% covered with surface-matted hydrilla *Hydrilla verticillata* and stocked with different abundances of *Lepomis* spp. and largemouth bass *Micropterus salmoides*. We conducted UVC point counts biweekly for 13 weeks to measure fish occurrence and fish counts from video analysis and, afterwards, recovered true fish abundances via pond drainings. In total, fish occurred in 179 of 324 point counts, and UVC captured counts on juveniles and adults of *Lepomis* spp. and largemouth bass in dense SAV. The UVC system measured fish occurrence and fish counts that accurately reflected the differences in fish abundances among ponds. The seasonal changes in fish abundance within ponds were also reflected in fish occurrences and fish counts, suggesting that video counts captured proportional changes in fish abundance in dense SAV habitats. This study showed that the UVC can be an effective sampling method for fish abundance estimates in very dense SAV.

Presenter: Kyle Wilson
Contact Person: Same
Type of Presentation: Oral

Table Rock Lake National Fish Habitat Initiative

Mike Allen; Missouri Department of Conservation, 610 Hatchery Road, Branson, MO 65616
Mike.allen@mdc.mo.gov

Shane Bush; Missouri Department of Conservation, 610 Hatchery Road, Branson, MO 65616
shane.bush@mdc.mo.gov

Abstract: The Missouri Department of Conservation (MDC), Bass Pro Shops, National Fish and Wildlife Foundation, and Arkansas Game and Fish Commission are currently working on a five year project to maintain and enhance the fish habitat in Table Rock Lake and serve as a pilot project in a broader national program focusing on habitat restoration within reservoirs. Project objectives include improving fish habitat and water quality within Table Rock Lake and its tributaries, and improving habitat and water quality in Lake Taneycomo, the tail water of Table Rock Lake. To date, over 2,000 fish habitat structures comprised of stumps, rocks, pine, cedar, and hardwood trees have been installed in Table Rock Lake. MDC is using electrofishing, SCUBA surveys, radio telemetry, and angler creel surveys to evaluate the effectiveness of these habitat structures. In Lake Taneycomo, 71 boulder clusters have been installed to improve trout habitat. MDC is also working to improve the watershed by providing cost-share benefits to landowners. Over 2,000 septic tanks have been pumped around the lake in an effort to reduce non-point sources of pollution into Table Rock Lake. Additionally, eight stream bank stabilization projects have been completed in the watershed to stop soil erosion and reduce sediment input into the lake. This project has proven to be an excellent opportunity to proactively maintain and enhance fish habitat in and around two of the Midwest's most popular sport fisheries and is providing a national example for sustaining and improving reservoir sportfish populations through large-scale habitat improvements.

Presenter: Mike Allen
Contact: same
Type of presentation: Oral

Trophic ecology of channel catfish from six Oklahoma reservoirs.

David R. Stewart; Department of Natural Resource Ecology and Management, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University, Stillwater, Oklahoma 74078; Randy.Stewart@okstate.edu

James M. Long; U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University, Stillwater, Oklahoma 74078; longjm@okstate.edu

Abstract.- Food web structure of six medium size Oklahoma reservoirs was assessed to examine trophic ecology of channel catfish to other potentially competing fish species. Aquatic vegetation, zooplankton and benthic invertebrates, Asian clam *Corbicula*, and fish samples were analyzed to test $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ measurements as trophic level indicators. Results from a Bayesian mixing model indicated channel catfish *Ictalurus punctatus* and bluegill *Lepomis macrochirus* diets were predominately comprised of aquatic invertebrates; whereas, flathead catfish *Pylodictis olivaris* and crappie *Pomoxis* spp. had a diet mostly consisting of both aquatic invertebrates and fish. Trophic level of channel catfish was similar to that of bluegill but occupied a lower trophic level than that of flathead catfish and crappie. Channel catfish, stocked in two reservoirs in 2010, had a diet consistent with “wild” channel catfish of the same length (total length, mm) one year post-stock. The presence of fish in diets of channel catfish increased with increase in TL and linear regression models indicated that trophic level did change with an increase in TL for four of the six reservoirs. Based on these results, stocked channel catfish have a diet similar to that of “wild” conspecifics and competitive interactions may exist with bluegill.

Presenter: David Stewart

Contact Person: Same

Type of Presentation: Oral

**Movements and Habitat Use of Southeastern
Blue Sucker in the Lower Pearl River**

Devon C. Oliver; Louisiana State University, Baton Rouge, Louisiana 70803; dolive3@siu.edu

William E. Kelso; Louisiana State University, Baton Rouge, Louisiana 70803; wkelso@lsu.edu

Michael D. Kaller; Louisiana State University, Baton Rouge, Louisiana 70803; mkalle1@lsu.edu

Abstract-Riverine fisheries management programs rarely focus on non-sport and non-commercial fishes such as catostomids. However, many suckers have become imperiled throughout river systems in the United States because of habitat alterations. In the Pearl River, sedimentation, dam construction, and other hydrologic modifications have negatively impacted habitats used by southeastern blue suckers *Cycleptus meridionalis*. We assessed blue sucker populations through electrofishing surveys and a mark-recapture study, and examined habitat selection by radio telemetry. In 2010 and 2011, we observed no southeastern blue suckers in the west branch of the Pearl River. In the adjacent main branch, we collected blue suckers, but at significantly lower catch rates (Mean CPUE = 0.053/minute) relative to three other common benthic Pearl River fishes, smallmouth buffalo *Ictiobus bubalus* ($P < 0.0018$), channel catfish *Ictalurus punctatus* ($P < 0.0001$) and flathead catfish *Pylodictus olivaris* ($P < 0.0017$). However, CPUE for southeastern blue suckers was similar to quillback *Carpionodes cyprinus* ($P = 0.999$) and highfin carpsucker *Carpionodes velifer* ($p = 0.999$), and the low CPUE values for these three catostomids indicate that the availability of suitable habitat may be limiting some sucker populations in this system. A mark-and-recapture analysis was unable to generate a reasonable population estimate for southeastern blue suckers in the lower Pearl River. Radio telemetry indicated an affinity for deeper, outside river bends with accumulations of large woody debris and gravel, with high habitat specificity indicated by extended periods of little movement from these areas. Limited movements suggest a low potential for colonization of new areas or recolonization of abandoned habitats.

Presenter: Devon C. Oliver

Contact Person: Same

Type of Presentation: Oral

**Friends of Reservoirs Foundation: A Plan for Building
and Growing Capacity to Improve Fish Habitat in our Nations Reservoirs**

Dave Terre; Texas Parks and Wildlife Department, Inland Fisheries Division, Austin TX 78739;
dave.terre@tpwd.state.tx.us

Jeff Boxrucker; Reservoir Fisheries Habitat Partnership, Norman OK 73026;
jboxrucker@sbcglobal.net

The Reservoir Fisheries Habitat Partnership (RFHP) established the *Friends of Reservoirs* (FOR) Foundation to assist in fund-raising efforts to support reservoir fisheries habitat restoration projects. A website was developed (www.waterhabitatlife.org) as a FOR outreach tool and fund-raising forum. Memberships in FOR are offered to groups and individuals. Memberships are focused on building local capacity for project development and funding and creating a link among FOR members and management agencies. FOR membership provides tax-deductible status for locally-raised funds. FOR's non-profit status also expands granting opportunities because many grants are available only to non-profit organizations. A strategy for marketing and promoting FOR has been developed and has been successfully implemented in Texas and in other states. These strategies have successfully connected state biologists, angling groups, conservation groups, lakeside property owners, and local businesses interested in improving fish habitats in reservoirs. Funding for local projects has been obtained and leveraged against private and public sources, including funds from RFHP. Our successful strategies will be presented and shared in hopes of growing a much larger FOR network within the United States.

Presenter: Dave Terre

Contact Person: Same

Type of Presentation: Oral

**Behavioral Thermoregulation of Fishes in Relation to Heated Effluent
from a Power Plant on the Cumberland River, Tennessee**

Justin Spaulding; Tennessee Cooperative Fishery Research Unit, Tennessee Tech University, Cookeville, Tennessee 38505; jspaulding@tntech.edu

Phillip Bettoli; USGS Tennessee Cooperative Fishery Research Unit, Tennessee Tech University, Cookeville, Tennessee 38505; pbettoli@tntech.edu

Mark Bevelhimer; Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831; bevelhimerms@ornl.gov

Abstract.—Laboratory-derived thermal preferences and critical thermal maxima of fishes are used by regulators to determine how and when power plants can discharge heated effluent. However, field studies have observed fishes utilizing effluents during summer that often exceed their laboratory determined preferenda and tolerances. In order to better understand thermal tolerances and develop more accurate criteria, ultrasonic transmitters were attached to fish to record thermoregulatory behavior in and around the discharge at the Tennessee Valley Authority's Cumberland Steam Plant on the Cumberland River. Previous studies elsewhere have addressed fish usage and avoidance of power plant discharges, but modern and sophisticated telemetry systems allow for a higher resolution assessment of fish behavior, residency, and thermal exposure. In the summer of 2012 we tagged three species of fish representing different habitat guilds known to inhabit the effluent: blue catfish (*Ictalurus furcatus*), smallmouth buffalo (*Ictiobus bubalus*), and largemouth bass (*Micropterus salmoides*). Tagged fish were actively tracked by boat and passively monitored with stationary underwater receivers capable of recording tag temperatures three times per minute for at least eight months. The number of detections recorded by the stationary receivers ranged from 237 to 72,326 per fish. Most fish spent at least some time in the thermal plume and two fish (smallmouth buffalo) resided there even when average daily water temperatures exceeded 34°C. More fish will be tagged and tracked in winter and summer of 2013. Emphasis will be placed on monitoring fish behavior during summer when ambient and discharge water temperatures will be highest.

Presenter: Justin Spaulding

Contact Person: Same

Type of Presentation: Oral

**Effect of pulsed gastric lavage on apparent survival
of a juvenile fish in a natural system**

Andrew B. Barbour; School of Forest Resources and Conservation, Program of Fisheries and Aquatic Sciences, The University of Florida; snook@ufl.edu

Ross E. Boucek; Department of Earth and Environmental Studies, Florida International University; rbouc003@fiu.edu

Aaron J. Adams; Mote Marine Laboratory, Charlotte Harbor Field Station; aadams@mote.org

Abstract.- A popular method to collect stomach contents is the use of pulsed gastric lavage (PGL), wherein a stream of pressurized water forces an individual to regurgitate food items. Most past experimental studies have shown no effect of PGL on survival, but these studies are limited to laboratory or cage experiments, thereby controlling for natural effects such as predation or emigration. Using a mark-recapture/resighting approach, we determined the effect of PGL on apparent survival ($\phi = 1 - \text{mortality} - \text{emigration}$) in a natural system. In two study sites, we marked a total of 200 age-1 juvenile common snook, *Centropomus undecimalis* (Bloch 1792) (mean = 251.7 mm standard length, sd = 30.7, range = 202 – 320 mm), with PIT tags, lavaged 89 of these snook, and resighted 90% of marked fish at least once with a telemetry array. Using the Barker survival model, we determined a significant effect of PGL on apparent survival through QAIC_c model selection, 95% confidence intervals of parameter estimates, and likelihood ratio testing ($P = 0.017$). The PGL effect reduced QAIC_c model averaged maximum likelihood estimates of apparent survival by 12.0 – 17.4%. Since we estimated apparent as opposed to true survival, we could not fully partition lethal and sublethal (emigration) effects; however, a lower incidence of emigration in lavaged individuals suggests emigration did not drive declines. Regardless of the mechanism, we found PGL affected individuals, which is contrary to most previous controlled studies. Future researchers using PGL must consider the influence of potential lethal/sublethal effects in natural settings.

Presenter: Andrew Barbour
Contact Person: Andrew Barbour
Type of Presentation: Oral

**Comparing Standard North American Freshwater
Fish Data Using a Web-Accessible Database**

Norman Mercado-Silva, University of Arizona, 325 Biosciences East, Tucson AZ 85721.
nmercado@u.arizona.edu

Scott A. Bonar, University of Arizona, 210 Biosciences East, Tucson AZ 85721,
sbonar@cals.arizona.edu

Matt Rahr, University of Arizona, 1110 E. South Campus Dr, Tucson AZ 85721,
rahr@ag.arizona.edu

Toby Torrey, University of Arizona, 1110 E. South Campus Dr, Tucson AZ 85721,
toby@cals.arizona.edu

Averill Cate Jr., University of Arizona, School of Natural Resources, Tucson, AZ 85721,
acate@email.arizona.edu.

Abstract.- Recently, the American Fisheries Society developed standard methods to sample freshwater fish populations, publishing them in 2009 in the book *Standard Methods for Sampling North American Freshwater Fishes*. This project involved 284 scientists from 107 different organizations across Canada, Mexico and the United States. Data collected using standard methods gives biologists the ability to compare data across regions or time. Here we discuss recent progress on an on-line web-accessible database program to compare fish growth, condition, length-frequency, and catch per unit effort data collected using AFS standard methods. Development of this database is a collaborative effort among AFS, the US Geological Survey, the National Park Service, the U.S. Forest Service, the University of Arizona, and the University of Guadalajara, Mexico. The database (1) provides on-line summaries of 4,092 data sets of condition, length-frequency, CPUE and growth indices of common freshwater fishes, collected using standard gears from 42 states and provinces across North America, (2) allows entry of new data collected using standardized methods, so averages of commonly-used fishery indices can be updated, and (3) allows queries, graphical, and tabular output of the data summaries so they can be easily accessed and integrated into projects across North America. Users will be able to compare condition, growth and abundance of fish collected in a particular waterbody with regional and rangewide averages and percentiles, thus increasing resource information in a variety of areas. The database is programmed in a PHP-based Drupal framework.

Presenter: Norman Mercado-Silva

Contact Person: Same

Type of Presentation: Oral

**VARIATION IN TOTAL ANNUAL REPRODUCTIVE
EFFORT OF LARGEMOUTH BASS IN FLORIDA LAKES**

Stephanie L. Shaw; Fisheries and Aquatic Sciences Program, School of Forest Resources and Conservation, The University of Florida, 7922 NW 71st St., Gainesville, FL 32653;
slshaw@ufl.edu

Micheal S. Allen; Fisheries and Aquatic Sciences Program, School of Forest Resources and Conservation, The University of Florida, 7922 NW 71st St., Gainesville, FL 32653;
msal@ufl.edu

Abstract. - Fish may forgo reproducing in a given season when resources are low and/or mortality is high in order to maximize lifetime reproductive effort. Extreme cases where a high proportion of the mature individuals in a population do not reproduce has the potential to influence sustainability of fishery resources. Our objectives were to a) estimate total annual reproductive effort of largemouth bass *Micropterus salmoides floridanus*; b) and monitor population-level impacts of variation in that reproductive effort. Snorkel surveys were used to estimate reproductive effort (nests/spawner) and recruit abundance (age-1) in four lakes in north central Florida from 2010 to 2012. Mark-recapture population estimates were used to estimate largemouth bass abundance at each lake in each year. The largemouth bass populations in all four lakes exhibited relatively slow growth with the majority of adults (84-95%) between 25.0 and 35.0 cm total length. Average relative weight of all four populations was low ranging from 68.3 to 72.5 for all bass over 15.0 cm. Reproductive effort varied among lakes and across years. Three lakes showed relatively consistent reproductive effort across years albeit at different intensity (Picnic Lake 0.02 to 0.04 nests/spawner; Keys Pond 0.24 to 0.53 nests/spawner; Devils Hole Lake 1.09 to 3.73 nests/spawner). Big Fish Lake showed the greatest annual variation in reproductive effort with 1.16 nests/spawner in 2010 dropping to 0.05 and 0.00 nests/spawner in 2011 and 2012. Limited food resources could have contributed to skip spawning, and this study was the first documented case of skip spawning in largemouth bass.

Presenter: Stephanie Shaw

Contact Person: Same

Type of Presentation: Oral

An Evaluation of Genetic Toxicity in the Great Lakes Basin, A Case Study.

Ryan P. Braham; West Virginia University, Division of Forestry and Natural Resources, Morgantown, WV 26506 rbraham@mix.wvu.edu.

Vicki S. Blazer; USGS, Leetown Science Center, Fish Health Branch, 11649 Leetown Road, Kearneysville, WV 25430 vicki_blazer@usgs.gov.

Patricia M. Mazik; USGS, WV Cooperative Fish and Wildlife Research Unit, Morgantown, WV 26506 pmazik@wvu.edu.

Abstract.- Genotoxicity observed in fishes is widely used as a biological indicator for anthropogenic contamination. The “fish tumors or other deformities” biological use impairment (BUI) occurs at 18 of the 30 areas of concern (AOC) located in the Great Lakes basin within the United States. As each AOC evaluates this specific BUI for possible delisting, genotoxicity can be integrated as a possible criterion for delisting. The micronucleus (MN) assay was incorporated to assess genotoxicity both among sites, as well as among species collected from 8 AOC’s, as well as 1 non-AOC site during the spring, 2011. Micronuclei were observed at all the AOC sites; however no MN were observed at the non-AOC site. Interestingly, MN were observed at differing occurrence rates by species. For the 3 AOC sites in which brown bullhead (*Ameiurus nebulosus*) and largemouth bass (*Micropterus salmoides*) were collected, MN occurrence rates were 0.189‰ and 0.963‰ respectively. For the 2 AOC sites in which white sucker (*Catostomus commersoni*) and smallmouth bass (*Micropterus dolomieu*) were collected, MN occurrence rates were 0.264‰ and 3.430‰ respectively. For the 1 AOC site in which brown bullhead and smallmouth bass were collected, MN occurrence rates were 0.0‰ and 0.598‰ respectively. Moving forward, this apparent site and species affect should be considered when evaluating genotoxicity.

Presenter: Ryan Braham
Contact Person: Ryan Braham
Type of Presentation: Oral

**Species-Habitat Associations of a Rare Tennessee
Stream Fish at Two Spatial Scales**

Brianna C. Zuber; Department of Biology, Box 5063, Tennessee Technological University,
Cookeville, TN 38505; bczuber42@students.tntech.edu

Hayden T. Mattingly; Department of Biology, Box 5063, Tennessee Technological University,
Cookeville, TN 38505; hmattingly@tntech.edu

Abstract. - Identifying factors that influence habitat use is fundamental to developing conservation strategies for rare species. The Barrens Plateau region of middle Tennessee harbors a number of unique and rare aquatic species, including the Barrens darter (*Etheostoma forbesi*). During June – October of 2009, we sampled 44, 100-m reaches in 29 streams for Barrens darters. We studied the darter's distributional patterns at two spatial scales (reach and microhabitat) to determine habitat variables significantly associated with Barrens darter presence or absence. At the reach scale, Barrens darter distribution was associated with six variables: link magnitude, total dissolved solids (TDS), conductivity, dissolved oxygen (DO), pH, and an index of bank erosion. Darters were more likely to be present in reaches with link magnitudes < 5 (Fisher's exact $P < 0.01$), TDS readings < 150 ppm ($P < 0.01$), conductivity < 204 μ S ($P < 0.01$), and DO < 7.5 mg/l ($P = 0.02$). With the exception of one site on Duke Creek (pH = 9), Barrens darters were more likely to be found in reaches with pH < 8 and little-to-moderate bank erosion (versus heavy or severe, $P = 0.06$). Although six microhabitat variables were measured, our analyses did not reveal any important darter-habitat associations at this scale. Additional research goals include identifying environmental variables associated with Barrens darter presence at larger spatial scales.

Presenter: Brianna Zuber

Contact Person: Same

Type of Presentation: Poster

**Mating System and Reproductive Behavior of Southern Flounder
on the Texas Gulf Coast**

Qingman Chen; Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, Texas 79409; qingman.chen@ttu.edu

Timothy B. Grabowski; U.S. Geological Survey, Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, Texas 79409; t.grabowski@ttu.edu

Ivonne R. Blandon; Texas Parks and Wildlife Department, Coastal Fisheries Division, CCA Marine Development Center, Corpus Christi, Texas 78418; ivonne.blandon@tpwd.state.tx.us

Abstract. - Southern flounder *Paralichthys lethostigma* is a recreationally important flatfish that has shown dramatic and alarming population fluctuations on the Texas Gulf coast over the past 10-15 years. The cause of these fluctuations is largely unknown, but shifting sex ratios due to altered thermal regimes or overfishing has been suggested as a potential factor influencing reproductive output. However, this remains uncertain as the mating system and reproductive behavior of southern flounder is poorly understood. Our objectives were to describe the mating system of southern flounder in captivity using video analysis and molecular markers. Multiple cameras were set up to record their behavior. Egg samples were taken after each spawning event to determine fertilization rate and the number of males participating in spawning and the relative reproductive success of each. Our data suggest that multiple males interact with female during the courtship and that the time between initial approach and gamete release is inversely related to the number of males participating in the courtship behavior. Our results provide insights on the potential impacts of skewed sex ratios on the reproductive behavior and success of southern flounder and also allow for the refinement of production techniques for the species.

Presenter: Qingman Chen

Contact Person: Same

Type of presentation: Poster

Inter-seasonal movements of Etheostomatinae darters (Percidae)

Mark S. Hoger; Center of Excellence for Field Biology, Austin Peay State University,
Clarksville, TN 37040; mhoger@my.apsu.edu

Rebecca Blanton Johansen; Center of Excellence for Field Biology and Department of Biology,
Austin Peay State University, Clarksville, TN 37040; johansenr@apsu.edu

Abstract. -Although movements of some fishes have been extensively studied, limited focus has been given to small, non-game fishes such as darters. Previous studies have demonstrated the need to incorporate multiple scales, taxa, and life histories to provide better insight into the movements of darters. A multi-season, mark-recapture study was conducted with darters at two Highland Rim streams of central Tennessee. A total of 10,136 individuals (12 species) were marked and 849 (8.5%; 8 species) recaptured. Frequency and distance of movement varied among species and an atypical, downstream directional bias was observed. Movement with respect to life history, season, size, sex, habitat, and congeneric and predator densities varied. Darters with increased reproductive investment moved more frequently but traveled shorter distances overall. However, during the spawning season darters with decreased reproductive investment moved more frequently, demonstrating a strong seasonal effect on movement. Although limited in its ability to detect long-range movements, this study provides a baseline for darter movement patterns across spatial and temporal scales, taxa, and life history characteristics, and has important conservation implications for this highly imperiled group of fishes.

Presenter: Rebecca Blanton Johansen

Contact Person: Same

Type of Presentation: Poster

Quantitative Microscopic Analysis of Scale Morphology in North American Darters (Percidae: Etheostomatinae)

Eva Grebe; Austin Peay State University, Center of Excellence for Field Biology and Department of Biology, Clarksville, TN 37044 egrebe@my.apsu.edu

Sarah Lundin-Schiller; Austin Peay State University, Department of Biology, Clarksville, TN 37044

Rebecca Blanton Johansen; Austin Peay State University, Center of Excellence for Field Biology and Department of Biology, Clarksville, TN 37044

Abstract.- The utility of fish scales in systematic ichthyology has been recognized since Agassiz classified fishes into four major groups based on scale morphology and composition. With improved microscopy and associated technology, recent studies have found informative variation in the microstructure of fish scales across a variety of taxonomic levels, highlighting the potential role of these characters in phylogenetic studies and discerning species boundaries. Despite a long history of research on the species-rich North American darter clade (Percidae: Etheostomatinae), variation in darter scale morphology, specifically scale microstructure, has not been thoroughly described, limiting the potential use of such data in systematic research. Two previous studies examined scale morphology of darters, but focused on a limited number of species, relatively few characters, or explored variation in the context of older hypotheses of diversity and phylogeny. This study expanded on previous work by using confocal microscopy to describe variation in scale microstructure, including characters not previously quantified, for all darter lineages under the current hypotheses of diversity and phylogeny. Variation among closely related species of a clade also was examined to determine the potential utility of scale characteristics in species-level taxonomic studies. Variation in several structures, such as scale shape and number of ctenii and radii, was noted among species and higher-level clades. Preliminary analyses suggest these characters may prove valuable in both taxonomic and phylogenetic studies, enhancing our understanding of the evolution of this diverse group of fishes.

<i>Presenter</i>	Eva Grebe
<i>Contact Person:</i>	same
<i>Type of Presentation:</i>	Poster

**Spatial and temporal variation in secondary production of
smallmouth bass from the New River, Virginia**

Morgan E. Brizendine; Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061; mobrizvt@vt.edu

John R. Copeland; Virginia Department of Game and Inland Fisheries, Blacksburg, Virginia 24061; john.copeland@dgif.virginia.gov

George C. Palmer; Virginia Department of Game and Inland Fisheries, Marion, Virginia 24354; george.palmer@dgif.virginia.gov

Bonnie J. Myers; Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061; embonn8@vt.edu

Andrew L. Rypel; Wisconsin Department of Natural Resources, Madison, Wisconsin 53707; andrewrypel@gmail.com

Abstract.- Production is a core measure of energy flow through ecosystems and the services that ecosystems provide to humans. Here, we provide multiple estimates of secondary production of smallmouth bass (*Micropterus dolomieu*), a valuable game fish, from the New River, VA and examine patterns in production both spatially (upstream versus downstream) and temporally (2005 versus 2010). Annual production of smallmouth bass at a site near Blacksburg in 2005 was 2.43 g m⁻² but declined to 1.71 g m⁻² in 2010. There was a 2-3 fold loss in production for the 3-6 year old age classes. This result supports recent complaints by anglers of a lack of medium-sized bass from this and other sections of the New River. Furthermore, results suggest that over time, changing environmental conditions, angling, or increased interspecific competition may be having a significant negative effect on New River smallmouth bass production.

Presenter: Morgan Brizendine
Contact Person: Same
Type of Presentation: Poster

**Migration and mortality of striped bass in the Roanoke River
and Albemarle Sound, North Carolina**

Julianne E. Harris; North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Campus Box 7617, Raleigh, NC 27695; jeharris@ncsu.edu.

Joseph E. Hightower; US Geological Survey, North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Campus Box 7617, Raleigh, NC 27695; jhightower@ncsu.edu.

Abstract.-We are examining migration and mortality of striped bass in the Roanoke River and Albemarle Sound, NC, using a combined tagging approach. In 2011-2012, we tagged 141 striped bass with both a sonic tag and a \$100-reward tag and over 5000 with a PIT tag. We identify movements of sonic-tagged individuals with receivers in Albemarle Sound and Roanoke River and evaluate mortality rates by returns of \$100-reward tags and detections of PIT tags from fishhouses and creels. Eighty-eight percent of sonic-tagged individuals migrated into the Roanoke River during 2011, as compared to 47% in 2012. Eight sonic-tagged fish were detected by receivers outside the Albemarle Sound system, four in the Atlantic Ocean near NY and four in the Pamlico Sound system, NC. Thus far, 14 sonic-tagged fish have been harvested and 12 have been caught-and-released, with one released fish experiencing immediate mortality. Using a combined tag-return and telemetry model, we estimated preliminary rates of fishing (F), catch-and-release (F_{cr}), and natural mortality (M) that were low except in summer, when M was 0.44. Using NC Wildlife Resources Commission creel survey data, we estimated the Roanoke River spawning population at ~755,000 in 2011 and 966,000 in 2012. When completed, this research will improve assessment and management of this economically valuable stock.

Presenter: Julianne Harris

Contact Person: same

Type of Presentation: Poster

**Captive spawning and propagation of four
species of imperiled cyprinids in Texas.**

Aaron Urbanczyk; Texas Tech University, Lubbock, Texas 79409; aaron.urbanczyk@ttu.edu

Gene Wilde; Texas Tech University, Lubbock, Texas 79409; gene.wilde@ttu.edu

Abstract.- Large streams and rivers of the Great Plains in the central United States are inhabited by a guild of cyprinids that broadcast spawn semi-bouyant ova into the current. Successful recruitment of these species, thus, requires flowing water. In 2011, an exceptionally strong La Niña event resulted in a drought of record through most of Texas. This drought caused almost complete reproductive failure among these species. In late 2011, we collected adults of several species, including three imperiled species, of fishes presumed to be broadcast spawners to propitiate and develop culture techniques for. All fish were injected with carp pituitary and were either allowed to batch spawn naturally in aquaria or were strip spawned during ovulation. We describe culture and spawning techniques as well as successes and limitations of each. These captive propagation techniques could be useful in the future as many broadcast spawning cyprinids are becoming species of conservation concern due to drought and anthropogenic changes.

Presenter: Aaron Urbanczyk

Contact Person: Same

Type of Presentation: Poster

Telomere Length and Its Relationship with Age in South Carolina Red Drum

Matt Walker; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
walkerm@dnr.sc.gov

Daniel Farrae; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
farraed@dnr.sc.gov

Steve Arnott; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
arnotts@dnr.sc.gov

Michael R. Denson; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
densonm@dnr.sc.gov

Tanya Darden; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
dardent@dnr.sc.gov

Abstract - Evaluation of fish population health is generally provided by periodic model-based stock assessments of which age structure is a critical factor. Accurate age determination typically involves lethal fishery independent sampling and evaluation of annuli on structures such as otoliths. Recently, a promising new field of non-lethal age estimation research, which exploits the relative lengths of telomeres, has shown to be useful for age estimation of short-lived laboratory raised animals. We assessed the relationship between telomere length and age for red drum ranging in ages from 1-39 years old collected from South Carolina's coast. Our preliminary analyses were designed to determine which of two non-lethally sampled tissues, fin and muscle, would provide an optimal estimate age. Fin tissue telomere length showed a stronger relationship with age, thus the remaining efforts focused on telomeres in fin tissues. Using three different analysis methods, correlations of fin tissue telomere fragment lengths and age estimates all converged at ~0.30 R². Although significant, the predictive value of telomere data alone is limited given the high levels variation in telomere length at age. The challenge in going forward with our research will be to determine the source of this variation, whether it is truly an inherent characteristic of population telomere lengths due to the long-lived, non-captive nature of red drum or the result of other confounding factors. Future research will be needed before telomere length can be incorporated into accurate age estimation of red drum.

Presenter: Matt Walker

Contact Person: Same

Type of Presentation: Oral

**Characterization of gizzard shad sound production
in response to environmental stressors**

Matthew P. Gruntorad; Biological Sciences, Texas Tech University, Box 43131, Lubbock, Texas, 79409-3131, matthew.gruntorad@ttu.edu

Gene R. Wilde; Biological Sciences, Texas Tech University, Box 43131, Lubbock, Texas, 79409-3131, gene.wilde@ttu.edu

Abstract - A large and growing number of fish species has been shown to produce identifiable sounds that are associated with different aspects of their life history such as mate location, mate attraction, spawning, and aggression. We recorded vocalizations made by gizzard shad (*Dorosoma cepedianum*) in response to three stressors. These stressors included low pH (6.5-6), high salinity (9-17 ppt) and high concentrations (10-15 mL/ 75 L) of ammonia hydroxide. There was a positive relationship between number of vocalizations and presence and intensity of stressor. Thus, sound production may serve as a measure of fish stress. In some recording situations, fish sound production decreased when fish were exposed to particularly high toxic conditions. Our results suggest that acoustic monitoring of field sites that contain gizzard shad may act as an “early warning system” for adverse environmental conditions. Furthermore, this may provide opportunities to remedy water quality issues before further impact on valuable game fish or water sources used for human consumption can occur.

Presenter: Matthew Gruntorad

Contact Person: Same

Type of Presentation: Oral

**Investigating Seasonal Movements and Spawning Locations
of Walleye in Cheat Lake, WV using Acoustic Telemetry**

Dustin M. Smith; Division of Forestry and Natural Resources, West Virginia University,
Morgantown, West Virginia 26506; dsmith304wv@gmail.com

Stuart A. Welsh; U.S. Geological Survey, West Virginia Cooperative Fish and Wildlife Research
Unit, West Virginia University, Morgantown, West Virginia 26506; swelsh@mail.wvu.edu

Nate D. Taylor; Division of Forestry and Natural Resources, West Virginia University,
Morgantown, West Virginia 26506; ndtaylor@mix.wvu.edu

Abstract - In recent years the walleye fishery in Cheat Lake, West Virginia has been improving owing to management efforts and improving water quality. However, improvements to the fishery have been slow and natural reproduction still appears to be limited. It is unclear whether impacts of current hydropower operations and lingering effects from upstream acid mine drainage (AMD) are limiting the walleye fishery. Of particular interest are the movements and habitats used by Cheat Lake walleye for spawning, and how hydropower operations and episodic AMD inputs affect spawning behavior. We began an acoustic telemetry study monitoring adult walleye movements in Cheat Lake in December 2011. Walleye movements and locations were determined both by manual tracking and with submersible, stationary receivers placed throughout the lake. Preliminary results suggest that adult walleyes move to the head of the lake to spawn in late winter/early spring and remain near spawning areas for up to several months. Increases in lake elevation and water temperature appear to trigger walleye movements to spawning areas. Further data collected on spring walleye movements will help determine what areas Cheat Lake walleyes use for spawning, and what effects (if any) the current hydropower operations and water quality restraints have on reproductive behavior. Additionally, future measurements of habitat use should provide insight into whether habitat is a limiting factor to the Cheat Lake walleye fishery.

Presenter: Dustin Smith
Contact Person: Same
Type of Presentation: Oral

Relationship between River Fragment Length and Persistence of Two Imperiled Great Plains Cyprinids

Gene R. Wilde; Department of Biological Sciences, Texas Tech University, Lubbock, Texas 79409; gene.wilde@ttu.edu

Aaron C. Urbanczyk; Department of Biological Sciences, Texas Tech University, Lubbock, Texas 79409; aaron.urbanczyk@ttu.edu

Abstract.-We used logistic regression to model the persistence of two imperiled pelagic-spawning cyprinids, sharpnose shiner *Notropis oxyrhynchus* and smalleye shiner *N. buccula*, endemic to the Brazos and Wichita rivers, Texas. There was a significant ($P < 0.0001$) positive relationship between persistence and river fragment length. Mean length of river fragments in which sharpnose shiner or smalleye shiner still occur fragment was significantly ($t = 11.71$; $df = 9$; $P < 0.0001$) greater (599 ± 27 km) than the mean length of fragments from which these species were absent (187 ± 20 km). Persistence of both species appears to depend on the presence of river fragments long enough to allow spawned ova and swim-up fry time to develop and move out of the current into backwater areas before being displaced into downstream reservoirs.

Presenter: Gene R. Wilde
Contact Person: Same
Type of Presentation: Poster

**Conservation Implications of Introduced Sheepshead Minnow
in the Upper Brazos River, Texas**

Gene R. Wilde, Aaron C. Department of Biological Sciences, Texas Tech University, Lubbock, Texas 79409; gene.wilde@ttu.edu

Aaron C. Urbanczyk; Department of Biological Sciences, Texas Tech University, Lubbock, Texas 79409; aaron.urbanczyk@ttu.edu

Doug W. Knabe; Department of Biological Sciences, Texas Tech University, Lubbock, Texas 79409; douglas.knabe@ttu.edu

Matthew P. Gruntorad; Department of Biological Sciences, Texas Tech University, Lubbock, Texas 79409; matthew.gruntorad@ttu.edu

Abstract.-From August 2011 through August 2012, we collected specimens of sheepshead minnow *Cyprinodon variegatus* from three sites in the upper Brazos River located 62, 79, and 108 km upstream from Possum Kingdom Reservoir, Texas. Sheepshead minnow was common at each site. The Red River pupfish *C. rubrofluviatilis*, which is native to the Brazos River, was collected only at the most upstream of these sites. Since August 2012, numerous specimens of *Cyprinodon* showing a combination of morphological traits (coloration, belly scalation) typical of both sheepshead minnow and Red River pupfish have been collected from these three sites. In October 2012, *Cyprinodon* specimens showing a combination of morphological traits typical of both sheepshead minnow and Red River pupfish were collected from fourth site, approximately 152 km upstream from Possum Kingdom Reservoir, which suggests rapid upstream movement of sheepshead minnow and putative hybrids. Previous introductions of sheepshead minnow into Texas waters inhabited by native *Cyprinodon* species have resulted in hybridization between native and introduced species. For example, in the Pecos River, sheepshead minnow hybridized with the endemic Pecos pupfish *C. pecosensis* and, over an approximately five-year period, the Pecos pupfish was replaced by a hybrid swarm throughout some 430 km of the Pecos River. The presence of sheepshead minnow in the upper Brazos River, upstream from Possum Kingdom Reservoir, has important conservation implications. Echelle & Echelle (1992) and Ashbaugh et al. (1994) suggest the Brazos River and Red River forms of Red River pupfish are distinct species. Sheepshead minnow has come into contact with Red River pupfish in the Brazos River, and putative hybrids between the two species now occur at several locations that span at least 150 km of river.

Presenter: Gene R. Wilde

Contact Person: Same

Type of Presentation: Poster

**A risk-based method for estimating reservoir
rule curves using historic water level data**

Ethan Mower; Department of Wildlife, Fisheries and Aquaculture, Mississippi State, MS 39762,
ebm136@msstate.edu

Leandro E. Miranda; U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife
Research Unit, Mississippi State, MS 39762, smiranda@cfr.msstate.edu

Abstract.- Management of seasonal water storage in flood control reservoirs is accomplished through rule curves, which are graphical representations of water levels relative to day of the year designed by engineers to minimize flood risk. Personnel tasked with managing reservoir fisheries often are required to make water level management recommendations to benefit fish, but that may involve changes to rule curves. However, fishery managers often do not have access to the data, models, or expertise required to change or develop rule curves. We sought to design a method for exploring potential changes to rule curves that is simple, risk-based, and relevant to fisheries managers. We used data on daily changes in water level downloadable from online sources, and applied quantile regression to analyze the data. Our procedure estimated the maximum water level a reservoir could support without spilling given historical 3, 7, 14, and 30 d water level increases. This method equips fisheries managers with information useful for discussing possible changes to rule curves with engineers responsible for operation of the reservoir.

Presenter: Ethan Mower

Contact Person: Ethan Mower

Type of presentation: Oral

**A stocking evaluation of grow-out channel catfish
in Oklahoma's small impoundments**

Chas Patterson; Oklahoma Fishery Research Laboratory, Oklahoma Department of Wildlife Conservation, Norman, OK 73072; cpatterson@odwc.state.ok.us

Abstract.- Channel catfish *Ictalurus punctatus* are stocked in small impoundments throughout Oklahoma as put-grow-take or put-take fisheries. These stockings are necessary to sustain an acceptable sport fishery as natural recruitment of channel catfish in small impoundments is often low. Many small impoundments are stocked annually with grow-out (228 mm) channel catfish at rates as high as 99 fish/ha. Tandem hoop nets have been used to evaluate channel catfish populations on nine small impoundments annually since 2010. In addition, a catfish angler survey was conducted on these impoundments in 2011. Results from the netting data suggest CPUE is highly variable among reservoirs and growth is negatively correlated to relative abundance, suggesting density dependence. Consequently, stocking rates were adjusted in 2011 based on growth data. Angler survey results in 2011 indicated angler catch rates were not correlated with relative abundance data. In addition, angler satisfaction of fish caught was fairly similar among lakes although lowest at lakes with stunted populations. Lakes will be stocked at the experimental rate through 2014 in an attempt to improve size distribution and angler satisfaction.

Presenter: Chas Patterson

Contact Person: Same

Type of Presentation: Oral

**Morphological and behavioral induced changes in the
redbreast sunfish in response to a native predator**

Heather M. Bishop; Department of Biology and Chemistry, Southern Polytechnic State University, Marietta, Georgia 30060; hbishop@spsu.edu

Peter C. Sakaris; Department of Biology and Chemistry, Southern Polytechnic State University, Marietta, Georgia 30060; psakaris@spsu.edu

Abstract.- Predator induced morphological changes in prey fish have not been well studied. We aimed to examine the morphological and behavioral responses of Redbreast Sunfish to a native predator. Forty juvenile redbreast sunfish were collected from Rottenwood Creek, Georgia, via backpack electrofishing. Two 150-g, rectangular tanks (one “predator” and one “control” tank) were each divided with a clear and permeable barrier into two one-half sections. We also divided a one-half section of each tank into two one-quarter sections with an opaque and impermeable divider. Ten sunfish were randomly assigned to each of the four one-quarter sections. An adult largemouth bass was stocked in the one-half section of the predator tank. The clear, perforated divider permitted the sunfish to observe the predator and be exposed to chemical cues released from the bass. All sunfish were fed bloodworm daily, while the largemouth bass was fed five nightcrawlers and two sunfish per week. Monthly body depth (mm), total length (mm), and weight (g) measurements were taken as well as monthly video trials on both control and experimental tanks over a 3-month period. Photos of all sunfish were taken to document any potential predator-induced changes in color. Dorsal and anal spine length (mm) and pectoral fin width (mm) of all sunfish will also be measured at the end of the study. We will also analyze video for any behavioral responses in prey in response to the predator. Data will be analyzed to determine if any significant morphological or behavioral changes occurred in the prey species.

Presenter: Heather Bishop

Contact Person: Peter Sakaris

Type of Presentation: Oral

**Estimating Seasonal Demographic Rates in Relation to
Streamflow Dynamics of a Benthic Stream Fish (*Etheostoma inscriptum*)
in a Bedrock Shoal Over 5-Years**

Rachel Katz; Odum School of Ecology, University of Georgia, Athens, Georgia 30605;
rakatz@uga.edu

Mary Freeman; USGS Patuxent Wildlife Research Center, Athens, Georgia 30602;
mary_freeman@usgs.gov

Abstract.- In lotic systems, streamflow-geomorphic interactions create a dynamic habitat template that influences stream fish population demography and persistence by regulating individual growth, survival, recruitment, and movement. Although studies have linked various streamflow metrics to lowered fish abundance, the cause of decline remains largely unresolved and could be explained by increased mortality, lower recruitment, or changes in immigration and emigration. Using a capture-mark-recapture approach, this research aims to evaluate the influence of streamflow on adult and young-of-year survival and recruitment while accounting for migration. Our study has been conducted on a common benthic stream fish (*Etheostoma inscriptum*) in bedrock shoals of the Middle Oconee River near Athens, GA. Sampling occurred monthly for 2-4 months during late summer and fall of 2008 through 2012. We batch-marked (N~7500) and released Turquoise darters within a “focal” bedrock shoal (1500m²) with a confined channel. To estimate movement rates between shoals of differing channel shapes, we also batch-marked and released fish (N~900) from 2011 through 2012 in habitat “patches” within an unconfined bedrock shoal (15000m²) located 500m to 1km upstream. We hypothesize that higher median seasonal flow increases survival and recruitment within the focal shoal, leading to density-dependent increases in emigration into other shoal habitats. If true, population surveys that do not account for migration could erroneously suggest that fish abundance declines as flows recover from drought conditions. This study will provide managers with information regarding how streamflow metrics affect benthic fish populations and illustrate the utility of using mark-recapture for elucidating flow-ecology relations.

Presenter: Rachel Katz

Contact Person: same

Type of Presentation: Oral

Use of dynamic occupancy models to assess the response of darters (Teleostei: Percidae) to varying hydrological and hydrothermal conditions in the Elk River, Tennessee

Colin P. Shea; Tennessee Cooperative Fishery Research Unit Tennessee Tech University, Cookeville, TN; cshea@tntech.edu

Kathryn M. Potoka; Tennessee Cooperative Fishery Research Unit Tennessee Tech University, Cookeville, TN; kpotoka@gmail.com

Phillip W. Bettoli; USGS Tennessee Cooperative Fishery Research Unit, Tennessee Tech University, Cookeville, TN; pbettoli@tntech.edu

Charles F. Saylor; Tennessee Valley Authority, Knoxville, TN; cfsaylor@tva.gov

Peggy W. Shute; United States Fish & Wildlife Service, Cookeville, TN; peggy_shute@fws.gov

Abstract.- Since the construction of Tims Ford Dam (TFD) in 1970, the Elk River in Tennessee and Alabama has experienced substantial changes in downstream hydrothermal and hydrological conditions. These changes have inhibited the ability of many stream fish species to persist in affected reaches, including the federally endangered boulder darter (*Etheostoma wapiti*). In 2007, the Tennessee Valley Authority ceased hydropower generation at TFD during critical boulder darter spawning and rearing periods (April – October), with the following objectives: (1) to enhance survival and recruitment of existing populations, and (2) to promote the recolonization of stream reaches that were previously unsuitable for warmwater fishes. Using data collected at six locations from 2005-2012, we developed dynamic multi-species occupancy models to estimate the influence of site- and species-level factors on colonization and extinction rates for 15 Elk River darter species, including *E. wapiti*. Modeling results indicated that local colonization rates were positively related to stream temperature, whereas the risk of local extinction was negatively related to stream temperature and positively related to stream discharge. Modeling results also suggested that crevice spawning species, such as *E. wapiti*, were much less likely to colonize previously unoccupied stream reaches. Additionally, the presence of upstream populations substantially reduced the risk of local extinction. Our study suggests that species-specific characteristics and flow and temperature conditions strongly influence the dynamics of darter populations in the Elk River. Results from this study contribute to the development of a decision support tool that will be used to identify optimal operational strategies for TFD.

Presenter: Colin P. Shea

Contact Person: Same

Type of Presentation: Oral

**The Biotic Integrity of Fish Assemblages in a
Highly Altered Tailwater System**

Tomas J. Ivasauskas; North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University Department of Biology, Raleigh, NC 27695; tjivasau@ncsu.edu

Phillip W. Bettoli, U.S. Geological Survey, Tennessee Cooperative Fishery Research Unit, Tennessee Technological University, Cookeville, TN 38505; pbettoli@tntech.edu

Abstract.- The Caney Fork River downstream of Center Hill Dam, a large hydropower dam in Tennessee, is highly altered by hydropeaking operations and hypolimnetic discharge. The tailwater reach exhibits an unnatural flow regime, altered temperatures, and seasonally decreased dissolved oxygen concentrations. We assessed the influence of the dam on the downstream fish assemblage and its biotic integrity. Boat-mounted and backpack DC electrofishing gears were used to sample the fish assemblages at five sites distributed along the 43-km tailwater reach. Sampling was conducted seasonally from fall 2009 through summer 2012. A multimetric index of biotic integrity was developed for the Caney Fork River using a multivariate procedure to identify metrics that responded to disturbance. Sixty-seven species of fish in 16 families were identified across all sites, seasons, and gear-types. A gradient in assemblage composition was evident. The multimetric index comprised nine metrics that describe species composition, trophic characteristics, and biotic diversity. The index was correlated to environmental conditions at sites and indicated that fish assemblages and biotic integrity recovered in a log-linear fashion with increasing distance downstream of the dam. Longitudinal recovery gradients are well-documented for other tailwater systems but have been rarely quantified using a biotic index.

Presenter: Tomas Ivasauskas

Contact person: Same

Type of presentation: Oral

**Assessment of age, diet, and growth of yellow perch
In Cheat Lake, West Virginia**

Nate Taylor; Division of Forestry and Natural Resources, West Virginia University,
Morgantown, West Virginia 26506; ndtaylor@mix.wvu.edu

Stuart Welsh; USGS West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia
University, Morgantown, West Virginia 26506; swelsh@wvu.edu

Dustin Smith; Division of Forestry and Natural Resources, West Virginia University,
Morgantown, West Virginia 26506; dsmith304wv@gmail.com

Abstract.- Cheat Lake, a 1700-acre reservoir on Cheat River in Monongalia County, WV, has been altered by acid mine drainage for over half of a century. Recent changes in water quality, however, are attributed to population size increases in several fish species, including yellow perch (*Perca flavescens*). Currently, Cheat Lake is one of a few reservoirs in WV that supports a yellow perch fishery, and fishery-independent data are needed for management purposes. We evaluated the condition, age, and size structure of the yellow perch population. Also, we assessed growth of yellow perch, and determined summer diet composition. Using a boat electrofisher, we collected 307 individuals between 9 July and 9 September 2012. Age 2 and 3 fish were common, and the oldest individuals were estimated as age 9. Aquatic insect larvae were the most abundant dietary item during summer, primarily Sialidae (alderflies), Chironomidae (midges), and Trichoptera (caddisflies). Sphaeriidae (fingernail clams) and small fishes were also common diet items. Fishery-independent data on age, size structure, fish condition, growth, and diet composition will aid management of this unique yellow perch fishery.

Presenter: Nate Taylor

Contact Person: Same

Type of Presentation: Oral

Bar Grading of Alligator Gar Fingerlings in Raceways

Steve E. Lochmann; Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff, 1200 North University Drive, Mail Slot 4912, Pine Bluff, Arkansas 71601; slochmann@uaex.edu

Brandon W. Baker; Georgia Department of Natural Resources, Wildlife Resources Division, P.O. Box 2089, Waycross, Georgia 31502; Brandon.Baker@dnr.state.ga.us

Kyle T. Rachels; Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff, 1200 North University Drive, Mail Slot 4912, Pine Bluff, Arkansas 71601; krachels@uaex.edu

Brett A. Timmons; Arkansas Game and Fish Commission, 771 Jordan Dr., Monticello, Arkansas 71655; batimmons@agfc.state.ar.us

Abstract.- Alligator gar are cultured in ponds, raceways, and tanks, with varying levels of growth and survival. Most culturists grade young alligator gar frequently, or risk survival rates to 250 mm in the single digit range. Grading is done visually and is time consuming and subjective. Our objective was to determine the efficacy of using floating bar graders to group like-sized fish. We stocked alligator gar into concrete at a density of 0.02 fish/L. Three vats were divided into three compartments. Fish in these vats were offered fathead minnows *Pimephales promelas* at a rate of 10% of body weight/d and graded with floating bar graders twice each week. Three vats were not divided. Fish in these vats were not graded, but were offered fathead minnows. Two vats were divided into three compartments. Fish in these two vats were graded, but were not offered fathead minnows. Fish in all vats were offered formulated feed *ad libitum* up to 10% of body weight/d. The experiment was run for 50 d, at which time alligator gar averaged (SD) 255 (36) mm TL and weighted 91 (54) g. Survival averaged 68% (17%). When we compared fish from graded and ungraded vats, weight gain was significantly greater in ungraded vats ($t=3.193$, $df=3$, $P=0.025$), but survival was significantly higher in graded vats ($t=-2.721$, $df=3$, $P=0.036$). When we compared fish from vats offered forage to vats not offered forage, weight gain ($t=3.002$, $df=2$, $P=0.048$) and survival ($t=6.749$, $df=2$, $P=0.048$) were both significantly greater in vats offered forage.

Presenter: Steve Lochmann

Contact Person: Same

Type of Presentation: Oral

Status of Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*Hypophthalmichthys nobilis*) in Southeastern Oklahoma

Curtis Tackett; Aquatic Nuisance Species Biologist; Oklahoma Department of Wildlife Conservation; 1801 N Lincoln Blvd Oklahoma City, OK 73105; ctackett@odwc.state.ok.us

Tim Patton; Department of Biological Sciences; Southeastern Oklahoma State University; 1405 North 4th Avenue, PMB 4054. Durant, OK 74701; tpatton@se.edu

Abstract.- Silver carp and bighead carp are native to southeastern Asia and have been introduced throughout much of the central and southeastern United States. Incidental capture of bighead carp had been reported from the Neosho River, Grand Lake, and the Red River; no silver carp had been reported from Oklahoma. In response to reported sightings by anglers in the Kiamichi River during 2012, we conducted a survey for silver and bighead carp in the Kiamichi River and three other lentic systems in southeastern Oklahoma. We used electrofishing gear and gill nets to sample over 5 days during June, 2012. We captured a total of 13 *Hypophthalmichthys*, including five silver carp and eight bighead carp, and we collected or detected them in three of the four water bodies sampled. Silver and bighead carp appear to be well established in southeastern Oklahoma, and it is likely that they are reproducing.

Presenter: Curtis Tackett
Contact: Same
Presentation Type: Oral

ABSTRACT 13065

Angler Exploitation of Black and White Crappie at Lake Overcup, Arkansas

Matthew D. Schroeder, Arkansas Game and Fish Commission, Mayflower, Arkansas 72106
mdschroeder@agfc.state.ar.us

Matthew L. Horton, Arkansas Game and Fish Commission, Mayflower, Arkansas 72106
mlhorton@agfc.state.ar.us

Thomas R. Bly, Arkansas Game and Fish Commission, Mayflower, Arkansas 72106
tbly@agfc.state.ar.us

Abstract.- Crappie populations are highly exploited across southeastern lakes. Unfortunately crappie exploitation rates are relatively unknown for Arkansas lakes. This makes optimizing the management of this species difficult. Angler catch, exploitation, and temporal patterns were determined with a tag reward exploitation study in 2011 and 2012 for crappie (*Pomoxis* spp.) in Lake Overcup, Arkansas. Catch curve analysis generated by trap net data (2007 to 2011) reveals an average total annual mortality of 63%. Due to uncertainty with angler reporting rates, adjusted annual angler exploitation was estimated over a range of 46% to 59%, with an adjusted annual angler catch of 49% to 62%. Anglers caught the majority of crappie from the months of November to May (97%). Modeling indicates that a 9-in minimum length limit (MLL) would increase yield 67% to 97%. A 9-in MLL would also increase the number of 10-in crappie harvested by 153% to 290%, and increase the number of 12-in crappie harvested by 150% to 1,100%, while only decreasing the total number of harvested crappie by 15% to 16%. This data suggests that a 9-in MLL would be beneficial to the crappie population. However, angler preferences to harvest a greater number of crappie, over fewer but larger crappie, would need to be factored into the decision on whether or not to implement a 9-in MLL.

Presenter: Matt Schroeder
Contact Person: Matt Schroeder
Type of Presentation: Oral

ABSTRACT 13066

Occupancy modeling as a tool for evaluating the status and distribution of darters in the Elk River, Tennessee

Kathryn Potoka, Tennessee Cooperative Fishery Research Unit and Department of Biology, Tennessee Technological University, 1100 North Dixie Avenue, Cookeville, Tennessee 38505
kmpotoka42@students.tntech.edu

Colin P. Shea, Tennessee Cooperative Fishery Research Unit and Department of Biology, Tennessee Technological University, 1100 North Dixie Avenue, Cookeville, Tennessee 38505
cshea@tntech.edu

Phillip W. Bettoli, U.S. Geological Survey, Tennessee Cooperative Fishery Research Unit, Tennessee Technological University, 1100 North Dixie Avenue, Cookeville, Tennessee 38505
pbettoli@tntech.edu

Abstract.- Since the construction of Tims Ford Dam in 1970, the Elk River in Tennessee and Alabama has experienced substantial changes in downstream hydrological and hydrothermal conditions. These changes have hampered the ability of many stream fish species to persist in affected reaches, including the federally endangered boulder darter *Etheostoma wapiti*. In 2007, the Tennessee Valley Authority implemented an adaptive management process aimed at identifying the optimal combination of spilling, sluicing, and hydroelectric generation that (1) promotes flow and temperature conditions suitable for the persistence of *E. wapiti*, (2) allows for continued hydropower generation, and (3) promotes the maintenance of an existing tailwater trout fishery. Recently implemented operational modifications are anticipated to improve spawning and rearing conditions for *E. wapiti* and provide an additional 48 river km for potential recolonization. We conducted backpack electrofishing surveys at forty sites throughout the mainstem Elk River to improve understanding of the current status and distribution of boulder darters. Using fish collection data for 15 darter species, including boulder darters, we developed multispecies occupancy models to estimate the influence of site- and species-specific factors on darter occurrence. Modeling results indicated that darter species occurrence was influenced by site-level factors, but the relationships varied among species. Results from our study will be used improve understanding of the factors influencing the current distribution of boulder darters in the mainstem Elk River. This knowledge will be integrated with ongoing efforts to identify the operational strategies at Tims Ford Dam that promote the persistence of this critically imperiled species.

Presenter: K. Potoka
Contact Person: Same
Type of Presentation: Oral

**Relative survival and contribution of stocked fry and
fingerling smallmouth bass in the Broad River, South Carolina**

Jason Bettinger, South Carolina Department of Natural Resources, Eastover, SC 29044
bettingerj@dnr.sc.gov

Abstract .- Smallmouth bass have been stocked intermittently into the Broad River, South Carolina, since 1984 and a unique fishery has developed even though summer water temperatures routinely exceed 31 °C. Numbers and sizes of smallmouth bass stocked have varied greatly depending on availability. Routinely, fry and fingerling smallmouth bass are stocked each year; however, it was not known which of these stockings had the higher survival and ultimately contributed to the fishery. The contribution and relative survival (RS) of fry (mean TL = 42 mm) and fingerling (mean TL = 150 mm TL) smallmouth bass stocked during 2005 – 2010 was evaluated by differentially marking fry and fingerling smallmouth bass with oxytetracycline. During 2005 – 2010 the total contribution of stocked smallmouth bass at age-1 to each year class ranged from 4% to 47% and was positively related to mean April water flows. The relative survival of stocked smallmouth bass favoured fingerlings over fry during each study year, ranging from 2:1 to 35:1. In the Broad River stocking smallmouth bass is only beneficial when mean spring water flows are average or above average and fingerling smallmouth bass should be stocked in lieu of fry.

Presenter: Jason Bettinger
Contact Person: Same
Type of Presentation: Oral

Movement of riverine smallmouth bass in a thermally heterogeneous system

Jacob T. Westhoff; Missouri Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife Sciences, 302 ABNR Building, University of Missouri, Columbia, MO 65211; westhoffj@missouri.edu

Craig P. Paukert; Missouri Cooperative Fish and Wildlife Research Unit, 302 ABNR Building, University of Missouri, Columbia, MO 65211; PaukertC@missouri.edu

Abstract - Concerns about the effects of climate change on aquatic systems have highlighted the importance of how aquatic biota may use different thermal habitats. Lotic systems that are influenced by groundwater (springs) present a unique scenario in which to consider these potential interactions. We implanted radio transmitters in 29 smallmouth bass (*Micropterus dolomieu*) captured in Alley Spring on the Jacks Fork River in Missouri during January of 2012. Additionally, we implanted archival tags set to record temperature every 30 minutes in nine of those fish. Fish were tracked using radio telemetry monthly from January through December of 2012. Fish movement patterns varied, but 81% of tagged fish left Alley Spring when daily maximum river water temperature first exceeded that of the spring (14.5°C) and an additional 15% left the spring before maximum river temperature reached 20°C. Most movement was upstream (81%) and ranged from 2.9 to 42.5 km (19.1 ± 13.2 km; average ± standard deviation). Downstream only movement was observed less frequently (15%) and ranged from 4.0 to 22.2 km (8.9 ± 9.5 km). Our results contradict previous findings that smallmouth bass are relatively sedentary in this river. Further, a minimum of 52% of our fish were caught by anglers during the study which informs managers of harvest pressure in groundwater influenced reaches.

Presenter: Jacob Westhoff

Contact Person: Jacob Westhoff

Type of Presentation: Oral

**GPS-based Snorkel Survey Mapping and Under Structure Video
Exploration for Aquatic Population Monitoring**

Ayers, P., W. Barbour, A. Smith, B. Connell, K. Swinson, C., King; Biosystems Engineering and Soil Science; University of Tennessee; Knoxville, TN 37996 ayers@utk.edu

Abstract.- Snorkel surveys provide a non-contact estimation of aquatic species population monitoring, but can be subjective based on the individual conducting the survey. A GPS-based snorkel-cam video mapping system was used to conduct endangered species population counts and develop detailed aquatic habitat maps. The system uses an integrated GPS and video camera mounted on a snorkel mask. The snorkel-cam provides high quality georeferenced video that is used to search, identify and count aquatic species. Surrounding habitat is also documented as well as automatically determining snorkeling effort (time), and area covered. Endangered mussel and darter surveys have been conducted using the GPS-based video integrated dive mask. As snorkelers are physically limited to observe under small clearance structure (rock and logs), a georeferenced manual underwater recording video camera with lights was developed. The device, called Sneak Peek, utilizes an above water display for directing the underwater camera and can be maneuvered under structure for video observations. GIS-based video replay of the survey is available within ArcGIS and Google Earth.

Presenter: Paul Ayers
Contact Person: Same
Type of Presentation: Oral

**Kayak-based Videomapping River Systems for
Determining Optimal Habitat for Endangered Fish and Mussels**

Ayers, P. Biosystems Engineering and Soil Science, University of Tennessee
Knoxville, TN 37996 (865) 974-4942 ayers@utk.edu

Abstract.- The need to develop GIS-compatible large-scale maps of river systems led to the design of a kayak-mounted GPS-based river videomapping system. The river mapping system is kayak-mounted with georeferenced under and above water cameras, depth sounder, width sensors and underwater lasers. GIS maps of streambank characteristics (pool, riffle, run), substrate (modified Wentworth scale), embeddedness (EPA classification), depth, width and river characteristic (pool, riffle, run) were developed. River rugosity and sinuosity can be determined. The system was used to map every foot of river on over 200 river miles in Tennessee, Kentucky, North Carolina, Georgia, Florida, Alabama and Indiana. The system provides a georeferenced database for river and stream inventory. A technique to define optimum habitat locations for endangered fish and mussel species was implemented. Habitat suitability indexes algorithm for endangered fish species were also developed. GIS-based video tours of the above and below water river features, providing virtual tours within ArcGIS and Google Earth will be demonstrated.

Presenter: Paul Ayers
Contact Person: Same
Type of Presentation: Oral

Evaluating Habitat Associations of a Fish Assemblage at Multiple Scales in a Minimally Disturbed Stream on the Edwards Plateau

Brandon D. Cheek; Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, Texas 79409-2120; brandon.cheek@ttu.edu

Timothy B. Grabowski; U.S. Geological Survey, Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, Texas 79409-2120; t.grabowski@ttu.edu

Abstract.- Landscape features at coarser spatial scales tend to limit or influence the structure at finer scales based on the hierarchical classification model of riverine systems. Through various boundary exchanges, coarser scales ultimately dictate the instream habitat structure like patch frequency, patch quality and range of spatial patterns of similar habitat patches. Therefore, understanding the influence that different scales have on instream habitat is essential for accurately quantifying fish habitat associations in a lotic environment. In this study, three scales (e. g. microhabitat, mesohabitat, reach) and multiple environmental variables were used to evaluate the fish assemblage habitat associations in the South Llano River, a spring-fed second order stream on the Edwards Plateau in central Texas, to determine the scales with the most influence on fish assemblage composition and structure. We used a low-cost side scan sonar system to map and classify substrate and other instream habitat features. We then established sampling stations stratified by meso- and microhabitat classes, and sampled the fish assemblage at each station seasonally. We performed canonical correspondence analysis to assess the relationships between the fish assemblage structure, physicochemical conditions, and landscape features. Analysis reveals that fish abundance is the highest within run habitats, however, coarser substrates (e.g. cobble) nested within pool habitats contain the most diverse amounts of fish species. These findings will help provide data on the habitat use patterns of a fish assemblage in a relatively undisturbed system and could potentially help prioritize future restoration efforts for other streams in the region.

Presenter: Brandon Cheek

Contact Person: Same

Type of presentation: Oral

Long-term changes in fish functional diversity and flow regime in the Rio Grande and its tributaries in the Trans-Pecos region in Texas

Seiji Miyazono; Department of Natural Resources Management, Texas Tech University, Goddard Hall Box 42125, Lubbock, TX 79409; seiji.miyazono@ttu.edu

Christopher M. Taylor; U.S. Fish and Wildlife Service, Abernathy Fish Technology Center, 1440 Abernathy Creek Road, Longview, WA 98632; Christopher_Taylor@fws.gov

Abstract.- Altered flow regime is a major threat to lotic ecosystems. Understanding relationships between fish functional groups and flow regime is useful for predicting the future structure of fish assemblages along hydrologic manipulations in various lotic systems. Here, we examined long-term (1977–2011) changes in fish functional groups and flow regime in the Rio Grande and its tributaries in the Trans-Pecos region in Texas. This region has been affected by a variety of anthropogenic activities such as reduced water quality, dewatering in the mainstem Rio Grande, and the introduction of non-native species. Rarefaction analysis indicated that the functional richness of contemporary fish assemblages in the locality with decreased discharge volume was significantly lower than that of historical fish assemblages. Nonmetric multidimensional scaling and *t*-test indicated that the functional similarity among study sites had significantly increased since 1977. Canonical correspondence analysis indicated that the contemporary fish functional groups were linked strongly to certain environmental factors (e.g., turbidity and habitat size). Our results suggested that decreases in water quality and quantity may have negatively affected certain functional groups, decreasing regional diversity in the system.

Presenter: Seiji Miyazono

Contact person: Same

Type of presentation: Oral

**Intersex in blacknose dace downstream
of waste water treatment plants in south-central Pennsylvania**

Lauren Kesslak- West Virginia University, Division of Forestry and Natural Resources,
Morgantown, WV 26506, LKesslak@gmail.com

Tammy Smith- Shippensburg University, Department of Biology, Shippensburg, PA 17257

Theo Light- Shippensburg University, Department of Biology, Shippensburg, PA 17257,
tsligh@ship.edu

Abstract.-Emerging contaminants found in waste water effluent are thought to cause endocrine disruption in aquatic organisms, including fish. Some of the impacts of these emerging contaminants include intersex, female-skewed sex ratios, and increased vitellogenin in male fish downstream of municipal waste water treatment plants (WWTPs). This study examined the impact of potential emerging contaminants on blacknose dace (*Rhinichthys atratulus*) in Pennsylvania streams and used stable isotope analysis to determine if there was a link between the percentage of dietary sewage derived carbon (as an indicator of overall effluent exposure) and gonadal abnormalities. Approximately 20 fish were sampled upstream and downstream of three WWTPs in south-central Pennsylvania in the spring, summer, and fall seasons of 2011. Stable isotopes of carbon and nitrogen were analyzed to ensure the fidelity of sample sites and to determine the amount of sewage derived carbon in the diets of blacknose dace downstream of waste water treatment plants. Stable isotope analysis was used to determine if the proportion of sewage derived carbon in the diet was associated with fish intersex by comparing the carbon signatures of intersex fish to the signatures of other downstream fish. Intersex was found in several downstream fish and downstream fish had higher approximate percentages of sewage derived carbon in their diets. Dietary sewage derived carbon percentage and intersex data were inconclusive.

Presenter: Lauren Kesslak

Contact Person: Same

Type of Presentation: Oral

**Electrofishing with spheres, rings and rods:
electrical fields of three common electrodes**

Jim Reynolds, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, Spring Creek, Nevada 89815; jbreynolds@alaska.edu

Abstract.- Effects of electrode size and shape on electrical fields have not been documented under controlled conditions. In a concrete hatchery raceway, I compared electrical fields in terms of voltage gradient (V/cm) for 15-cm and 30-cm diameter rings and spheres and 48-cm and 96-cm long rods. Rings and rods consisted of four stock diameters: 3, 6, 10 and 13 mm. Identical pairs (e.g., two 15-cm spheres) were suspended 300 cm apart and energized with 120-V AC. In-water voltage was measured between each of the 18 electrode pairs and converted to gradients. Gradients were compared at 1 cm (hazardous to fish) from electrodes and at distances to 1.0 and 0.1 V/cm (inner and outer edges of field). Gradients at 1 cm were lowest for the 30-cm sphere (4-5 V/cm), followed by the 15-cm sphere (10-11), all rods (10-20), 30-cm rings (12-26) and 15-cm rings (20-30); 3-mm stock gave higher V/cm and 13-mm lower. Distances to 0.1 V/cm were longest for the 30-cm sphere and 96-cm rods (up to 100 cm), followed by 30-cm rings (46-79 cm) and 48-cm rods and 15-cm rings (40-60 cm). All electrodes produced 1 V/cm at 10-20 cm. Electrode shape and stock diameter significantly affected voltage gradient at 1 cm, an important consideration for fish welfare. Field size was little influenced by stock diameter but more affected by electrode shape. Backpack electrofishers should use 15-cm rings with caution. Boat units will be safer and more effective with larger spheres but these are more cumbersome.

Presenter: Jim Reynolds

Contact Person: Same

Type of Presentation: Oral

**Evaluations of the Growth and Habitat Use of Guadalupe Bass
at a Landscape Scale in the South Llano River, Texas**

Jillian R. Groeschel; Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, Texas 79409-2120, (806)742-0841; jillian.groeschel@ttu.edu

Timothy B. Grabowski; U.S Geological Survey, Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, Texas 79409-2120; t.grabowski@ttu.edu

Gary P. Garrett; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, Mountain Home, Texas 78058, Gary.Garrett@tpwd.state.tx.us

Abstract.- Guadalupe bass *Micropterus treculii* is a black bass species endemic to central Texas. Its dependence on undisturbed pool and run habitats with sufficient flow and cover renders it sensitive to habitat alteration. The decline of the species due to habitat alteration/loss and introgressive hybridization with introduced smallmouth bass *Micropterus dolomieu* has prompted efforts to restore Guadalupe bass habitats. However, detailed data on how the species may respond to these efforts are lacking. We assessed age-specific Guadalupe bass habitat associations and habitat specific growth rates in the South Llano River. Substrates were classified using side-scan sonar. Scales and otoliths were extracted from Guadalupe bass to determine age and growth. Over 65% of captured Guadalupe bass were age-2 or age-3, but individuals ranged from 0-7 years of age. Over half of the individuals $\geq 300\text{mmTL}$ were captured from the bedrock dominated upper reaches of the river, while individuals $\leq 150\text{mmTL}$ were captured further downstream in shallower pool and run mesohabitats with cobble-gravel substrates. Our results suggest age-specific Guadalupe bass habitat associations that may increase the effectiveness of restoration efforts directed at the species. Further application of these results may allow the use of the Guadalupe bass population trajectories and habitat occupation rates as an indicator of stream health in Edwards Plateau streams or as a predictor of changes in stream condition.

Presenter: Jillian Groeschel

Contact Person: Same

Type of presentation: Oral

**The Effect of Overexploitation on the Genetic Diversity
of Atlantic Red Snapper**

Carolyn Tarpey, South Carolina Department of Natural Resources, Marine Resources Research Institute, Charleston, SC. 843-762-8854 tarpeyc@dnr.sc.gov

Tanya Darden, South Carolina Department of Natural Resources, Marine Resources Research Institute, Charleston, SC 843-725-4876 dardent@dnr.sc.gov

Abstract - Red snapper has been overfished and undergone overfishing by commercial and recreational fishermen for the latter half of the 20th century. Currently, the Atlantic red snapper population is estimated to be only 11-14% of a sustainable level, and has been predicted to remain in an unsustainable level for many years to come. Our research evaluates if the population reduction experienced by red snapper has resulted in (1) a decrease in genetic diversity or effective population size, and/or (2) a change in genetic composition among four time periods: 1977-1978, 1983-1984, 1999-2000, and 2007-2009. Genetic results support the estimation of a small population census size for Atlantic red snapper, and the population appears to be experiencing influences from both genetic drift and inbreeding. The lack of a substantial decrease in diversity in light of continued reduction in census size is a positive sign for red snapper. However, the low estimated effective population size is less than positive, indicating recovery of genetic diversity will likely take longer and the population has a higher likelihood of large influences from genetic drift. Therefore, for red snapper, overfishing appears to have resulted in a small effective population size leaving the Atlantic population potentially vulnerable to future anthropogenic and natural changes.

Presenter: Carolyn Tarpey

Contact person: Same

Type of presentation: Oral

The role of lake depth in regulating water quality and fish communities in floodplain lakes of the Yazoo River Basin, MS.

Daniel Goetz, Graduate Research Assistant, Department of Wildlife, Fisheries and Aquaculture, Box 9690, Mississippi State, MS 39762, USA, phone: 717-752-7593, dgoetz@cfr.msstate.edu

Steve Miranda, U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Box 9691, Mississippi State, MS 39762, USA; smiranda@cfr.msstate.edu

Robert Kröger, Department of Wildlife, Fisheries and Aquaculture, Box 9690, Mississippi State, MS 39762, USA; rkroger@cfr.msstate.edu

Abstract- We evaluated water quality and fish communities in deep (> 3.0 m; N=7 lakes) and shallow (< 1.5 m; N=6 lakes) floodplain lakes in the Yazoo River Basin (Mississippi, USA) using direct and indirect gradient multivariate procedures. Shallow lakes displayed wide diel oxygen fluctuations, some reaching hypoxic/anoxic conditions for extended periods of time, high suspended solids, and warmer water temperatures. Conversely, deeper lakes were represented by higher visibility, stable oxygen levels and cooler water temperatures. Fish assemblages in shallow lakes were dominated by tolerant small-bodied fishes and those able to breathe atmospheric oxygen, while deeper lakes had a greater representation of predators and other large-bodied fishes. Understanding the interactions between depth, water quality, and fish assemblage composition may facilitate development of (1) effective management plans for improving environmental conditions and stability and ultimately higher fish diversity in lakes of concern, (2) fish guilds reflective of oxbow lakes water quality.

Presenter: Dan Goetz

Contact Person: Same

Type of Presentation: Oral

Pallid sturgeon habitat use and selection in the lower Mississippi River

Jason R. Herrala; Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Mississippi State, Mississippi 39762, Jason.herrala@ky.gov

Nathan M. Kuntz; Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Mississippi State, Mississippi 39762, nkuntz@cfr.msstate.edu

Harold L. Schramm, Jr.*; U.S. Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Mississippi State, Mississippi 39762, hschramm@cfr.msstate.edu

Abstract.—The pallid sturgeon *Scaphirhynchus albus* is an endangered riverine sturgeon with historical distribution restricted to parts of the Yellowstone, Missouri, Mississippi, and Atchafalaya rivers. Although rare, pallid sturgeon in the lower Mississippi River remain self-sustaining, and information about habitat use is important to conserve this species. Seventy-four pallid sturgeon (612-1,013 mm fork length) were tagged with acoustic transmitters, and 35 fish were relocated in a 40-km reach of the lower Mississippi River from March 2009 through April 2011. Fifty percent of pallid sturgeon detections were in relatively narrow ranges of depths (6.2-13.6 m) and surface current velocities (0.64-1.05 m s⁻¹). Fish were detected most often at sandbar habitats (27% of all detections), main channel habitats (19%), and wing dike (15%). Pallid sturgeon exhibited positive selection for island tip, natural bank, and sandbar habitats. Although frequently used, pallid sturgeon exhibited negative selection for main channel habitat. Ordination axes were significantly correlated with river stage and water temperature, supporting the conclusion that use of a particular habitat appears to be seasonal.

Presenter: Hal Schramm, Jr.

Contact Person: Same

Type of Presentation: Oral

Nocturnal Microhabitat Use of the Diamond Darter (*Crystallaria cincotta*)

Stuart A. Welsh; U.S. Geological Survey, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, Morgantown, West Virginia 26506; swelsh@mail.wvu.edu

Dustin M. Smith; Division of Forestry and Natural Resources, West Virginia University, Morgantown, West Virginia 26506; dsmith304wv@gmail.com

Nate D. Taylor; Division of Forestry and Natural Resources, West Virginia University, Morgantown, West Virginia 26506; ndtaylor@mix.wvu.edu

Abstract.- The only known extant population of the diamond darter (*Crystallaria cincotta*) exists in the lower 37 km of Elk River, WV. Our understanding of diamond darter habitat use was previously somewhat limited, in part, because few individuals have been observed during sampling with conventional gears. For this study, we quantified microhabitat use of diamond darters based on measurements of water depth, water velocity, and percent substrate composition. Using spotlights at nighttime, we observed a total of 82 diamond darters at 10 of 11 sampling sites within the lower 37 km of Elk River. Diamond darters were located primarily in glide habitats, characterized by relatively shallow depths (< 1 m), moderate to low water velocities (often < 0.5 m·s⁻¹), and a smooth water surface. Microhabitat use (mean ± SE, and range) of diamond darters was estimated for depth (0.47 ± 0.02 m, 0.15 – 1.07 m), average velocity (0.27 ± 0.01 m·s⁻¹, 0.13 – 0.48 m·s⁻¹), and bottom velocity (0.15 ± 0.01 m·s⁻¹, 0.06 – 0.31 m·s⁻¹). Substrate used (mean ± SE) by diamond darters was predominantly sand intermixed with lesser amounts of gravel and cobble; % sand (52.1 ± 1.6), % small gravel (12.2 ± 0.78), % large gravel (14.2 ± 0.83), % cobble (19.8 ± 0.96), and % boulder (1.6 ± 0.36). Data on microhabitat use will aid conservation and management efforts for this species. Spotlight searches for diamond darters should be considered for study designs of population estimation and long-term monitoring.

Presenter: Stuart Welsh
Contact Person: Same
Type of Presentation: Oral

Impact of fish movement between areas vulnerable and invulnerable to angling on fisheries sustainability.

Bryan G. Matthias; University of Florida, Gainesville, FL 32653; bmatthias@ufl.edu

Christopher T. Monk; University of Florida, Gainesville, FL 32653; christopher.monk@ufl.edu

Micheal S. Allen; University of Florida, Gainesville, FL 32653; msal@ufl.edu

Daniel C. Gwinn; University of Florida, Gainesville, FL 32653; dgwinn@ufl.edu

Abstract.-Conventional fisheries management typically ignores spatial and behavioral patterns in vulnerability of fish to angling. However, a portion of a fish stock may be invulnerable to fishing due to spatial patterns in angler distribution relative to fish distribution (spatial invulnerability) or some individual fish not being reactive to fishing gears (behavioral invulnerability). Few studies have examined how exchange rates between vulnerable and invulnerable states impacts the effectiveness of size limits as conservation tools in cases where some fish aren't vulnerable to fishing. A multistate age-structured model was constructed to examine the impacts of limited vulnerability on spawning potential ratio (SPR) and yield for a harvest oriented fishery with high and low fishing mortality rates over 300 mm, 400 mm, and 500 mm minimum length limits (MLLs). A fully open fishery was compared to situations where three-quarters, one-half, and one-quarter of a fish population was invulnerable to fishing. For limited vulnerability models, we considered monthly exchange rates (e.g. percent of the population switching vulnerability states each month) ranging from 0.001 to 0.250. In all situations SPR was higher when a greater portion of the population was invulnerable to angling. Conversely, yield was higher when a greater portion of the population was vulnerable to angling, except when SPR values dropped below 0.3. These low SPR values occurred under the 300 and 400 mm MLLs at high exploitation rates for the fully open fishery. By ignoring assumptions of limited vulnerability, stock predictions are conservative, which can result in reduced yield and greater sustainability.

Presenter: Bryan G. Matthias

Contact Person: same

Type of Presentation: Oral

Multi-scale habitats and stressors influencing wadeable stream fishes in the Lake Pontchartrain Basin, with emphasis on the rare Broadstripe topminnow

J. Brian Alford; Louisiana Department of Wildlife and Fisheries, Baton Rouge, Louisiana 70808; balford@wlf.la.gov

Abstract.- This study was designed to assess instream, subwatershed and watershed characteristics associated with fish assemblages in wadeable streams draining the Lake Pontchartrain Basin in Louisiana and Mississippi. Generalized additive models (GAM) were also created to determine optimal instream habitat and landscape conditions for the endemic Broadstripe topminnow (*Fundulus euryzonus*). At the instream scale, channel width, riparian canopy cover, riparian hardwood composition, dissolved oxygen concentration, rapid habitat assessment (RHA) score, and specific conductivity were associated with fish assemblage structure. At the subwatershed and watershed scales, geomorphic characteristics were important, including elevation, watershed size, and stream density. Stressors included point-source discharge, dam, and oil/gas well densities. Forest, pasture, and herbaceous cover were significantly associated with fish assemblages, but to a weaker extent. Broadstripe topminnow co-occurred with *Ambloplites arriomus*, *Luxilus chrysocephalus*, *Noturus leptacanthus*, *N. nocturnus*, *Percina nigrofasciata*, *Etheostoma swaini*, *Lythrurus roseipinnis*, *Erimyzon tenuis* and *E. oblongatus*. This assemblage was associated with higher elevations, greater vegetative land cover, RHA scores, and lower point-source discharge and dam densities. Broadstripe topminnow abundance was maximized at sites with nearly optimal habitat condition (RHA scores 150-200 out of 200) and low specific conductivity ($\leq 40 \mu\text{S}/\text{cm}$). At the subwatershed and watershed scales, optimal land cover was 38% upland forest and 16% natural herbaceous vegetation. Optimal road and dam densities were small ($< 1 \text{ km}/\text{stream km}$ and $0.02/\text{km}^2$, respectively). To help conserve the species, watersheds with appropriate land cover and geomorphology can be targeted for easements. Restorative land management measures should promote vegetative land cover and prevent new road and dam construction.

Presenter: Brian Alford

Contact Person: Same

Type of Presentation: Oral

**From Oceans to Streams – Underwater Videomapping for
determining Aquatic Habitat and Species Population Counts**

Ayers, P. Biosystems Engineering and Soil Science, University of Tennessee-Knoxville, TN
37996 ayers@utk.edu

Abstract.- Georeferenced underwater video provides an opportunity to explore and document underwater environments in a large scale using GIS. Ocean mapping for aquatic habitat, coral species, disease and marine debris was conducted at Biscayne National Park. Over 250 miles of river system aquatic habitat has been mapped using a canoe and kayak-mounted video mapping system. A GPS-based snorkel-cam video mapping system was used to conduct endangered species population counts and develop detailed aquatic habitat maps. A georeferenced manual underwater recording video camera with lights, called Sneak Peek, utilizes an above water display for maneuvering the underwater camera under structure for video observations. The mapping systems provide a georeferenced historical database for ocean, river and stream inventory. GIS-based video tours of the underwater environment within ArcGIS and Google Earth allow the viewer to virtually return to the site.

Presenter: Paul Ayers
Contact Person: Same
Type of Presentation: Poster

**Determining the Distribution of Endemic Crayfish
Species at Multiple Spatial Scales**

Joey Dyer, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University,
405-744-9840, jjdyer@okstatemail.okstate.edu

Shannon K. Brewer, U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research
Unit 405-744-9841, shannon.brewer@okstate.edu

Abstract.-Narrow-range endemics are vulnerable to a variety of threats, but our understanding of their distributional extent or factors that structure their distribution is often limited. Crayfish serve as important forage for over 200 species including sportfish populations; however, our lack of knowledge about these species prevents meaningful conservation priorities from being achieved. The objective of this study was to determine the spatial distribution of three endemic crayfish species in the Ouachita Mountains. We paired species presence with coarse-resolution environmental parameters and used Maximum Entropy models to produce a probability of occurrence for every stream reach within the Ouachita Mountain region. Maximum entropy models predicted moderate to high probabilities of occurrence in catchments west of currently-sampled locations. The models also indicated soil compositions of stony sandy-loam, lithology dominated by novaculite, sandstone and shale, elevation > 300 m, and winter climate conditions were significant to crayfish distributions. Decision tree models indicated several fine-scale features also changed the probability of species occurrence: particular hydraulic channel units, substrate size, and water-column velocity were significant in predicting higher probabilities of occurrences. This information can serve as a benchmark to set regional conservation priorities. Further, these techniques may be used to assess future threats such as global climate change.

Presenter: Joey Dyer
Contact Person: Same
Type of presentation: Oral

**Development of the Tennessee River Lake Sturgeon
Management Plan and Working Group**

Kathlina Alford; Tennessee Aquarium Conservation Institute, Chattanooga, TN 37402;
kfa@tnaqua.org

Mark Cantrell, USFWS, Asheville, NC 28801; Carlos Echevarria, Warm Springs National Fish Hatchery – USFWS, Warm Springs, GA 31830; Anna George, Tennessee Aquarium Conservation Institute, Chattanooga, TN 37402; Jason Henegar, Tennessee Wildlife Resources Agency, Nashville, TN 37204; Dave Matthews, Aquatic Monitoring & Analysis - TVA, Knoxville, TN 37902; Greg Moyer, Warm Springs Fish Technology Center – USFWS, Warm Springs, GA 31830; Bernie Kuhajda; Tennessee Aquarium Conservation Institute, Chattanooga, TN 37402;

Abstract: Lake Sturgeon (*Acipenser fulvescens*) were once abundant in the Tennessee River but due to anthropogenic stressors this species became extirpated from the drainage. In 1998, biologists from USFWS, TWRA, TVA and the Tennessee Aquarium began working on a plan to restore this species to the Tennessee River. Water quality improvements, lock systems installed on many dams, and fishing legislation to protect the species all made it possible for this fish to once again thrive in the river. With assistance from Wisconsin DNR, a plan was developed to acquire eggs from wild fish and raise fry for reintroduction into the Upper Tennessee River. The Warm Springs NFH, Private John Allen NFH, Mammoth Springs NFH, Orangeburg NFH, the University of Tennessee and the Tennessee Aquarium all participate in raising sturgeon to a releasable size of 6+ inches. Until 2011 monitoring was largely unsuccessful. Finally, during 3 weeks of sampling during 2011 and 2012, 97 Lake Sturgeon were captured. Results from these captures have generated data about fish growth, movement, survivability and effective population size. In addition to these survey efforts, TWRA collects angler reports. Because of the unique life history of the Lake Sturgeon, the management plan anticipates that restoration will be a 20+ year endeavor. It is important to update management plans regularly to assess productivity and success of the project. In 2012 the working group updated the 2006 Tennessee Lake Sturgeon Management Plan to include new data, standardized collection and genetics procedures, and an updated monitoring area.

Presenter: Kathlina Alford
Contact Person: Same
Type of Presentation: Oral

**Management and monitoring efforts of American shad
in the Santee-Cooper River Basin**

Pamela Corwin; South Carolina Department of Natural Resources & The Citadel, Bonneau,
South Carolina 29431; corwinp@dnr.sc.gov

Abstract.- With the current trends in climate, habitat degradation, and fisheries, well-designed mitigative strategies for conserving fish stocks have become increasingly necessary. Supplementation of wild alosids with captive-bred fish is a common practice for both commercial and conservation purposes. American shad (*Alosa sapidissima*) runs in South Carolina have been reduced in large part due to man-made coastal river alterations and overharvest of a diminished stock. The Santee-Cooper River basin American shad run has stabilized but adult and/or juvenile American Shad rarely inhabit two significant inland tributaries, the Broad and Wateree Rivers. The South Carolina Department of Natural Resources has implemented a hatchery program funded through the Santee Accord with goals of maintaining a commercial and recreational fishery in the basin and restoring historical runs in the Broad and Wateree Rivers, respectively. This is a review of the various techniques used by the Jack D. Bayless Hatchery staff to obtain adult broodstock; accommodate successful captive spawning, passive egg collection, and larval rearing; as well as efforts to monitor the augmentation of hatchery fish into historical spawning grounds using tetracycline marked otoliths from out-migrating juveniles.

Presenter: Pamela Corwin
Contact Person: Same
Type of Presentation: Oral

**Effects of Stocking Hatchery-Reared Largemouth Bass
on Wild Juvenile Largemouth Bass in Small Impoundments**

Kyle T. Rachels; Aquaculture/Fisheries Center, University of Arkansas–Pine Bluff, Pine Bluff, Arkansas 71601; krachels@uaex.edu

Steve E. Lochmann; Aquaculture/Fisheries Center, University of Arkansas–Pine Bluff, Pine Bluff, Arkansas 71601; slochmann@uaex.edu

Abstract.- Stocking juvenile largemouth bass *Micropterus salmoides* is a common tool for managing sport fisheries. However, managers rarely evaluate the effects of hatchery-reared largemouth bass on wild conspecifics. In summer 2011, we conducted capture-recapture abundance estimates of age-0 largemouth bass in 30 small impoundments (0.88–10.96 ha) prior to stocking at rates of 0, 60, or 180 hatchery-reared largemouth bass per hectare. Hatchery-reared largemouth bass were marked with a freeze brand 2 weeks before stocking, and transported to the impoundments in water < 25°C with 5 ppt salt and 25 mg/L MS-222. Capture-recapture abundance estimates were repeated in summer 2012 on the wild age-1 largemouth bass cohort in each impoundment. There were no significant differences in mortality ($P = 0.635$), growth ($P = 0.451$), or age-1 relative weight ($X^2 = 0.149$) of wild juvenile largemouth bass among treatments. Mean daily instantaneous mortality ranged from 0.01 to 0.14 ($n = 23$), mean daily instantaneous growth ranged from 0.004 to 0.012 ($n = 29$), and mean age-1 relative weight ranged from 84 to 106 ($n = 29$). Control impoundments were not significantly different than stocked impoundments in total age-1 largemouth bass density ($P = 0.98$). Few hatchery-reared largemouth bass were collected as age-1 fish, despite hatchery fish comprising 8–79% of the 2011 year-class immediately after stocking. Our results suggest hatchery-reared largemouth bass do not negatively affect wild largemouth bass. The nature and timing of stocked largemouth bass mortality would provide greater elucidation of the interaction between hatchery and wild fish.

Presenter: Kyle T. Rachels
Contact Person: Same
Type of Presentation: Oral

Movement and Habitat Use of Alligator Gar in Escambia River Florida

Matthew Wegener; Florida Fish and Wildlife Conservation Commission, Holt, FL;
matt.wegener@myfwc.com

John Knight; Florida Fish and Wildlife Conservation Commission, Holt, FL;
john.knight@myfwc.com

Kathryn Harriger; Florida Fish and Wildlife Conservation Commission, Holt, FL;
kate.harriger@myfwc.com

Abstract.- Several Gulf Coast states currently promote trophy fisheries for alligator gar (*Atractosteus spatula*). However, the population status of alligator gar in Florida is unknown, and in 2006 the Florida Fish & Wildlife Conservation Commission closed harvest. A project was initiated to examine habitat use and movement of alligator gar in the Escambia River so that a strategy for estimating population size could be developed to re-evaluate the harvest regulation. Seventeen alligator gar (TL range: 93 to 190 cm) were captured in gill nets and tagged with external radio and acoustic transmitters. Both active and passive techniques were used to monitor movement. Preliminary findings indicate that habitat use and movement rate vary seasonally. During winter months, alligator gar exclusively used backwater habitats and moved little. As temperatures increased, movement rates were greater, and habitat use shifted to the main river channel. Most tagged fish remained within 20 km of the original tagging site, but two individuals moved between adjacent watersheds and one fish traveled > 50 km in 5 d. Current research objectives are to evaluate a new tagging method and assess daily-habitat use with passive-tracking techniques. Continuous data collection from stationary receivers will facilitate determination of habitat types valuable to alligator gar and their movement rates between such areas. This approach will provide information to managers looking to conserve this species by protecting habitat throughout the range of alligator gar in Florida.

Presenter: Matthew Wegener
Contact Person: Same
Type of Presentation: Oral

Evaluation of Multi-decadal Changes in the Nekton Community of a Texas Riverine Estuary: Potential Influence of Freshwater Inflow

Alex Miller, University of Houston Clear Lake, School of Science and Computer Engineering, 2700 Bay Area Blvd, Houston, TX 77058 and Environmental Institute of Houston, UHCL, 2700 Bay Area Blvd, Houston, TX 77058 avmiller88@gmail.com

George Guillen, Environmental Institute of Houston, UHCL, 2700 Bay Area Blvd, Houston, TX 77058

Abstract.-The Brazos River is a riverine estuary in southeast Texas with little historical data. Research was needed to determine if (1) nekton communities in the lower Brazos River have changed since last rigorously surveyed nearly 40 years ago; (2) how these subtropical communities have changed both temporally and spatially in terms of areas of the river utilized; (3) how these communities were affected by alterations in freshwater inflow and associated water quality variables; and (4) if the lower Brazos River serves as a nursery habitat for juvenile fishes and decapod crustaceans. This data is critically needed by resource managers to understand the impact that has been made on the riverine, estuarine and near shore marine ecosystem due to changes in freshwater inflow and water quality management. With nekton and water quality samples each month from January-December 2012, we determined that: (1) Since the mid-1970's, the nekton assemblage has a 60% similarity with the current communities; (2) these changes in the nekton community are mostly regulated by freshwater inflow; (3) diversity and evenness have increased under oligohaline conditions; and (4) several mechanisms are likely responsible for these observed patterns including freshwater inflow directly affecting organisms via altered salinity regimes, and indirectly through modification in sediment transport, nutrients and wetland creation. We further discuss the relative influence of freshwater inflow on overall nekton diversity and productivity during short and long time periods and the potential impacts on nearshore marine water productivity and utilization by estuarine and marine organisms.

Presenter: Alex Miller

Contact Person: Same

Type of presentation: Oral

Fish Kills on Oklahoma's Red River: An Unsolved Mystery

Matt Mauck; Oklahoma Department of Wildlife Conservation, Durant, OK 74729
mmauck@simplynet.net

Abstract.- Perhaps the largest and most perplexing fish kills in Oklahoma history have recently occurred along the Red River. The timing of these events, the effected species composition, and necropsy investigations have failed to bring all the puzzle pieces together. Similarly, exhaustive water quality sampling by several State and Federal agencies haven't been able to highlight definitive causes. This presentation will outline the environmental conditions around these events, discuss field investigations and laboratory analysis, and present evidence to date. The author hopes audience feedback may provide insight into causative factors leading to these fish kills based on similar experiences in other states as well as provide a fresh perspective on how to precede if additional fish kill events continue on this river system.

Presenter: Matt Mauck
Contact Person: Same
Type of Presentation: Oral

**Effects of a drought of record on the fish assemblage
of a prairie stream in Texas**

Doug W. Knabe; Department of Biological Sciences, Texas Tech University, Lubbock, Texas
79409; douglas.knabe@ttu.edu

Gene R. Wilde; Department of Biological Sciences, Texas Tech University, Lubbock, Texas
79409; gene.wilde@ttu.edu

Abstract.-The upper Brazos River is an intermittent stream in which discharge is primarily influenced by sporadic rainfall. As result of an exceptionally strong La Niña event during 2011, much of Texas, including the Brazos River basin, experienced the drought of record. We have continuously sampled the fish community of the Brazos River since January 2008. This data set allows us to observe the responses of the fish assemblage to the drought and its subsequent recovery. In 2011, samples showed a drastic decrease in the abundance of most cyprinids (from >95% of the assemblage to <15%) and an increase in abundance of cyprinodontids (from <5% to >80%). Many of the cyprinids found in the Brazos River require a flowing river to spawn, and we found no evidence of successful reproduction by these species in 2011, explaining their decreased abundance. Additionally, higher salinities that resulted from reduced discharge favored the increase in abundance of fishes with high salinity tolerances such as cyprinodontids. In 2012, spring and summer rains kept water flowing in the river throughout most of the spawning season. During this time, we found that, in comparison to 2011, cyprinid abundance increased to >30%, while cyprinodontid abundance decreased to <70%. This indicates that the cyprinids in the river were able to successfully reproduce in 2012, thereby allowing the persistence of some species and bringing the fish assemblage closer to pre-drought conditions.

Presenter: Doug W. Knabe
Contact Person: Same
Type of Presentation: Oral

**Critical Thermal Maxima and Heat Hardening
in Two Populations of Alligator Gar**

Anthony V. Fernando; Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff, Pine Bluff, Arkansas 71601; tfernando@uaex.edu

Alf H. Haukenes; Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff, Pine Bluff, Arkansas 71601; ahaukenes@uaex.edu

Steve E. Lochmann; Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff, Pine Bluff, Arkansas 71601; slochmann@uaex.edu

Abstract.- To determine critical thermal maxima (CTM), fish are subjected to temperature increases until a loss of equilibrium is observed. Small increases in CTM (heat hardening) typically follow exposure to heat stress; likely the result of production of heat shock proteins which can protect cellular processes during subsequent heat stress. The objectives of this study were to determine a basal CTM for alligator gar, to determine if basal CTM varies between two populations, and to determine if whether heat hardening occurs. During Trial 1, age-0 fish (181 ± 15 mm TL) acclimated to 23°C were placed in a 1.6-L container receiving aeration. The container was placed in a water bath. Temperature was raised from ~23°C at a rate of 0.3°C/min. The CTM was determined by recording temperature when the fish lost equilibrium. CTM was determined for five fish from a coastal and five fish from a river population. Fish were then held at 23°C for 48 h. The experiment was repeated with the same fish (Trial 2). A general linear model was used to determine the effect of population on CTM and to determine whether heat hardening had occurred. The basal CTM for alligator gar was $39.0^\circ\text{C} \pm 0.4^\circ\text{C}$. There was no significant difference in the basal CTM between the two populations. There was a significant increase in CTM between Trial 1 and Trial 2 for the river population ($P=0.042$), but not for the coastal population. While basal CTM appears similar across populations of alligator gar, the response to thermal stress appears to differ.

Presenter: Tony Fernando

Contact Person: Same

Type of Presentation: Oral

**Freshwater Information Network: Facilitating Data
Sharing for Southeastern Aquatic Conservation**

Evan R. Collins; Tennessee Aquarium Conservation Institute, Chattanooga, TN 37402;
evancollins@tnaqua.org

Bernard R. Kuhajda; Tennessee Aquarium Conservation Institute, Chattanooga, TN 37402;
brk@tnaqua.org

Anna L. George; Tennessee Aquarium Conservation Institute, Chattanooga, TN 37402;
alg@tnaqua.org

Abstract.- While the southeastern U.S. is known for its diverse aquatic fauna, it is unfortunately a fauna increasingly at threat. Meaningful conservation actions require data that are capable of integrating distribution and diversity across varying spatial and temporal scales. However, these data are scattered throughout a number of databases, academic institutions, government agencies, and personal libraries. Collating, organizing, and sharing this plethora of data will facilitate coordinated conservation and restoration programs by interested stakeholders. As part of the Southeastern Fishes Council initiative to draft conservation plans for imperiled fishes in the Southeast, 61 fish species were identified as most at risk in the Mobile Basin and the Cumberland/Tennessee River drainage. For each species we compiled museum data in the form of accessioned specimens, field identifications from field notes, and gray literature from agency status reports. We currently have gathered over 70,000 museum records from 27 institutions and are incorporating field-identified records and data from status surveys. Records were georeferenced using the Global Biodiversity Information Facility Guide to Best Practices for Georeferencing protocol. Detailed distribution maps were created from the databases, with collection dates noted by color coding for three time periods. Negative data were included when surveys were specifically looking for the species in its known range. Map drafts were reviewed by experts on each species to determine accuracy and find missing records. These records form the basis for a dynamic database, the Freshwater Information Network (FIN), which can be continually updated to reflect best available science for rapid dissemination.

Presenter: Anna George

Contact Person: Same

Type of Presentation: Oral

**Case Study on Methods to Maximize
Largemouth Bass Growth in a Georgia Pond**

Greg Grimes, Aquatic Environmental Services, Inc., Ball Ground, Georgia 30107;
greg@lakework.com

Abstract.- The objective of this study was to achieve the fastest growth and the highest top end growth of largemouth bass *Micropterus salmoides* in a sport fishing pond in the southeast United States. A 32-acre lake located in Harris County Georgia was used for this study. We began during the pre-construction phase where we detailed fish habitat enhancement. We worked closely with pond builders to implement the fish habitat plan. After lake construction was completed, we stocked the lake following an aggressive stocking plan. Coppernose bluegill *Lepomis macrochirus* and redear sunfish *L. microlophus* were stocked at a high rate to achieve a 44:1 bream to bass ratio. In addition to the bluegill and redear sunfish, fathead minnows *Pimephales promelas*, golden shiners *Notemigonus crysoleucas*, crayfish, and threadfin shad *Dorosoma petenense* were also stocked to establish a strong forage base for bass. Northern, Florida, and F1 largemouth bass were stocked after the forage base was established. After using an outside of the box approach to stocking the lake, we continued to manage the lake aggressively, including a liming and fertilization program, bottom diffused aeration system, bathymetric mapping, supplemental feeding program, and early, strict harvest guidelines of largemouth bass. Subsequent stockings of rainbow trout and gizzard shad also took place. The lake was electrofished five times over thirty months. The results have been very promising; some bass reached five pounds in 1.5 years and over eight pounds in less than three years.

Presenter: Greg Grimes
Contact Person: Same
Type of Presentation: Oral

Evaluating age and growth of blue catfish in Kerr Reservoir, Virginia.

Nathaniel Adkins; Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061; nadkins@vt.edu

Brian Murphy; Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061; murphybr@vt.edu

Steve McMullin; Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061; smcmulli@vt.edu

Abstract.-Blue catfish, *Ictalurus furcatus*, first appeared in Kerr Reservoir sampling in the mid 1980s. Since then, population sizes have grown rapidly and the reservoir has received national attention for the world record blue catfish caught in 2010 (64.9kg). Such population growth raises questions as to whether the population dynamics of Kerr are similar to those of other water bodies. In addition, the large population and varied size structure provides opportunities for both recreational and trophy anglers. Current Virginia regulations allow the harvest of only one fish >82cm per day. Given the mixed recreational use and uncertainty over the trajectory of the population, managers need information on the dynamics of the population in order to determine whether this is an appropriate management protocol. In 2011 and 2012, we collected over 400 blue catfish from Kerr Reservoir using gillnets and experimental jugline sampling. Collected fish ranged from 217 mm to 1125 mm in length and otolith analysis aged the fish at 2 to 20 years. Von Bertalanffy growth-parameter estimation calculated an L_{∞} value = 1250mm, $k=0.09$, $t_0=-0.2$ years, and a maximum age of 27 years. These values closely match those published in 2009 studies at Wilson Reservoir, Alabama and Kentucky Lake, water bodies similar to Kerr Reservoir. Ongoing work will provide estimates of mortality and harvest to be included in models aimed at determining the effects on the population of different management decisions. These results will provide an evaluation of current regulations as well as recommendations for future management.

Presenter: Nathaniel Adkins

Contact Person: Same

Type of Presentation: Oral

**The Current Status of Oklahoma's Paddlefish Research
Center on Grand Lake Paddlefish Stock
and Implications for Harvest Management**

Brent Gordon, Oklahoma Department of Wildlife Conservation 300 S. Aquarium Drive, Jenks,
OK 74037 bgordon07@sbcglobal.net

Dennis Scarnecchia, University of Idaho, Moscow, ID 83844-1136 scar@uidaho.edu

Abstract.- Although paddlefish investigations have been conducted in Oklahoma since the 1950s, the opening of the Paddlefish Research Center (PRC) on Grand Lake in 2008 has provided us with detailed quantitative fishery information that was previously unavailable. After five years of intensive paddlefish research and stock assessment of Grand Lake paddlefish conducted jointly by the Oklahoma Department of Wildlife Conservation (ODWC) and the University of Idaho (UI). As part of this joint effort, ODWC is currently assembling and analyzing all available historical paddlefish data into a comprehensive Oklahoma Paddlefish Plan involving all Oklahoma waters and paddlefish harvest management units. Such a plan will require one or more years to complete. A sustainable plan for the species to accompany the successful roe donation/caviar processing activities at the PRC are the two critical aspects by which the ultimate success of the Oklahoma Paddlefish Management Program will be judged by state agencies, federal agencies, conservation organizations, and the public. In 2008 and 2009, the higher than anticipated angler interest and harvest in the Grand Lake paddlefish snag fishery indicates that a timely review was warranted of stock status, existing harvest regulations, and possible harvest management options which led to regulation changes in 2010 and proposed regulation changes for 2014.

Presenter: Brent Gordon
Contact Person: Same
Type of Presentation: Oral

**The difficult problem of detecting population trends
of rare fishes that occur in big rivers**

Megan Hagler; Odum School of Ecology, University of Georgia, Athens Georgia 30601;
megan@uga.edu

Mary Freeman; Patuxent Wildlife Research Center, USGS, Athens Georgia 30601;
mary@hemip.nhm.uga.edu

Bud Freeman; Georgia Museum of Natural History, University of Georgia, Athens Georgia
30601; bud@hemip.nhm.uga.edu

Abstract.-We conducted annual seine surveys of small-bodied shoal-dependent fish species at 10 shoals on the upper Etowah River from 1997-2007 with the goal of monitoring populations through time with minimal harm to imperiled species. The upper Etowah River (free-flowing above Allatoona Reservoir in north central Georgia) harbors several fish species of conservation concern, especially as suburban Atlanta grows, resulting in increased urban land use in the watershed. Target species include the federally protected amber darter (*Percina antesella*) and the state protected Coosa madtom (*Noturus* sp. cf. *N. munitus*), and several non-imperiled species. To assess evidence of trends, we used N-mixture models implemented in WinBUGS to simultaneously estimate abundance across years, while accounting for incomplete detection. Habitat features (e.g., presence of riverweed (*Podostemum ceratophyllum*) and stream flow at the time of the survey strongly influence probability of capture. Although for some species there was weak support for a trend over time (e.g., a small decline in the abundance of amber darter), credible intervals were relatively large due to low probability of capture. Further, there was weak support for evidence that population sizes were strongly influenced by natural stream flow variability, for example, the frequency of spates of high flow and duration of stable flows in spring and summer, although the Etowah did not experience extreme de-watering of shoal habitats during drought years of the study. We use these data to evaluate how useful count data from seine surveys in a large river may be for monitoring rare animals of conservation concern.

Presenter: Megan Hagler

Contact Person: Same

Type of Presentation: Oral

**Fish assemblages in connected and isolated floodplain
lakes of Bear Creek watershed, Mississippi**

Caroline Andrews; Department of Wildlife, Fisheries and Aquaculture, Mississippi State University, Mississippi State, MS 39762; candrews@cfr.msstate.edu

L.E. Miranda, US Geological Survey, Mississippi Cooperative Fish and Wildlife Research Unit, Mississippi State University, Mississippi State, MS 39762; smiranda@cfr.msstate.edu

Robert Kröger; Department of Wildlife, Fisheries and Aquaculture, Mississippi State University, Mississippi State, MS 39762; rkroger@cfr.msstate.edu

Abstract - Oxbow lakes form isolated fragments on floodplains and retain differing degrees of connectivity to neighboring rivers. Maintenance of both lacustrine and rheophilic fish communities in oxbow lakes is inherently dependent on the hydrologic landscape. We explore how hydrologic connectivity shapes fish communities in the Bear Creek watershed in central Mississippi. Bear Creek includes an assemblage of six linked pools located in former channel of the ancient Mississippi-Ohio River. Additionally, numerous other oxbow lakes span the watershed ranging in age and connectivity to the creek. Fish collections made with electrofishing in 2006-2012 indicated that in-channel lakes had similar fish communities and were characterized by rheophilic species. Conversely, fish communities in off-channel lakes often exhibited strong dissimilarities among themselves and were distinguished from in-channel lakes by the dominance of lacustrine species. From a fishery management perspective, our survey suggests a diversity of fishing opportunities are provided by the diversity of fish assemblages, and that off-channel lakes offer the greatest potential for management involvement.

Presenter: Caroline Andrews

Contact Person: Same

Type: Oral

Community structure of demersal temperate reef fish as a function of reef age and fishing pressure: A case study using low-relief artificial reefs in South Carolina

Carly Altizer; Graduate Program in Marine Biology, College of Charleston, Charleston, South Carolina 29412; carly.altizer@gmail.com

Joseph Ballenger; Marine Resources Monitoring, Assessment, and Prediction (MARMAP) – South Carolina Department of Natural Resources, Charleston, South Carolina 29412; BallengerJ@dnr.sc.gov

Bob Martore; Marine Artificial Reef Program (MARP) – South Carolina Department of Natural Resources, Charleston, South Carolina 29412; MartoreB@dnr.sc.gov

Abstract.—Though artificial reefs are frequently used to enhance fish populations, provide new recreational fishing opportunities, and mitigate habitat loss, little is known regarding the influence of reef age on artificial reef community structure. In terrestrial systems, habitat age heavily influences community structure. The effect of habitat age has not been definitively tested for fish communities at artificial reefs. Previous studies tracking succession of fish communities on new artificial reefs have used short time scales (≤ 5 years) and focused primarily on tropical reefs. This study investigates the impact ecological succession has on species richness, diversity, and fish density at two artificial reef systems in South Carolina. SCUBA video surveys of fish communities were conducted over a 13-year period (1999-2012) at an unpublished artificial reef system made of concrete cones. This reef was divided into four identical corners, with two corners experiencing controlled fishing pressure from June 1999 to November 2002. Additional SCUBA video surveys were conducted at three fished artificial reef sites made of concrete cones and balls of different ages during May-November 2012. Parameters of interest collected during the surveys included species richness, abundances, and diversity. The results show how species richness, diversity, fish density, and community structure change over time as artificial reefs age. An additional corollary is how controlled fishing pressure can affect these parameters. Fisheries managers can use these results to guide the development of management regulations to achieve optimal utilization of economically important species inhabiting artificial reefs.

Presenter: Carly Altizer

Contact Person: Carly Altizer

Type of Presentation: Oral

Juvenile paddlefish (and other mythical creatures) in Grand Lake, Oklahoma

Jason D. Schooley; Oklahoma Department of Wildlife Conservation, PO Box 1201 Jenks, Oklahoma 74037; jschooley02@sbcglobal.net

Abstract.- Responsible and sustainable management of a sport fishery requires thorough knowledge of life history. Species such as American paddlefish *Polyodon spathula*, that are long-lived and slow to mature, must be managed differently than other fish species. In northeast Oklahoma, paddlefish snag fisheries are annually enjoyed by tens of thousands of resident and nonresident anglers. Most resource management activities by Oklahoma Department of Wildlife Conservation involve large or adult paddlefish- those which are susceptible to large-mesh gill nets or snagging during spawning migrations upstream. Information on juvenile paddlefish is lacking, which delays year-class level stock assessment until the fish are reproductively mature. This paucity of data on young paddlefish in Oklahoma is largely due to the inability to capture them through methods successfully used on other populations. These various failed methodologies are reviewed here and updated with recent successes utilizing acoustic telemetry and Paupier nets. Though ODWC now maintains the largest, most extensive data set in the United States on adult paddlefish life history, this knowledge begs the accompaniment of ecological information on early life stages and evaluation of recruitment success. Through attainment of this goal, ODWC will be best equipped to preserve and maintain this fishery in Oklahoma.

Presenter: Jason D. Schooley

Contact Person: Same

Type of Presentation: Oral

**Growth of wild brown trout in the Chattahoochee River
below Buford Dam, Georgia**

Patrick O'Rourke; Georgia Wildlife Resources Division, Gainesville, Georgia 30501;
Patrick.O'Rourke@dnr.state.ga.us

Abstract- The Georgia Wildlife Resources Division (WRD) performed a tagging study from April 2011 to May 2012 to study the growth of wild brown trout in the Lanier Tailwater section of the Chattahoochee River. Sampling occurred monthly at four sites and fish were tagged through March 2012 for subsequent recapture. Growth increments between tagging and recapture events were calculated and used to estimate average length at age via an extrapolated von Bertalanffy growth curve. Brown trout appear to typically reach a "catchable" size (i.e. 200 mm TL) in slightly more than one year and reach ~250 mm TL by age three. However, it can take more than ten years for the average brown trout to reach 300 mm TL. Some individuals did display much faster growth rates which could only partially be explained by obvious variables such as seasonality, location, or size. The strong decline in growth rate among larger fish may be a result of sparse available forage in a relatively unproductive river, while the individual variability between similar fish may be a result of behavior (e.g. transition to piscivory).

Presenter: Patrick O'Rourke
Contact: Same
Type of Presentation: Oral

Influence of phylogenetic community structure on introduced fishes in the southeast United States

Matt Neilson; Cherokee Nation Technology Solutions, contracted to USGS, Southeast Ecological Science Center, 7920 NW 71st Street, Gainesville, FL 32653; mneilson@usgs.gov

Pam Fuller; USGS, Southeast Ecological Science Center, 7920 NW 71st Street, Gainesville, FL 32653; pfuller@usgs.gov

Abstract:- A central goal of invasion ecology and management efforts for introduced species is to identify both the communities that are susceptible to introduction and the likelihood of success of a species' introduction within a given community. Ecological theory suggests several potential roles for the influence of phylogenetic relatedness and community structure on a community's potential for invasion as well as the success of introduced species. For example, species in diverse communities (measured through species richness or phylogenetic diversity) likely occupy a larger portion of available niche space, thereby limiting the success of potential invaders through competition. Similarly, Darwin's naturalization hypothesis suggests that successful invaders are more distantly related to a community, potentially occupying unique niches and facing less competition from native species. Although the interplay between phylogenetic community structure/diversity and invasion success has been well studied in plant communities, few studies have examined its role in vertebrate communities, especially fishes. We examined the influence of phylogenetic community structure on invasions in fish communities in the South-Atlantic Gulf region (HUC 03). At the sub-basin (HUC8) scale, there was no relationship between number of introduced species and native species richness or phylogenetic diversity. At the basin (HUC6) scale, there was a significant negative relationship between community phylogenetic diversity and number of introduced fishes, echoing a similar (but non-significant) trend for species richness where more diverse communities had fewer numbers of introduced species. Future analyses will investigate the influence of relatedness of successful and unsuccessful invaders to native fish communities.

Presenter: Matt Neilson

Contact Person: same

Type of presentation: Oral

Introduced flathead catfish migrations and potential predation impact in a North Carolina river

Joshua K. Raabe; North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Campus Box 7617, Raleigh, NC 27695; jkraabe@ncsu.edu.

Joseph E. Hightower; US Geological Survey, North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Campus Box 7617, Raleigh, NC 27695; jhightower@ncsu.edu.

Abstract.- Introduced flathead catfish *Pylodictis olivaris* may negatively influence native fish communities as they are large-bodied, obligate carnivores. However, their migrations and feeding potential have received limited study in their introduced range. Therefore, in the springs of 2008 through 2010, we evaluated flathead catfish migrations and estimated maximum consumption in the Little River, North Carolina, a tributary to the Neuse River where introductions occurred approximately 25 years ago. We used a resistance board fish weir combined with passive integrated transponder (PIT) tags and antennas to capture, tag, and track flathead catfish. We estimated maximum consumption based on daily rations that were functions of individual size and water temperature. Flathead catfish appeared to use the Little River seasonally, as immigrations commenced in March and tagged individuals began to emigrate in June. For flathead catfish tagged in 2009, 72% were either recaptured or detected in 2010 indicating high survival and return rates. Flathead catfish primarily occupied lower river reaches, although some individuals migrated into upstream habitat (river km 77-82) during increasing flow events. For large flathead catfish (>636 mm), we estimated 2010 maximum seasonal consumption of 338 kg by the sampled population (n=146) and 916 kg by the estimated population (n=395), equating to 472 and 1278 median-sized anadromous American shad *Alosa sapidissima*. Estimated consumption was highest in May when water temperatures increased and the most flathead catfish were in the river. Flathead catfish appear capable of long migrations and negatively influencing native fish populations through direct consumption.

Presenter: Joshua Raabe
Contact Person: same
Type of Presentation: Oral Presentation

Discerning smallmouth bass movement between the James River and Blue Ridge tributaries using otolith isotope chemistry.

Sasha Doss; Biology and Environmental Studies Major, Washington and Lee University, Lexington, Virginia 24450; dosss13@mail.wlu.edu

Caroline Wass; Neuroscience Major, Washington and Lee University, Lexington, Virginia 24450; wassc14@mail.wlu.edu

Forest Behne; Biology Major, Washington and Lee University, Lexington, Virginia 24450; behnem14@mail.wlu.edu

Simon Thorrold; Fish Ecology Laboratory, Woods Hole University, Woods Hole, Massachusetts, 02543; sthorrold@whoi.edu

Robert Humston; Associate Professor of Biology, Washington and Lee University, Lexington, Virginia 24450; rhumston@wlu.edu

Abstract.- Smallmouth bass (*Micropterus dolomieu*) constitute one of the most popular recreational fisheries in Virginia. A better understanding of their dispersal and migration behavior in riverine networks will facilitate management of the fishery at the scale of basins rather than individual rivers. We conducted a study to test the effectiveness of using otolith chemistry to determine smallmouth bass movement behavior in the James River and its Piedmont region tributaries. We measured Strontium isotope ratios in the otoliths of fish via multicollector ICP-MS and compared those values against known Strontium ratios of mainstem and tributary habitats. As tributary habitats tended to be enriched in heavy strontium (^{87}Sr) compared to the mainstem, we were able to reconstruct individual histories of between-river movements for each fish. We identified substantial movement by individuals between the James and its tributaries, with movements occurring across all life history stages. Young of year dispersal was particularly common and tended to happen early in the first few months of life. Isotopic analysis offers several advantages for reconstructing movement history from otolith chemistry; however, determining the ecological function of observed movements remains an important challenge.

Presenter: Sasha Doss
Contact Person: Same
Type of Presentation: Oral

**Channel and blue catfish recruitment patterns
in Colorado River reservoirs, Texas**

Nathan G. Smith; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, 5103 Junction Highway, Mountain Home, Texas 78058; nate.smith@tpwd.state.tx.us

David L. Buckmeier; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, 5103 Junction Highway, Mountain Home, Texas 78058; david.buckmeier@tpwd.state.tx.us

Daniel J. Daugherty; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, 5103 Junction Highway, Mountain Home, Texas 78058; dan.daugherty@tpwd.state.tx.us

Abstract.- Efforts to manage catfish populations for multiple fishery goals requires the ability to identify appropriate objectives for each water body because not all waters are capable of supporting high levels of harvest or producing trophy-sized fish. We examined recruitment patterns of channel and blue catfish in four reservoirs of the Colorado River, Texas. Our objectives were to evaluate the consistency of catfish recruitment patterns, estimate the magnitude of recruitment variability, and explore correlations between recruitment variability and possible explanatory variables. Catch-curve analyses were performed on age-structured data for multiple sample years in each reservoir. Variances associated with catch-curve residuals were used to evaluate the magnitude of recruitment variability. Multiple years of catch-curve residuals were standardized and combined to estimate a weighted recruitment index for each species in each reservoir that was used to evaluate recruitment consistency and correlated with possible explanatory variables using multivariate linear regression. Annual patterns of recruitment were largely synchronous across reservoirs for both channel and blue catfish, although the magnitude of recruitment variability differed substantially among reservoirs. Recruitment variability was inversely correlated with reservoir stability, and year class strength of both species was positively correlated with rising prespawn water levels in some reservoirs. While synchronous patterns of recruitment may hinder efforts to manage each reservoir for specific fishery objectives, differences in the magnitude of recruitment variability may present opportunities for managers. Previous research suggests that greater recruitment variability may improve growth rates and fishery quality because of reduced density dependence.

Presenter: Nathan G. Smith
Contact Person: Same
Type of Presentation: Oral

Population structure and genetic characterization of American shad spawning runs in the Carolinas: using genetic tools for responsible stocking

Elizabeth Cushman; South Carolina Department of Natural Resources, Hollings Marine Lab, Charleston, SC 29412; cushmane@dnr.sc.gov

Gregory Moyer; U.S. Fish and Wildlife Service, Warm Springs Fish Technology Center, Conservation Genetics Lab, Warm Springs, GA 31830; Greg_Moyer@fws.gov

Tanya Darden; South Carolina Department of Natural Resources, Hollings Marine Lab, Charleston, SC 29412; dardent@dnr.sc.gov

Abstract. – Stocking has become an increasingly important fisheries management tool for enhancing and restoring wild populations of fishes; however, supplementation of wild populations with hatchery-produced individuals could potentially have negative impacts on the target stock's genetic fitness. A Responsible Approach to stocking calls for genetic resource management including determining the genetic status of the target stock and monitoring genetic parameters throughout the stocking effort. American shad (*Alosa sapidissima*), whose once abundant spawning runs experienced major declines throughout the 20th century, is currently being stocked in several river systems. A suite of 8 microsatellite markers was used to characterize the genetics of four spawning runs of American shad in the Carolinas (Roanoke River, Pee Dee River, Santee/Cooper basin, and Edisto River) and examine the structure between them, finding that within-river levels of genetic diversity are relatively high and that significant differences exist between some of the spawning runs. The results of this evaluation provide a current estimate of genetic diversity and structure between spawning runs of American shad in North and South Carolina, and this set of microsatellite markers can be used to monitor genetic parameters within these river systems as stocking continues. Our results, along with future work, will provide information that can be used for responsible stocking and, in general, for aiding in the recovery of this important species in the Carolinas.

Presenter: Elizabeth Cushman

Contact Person: Same

Type of Presentation: Oral

Validation of Techniques for Host Fish Studies using *Lampsilis straminea*

Kathryn Harriger; Florida Fish and Wildlife Conservation Commission, Holt, FL;
kate.harriger@myfwc.com

John Knight; Florida Fish and Wildlife Conservation Commission, Holt, FL;
john.knight@myfwc.com

Matthew Wegener; Florida Fish and Wildlife Conservation Commission, Holt, FL;
matt.wegener@myfwc.com

Abstract. – Host-fish requirements are unknown for many imperiled freshwater mussels (Unionidae), which impedes conservation efforts to protect them. The goal of our study was to design a facility for conducting host-fish studies on imperiled mussels in northwest Florida. Our facility consists of a custom aquarium system and a refrigeration system for holding potential host fish and gravid mussels, respectively. We used *Lampsilis straminea* (a common mussel species with known host fish) in our first host fish trial to evaluate the effectiveness of our facility for conducting host-fish studies. Potential host fish were exposed to *L. straminea* glochidia for 30 minutes in aerated containers of water and were then held in the aquarium system for the duration of the study. Aquaria were flushed to collect sloughed glochidia (from non-host fishes) and transformed juvenile mussels (from host fishes), which were counted and totaled for each fish species. Our facility was effective in conducting a successful host fish trial; *Micropterus salmoides* and *Lepomis macrochirus* (known *L. straminea* hosts) were identified as hosts in our study. *Micropterus punctulatus* and *Ambloplites ariommus* also produced large numbers of viable juvenile mussels, but continued research is needed to confirm these fish as hosts for *L. straminea*. Our future host-fish research and schematics of the facility will contribute valuable information to the conservation of imperiled mussels in the southeast, and may be useful to other scientists conducting host-fish studies on freshwater mussels.

Presenter: Kathryn Harriger
Contact Person: Same
Type of Presentation: Oral

Cross-population comparisons of grass carp growth: implications for hydrilla management in an Appalachian reservoir

Matthew A. Weberg; Department of Fisheries and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061; matt.weberg@gmail.com

John R. Copeland; Virginia Department of Game and Inland Fisheries, Blacksburg, VA 24060; John.Copeland@dgif.virginia.gov

Brian R. Murphy; Department of Fisheries and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061; murphybr@vt.edu

Andrew L. Rypel; Department of Fisheries and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061; andrewrypel@gmail.com

Abstract.-Somatic growth rates of grass carp (*Ctenopharyngodon idella*) are related to vegetation consumption, making it a key variable in the development of stocking models for controlling nuisance vegetation such as hydrilla (*Hydrilla verticillata*). In 2011 and 2012, age 1+ grass carp were stocked into Claytor Lake, VA to control a rapidly expanding hydrilla infestation. To investigate grass carp growth in Claytor Lake, we subsampled each stocking cohort prior to release. Mean length and weight at stocking was 393 mm and 0.60 kg in 2011, and 334 mm and 0.42 kg in 2012. The 2011 stocking cohort was 618 mm and 3.51 kg after the first year in Claytor Lake, and 717 mm and 4.65 kg after the second growing season. The 2012 stocking cohort reached 531 mm, and 1.88 kg after their first growing season in the lake. In general, growth reported for U.S. populations exceeds that reported for native populations in the Amur basin, Russia. First-year growth of the 2011 stocking cohort in Claytor Lake was comparable to other introduced U.S. populations; however a decline in growth seen in 2012 relative to other populations suggests that hydrilla reductions in this system may have begun limiting growth. Future research will incorporate Claytor Lake grass carp growth estimates with annual hydrilla biomass estimates, and observed environmental data in the development of a stocking model aimed at achieving desirable levels of hydrilla control.

Presenter: Matthew Weberg

Contact Person: Same

Type of Presentation: Poster

**Comparison of sympatric redbreast sunfish and bluegill
sunfish populations in Nickajack Creek, Georgia**

Nekeshia N. Griffin; Department of Biology and Chemistry, Southern Polytechnic State University, Marietta, Georgia 30060; ngriffin@spsu.edu

Peter C. Sakaris; Department of Biology and Chemistry, Southern Polytechnic State University, Marietta, Georgia 30060; psakaris@spsu.edu

Abstract.-The purpose of this study is to compare seasonal abundances, age, growth, and condition of redbreast sunfish and bluegill sunfish in Nickajack Creek, Georgia. We used backpack electrofishing to sample for sunfishes from four pool habitats in Summer and Fall 2012. Fish were measured (mm TL) and weighed (g), and a minimum of three scales were removed from each fish. Shock time (s), water temperature (°C), water depth (cm), and transect length (m) were recorded at each sampling location. In summer, a total of 19 bluegill sunfish and 64 redbreast sunfish were collected. Mean lengths of bluegill sunfish and redbreast sunfish were 124 and 111 mm TL, respectively. Bluegill sunfish lengths ranged from 94 to 149 mm TL, while redbreast sunfish lengths ranged from 42 to 176 mm TL. In Fall, a total of 19 bluegill sunfish and 147 redbreast sunfish were collected. Mean lengths of bluegill sunfish and redbreast sunfish were 117 and 90 mm TL, respectively. Bluegill sunfish lengths ranged from 88 to 160 mm TL, while redbreast sunfish lengths ranged from 21 to 180 mm TL. We discovered a significant interaction in CPUE (no. fish/min) between season and species, with a substantial increase in redbreast sunfish CPUE and minimal change in bluegill sunfish CPUE from summer to fall. Length-frequency comparisons indicated the presence of a strong age-0 year class for redbreast sunfish, but no indication of recruitment for bluegill sunfish. We will compare age, growth, and condition between species and conduct spring sampling to obtain fecundity estimates.

Presenter: Nekeshia Griffin
Contact Person: Peter Sakaris
Type of Presentation: Oral

**Estimating effects of hypoxia dynamics on growth
of juvenile spot in nursery areas**

Lindsay A Campbell, North Carolina State University, Raleigh, NC 27695; laglass@ncsu.edu

James A Rice, North Carolina State University, Raleigh, NC 27695; jim_rice@ncsu.edu

Russell J Borski, North Carolina State University, Raleigh, NC 27695; Russell_borski@ncsu.edu

Abstract.- In North Carolina and elsewhere there is concern that excessive nutrient loading and resulting hypoxic conditions in coastal ecosystems are adversely affecting native fauna, but quantifying the effects on fish can be difficult. Hypoxia may reduce fish growth via direct exposure, or indirectly (e.g., costs of avoidance, reduced food availability, density-dependent effects in oxygenated refuges). Given the fine spatial and temporal scale of oxygen dynamics in estuarine habitats, evaluating the impacts of hypoxia on fish growth requires short-term growth indicators that integrate the effects of rapidly changing environmental conditions. To address this need, we experimentally determined the sensitivity and response time of a suite of bioindicators of recent growth (RNA:DNA ratio and RNA concentration in muscle tissue, insulin-like growth factor-I mRNA expression in the liver, Hepatosomatic Index, and Fulton's K) to changes in specific growth rate of juvenile spot *Leiostomus xanthurus*. A model based on multiple bioindicators was better at estimating growth rate than models based on individual indicators. We used this model to estimate recent growth rates of juvenile spot collected from the Neuse River estuary and related them to recent DO conditions. Estimated growth rates of spot collected after a week of Good DO conditions were almost twice those of spot collected after a week of Poor DO conditions. Using these results and DO data from the Neuse River estuary in 2007-2010, we estimated that hypoxia dynamics reduced growth of spot over the summer 6-18% in these years relative to growth under constant Good DO conditions.

Presenter: Lindsay Campbell

Contact person: same

Type of presentation: Oral

**Global Population Genetics of Cobia and Potential Implications
for Offshore Marine Aquaculture Operations**

Maggie Jamison; SC DNR, Marine Resource Research Institute, Charleston, SC 29412;
JamisonM@dnr.sc.gov

Justin Yost; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
Yostj@dnr.sc.gov

Karl Brenkert; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
Brenkertk@dnr.sc.gov

Michael R. Denson; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
Densonm@dnr.sc.gov

Tanya Darden; SC DNR, Marine Resources Research Institute, Charleston, SC 29412;
Dardent@dnr.sc.gov

Abstract - Cobia, *Rachycentron canadum*, is a pelagic, migratory species with a cosmopolitan distribution throughout tropical and subtropical waters. Commercial and recreational cobia harvests from the Gulf of Mexico and Atlantic waters generally have been declining since 1996. Recreational fishing pressure on cobia has increased substantially during this period, especially in areas where they exhibit annual inshore aggregations, making them susceptible to overfishing. Although cobia are currently managed as a single fishery within US waters, the genetic composition of cobia population(s) is not clear. The ultimate goal of our project is to assess potential genetic risks associated with offshore marine aquaculture operations for cobia based on life history and population genetic data. Using a suite of ten optimized and multiplexed microsatellite markers, to date we have genotyped a large sample collection of cobia provided by an established local, national and global network of colleagues. The genetic data were evaluated to elucidate patterns of both local (southeastern Atlantic U.S. coast and Gulf of Mexico) and global (U.S., South Africa, Australia, India, and Thailand) gene flow. Results will be incorporated with life history data to evaluate the genetic risks of net pen culture in a global context.

Presenter: Maggie Jamison

Contact Person: same

Type of Presentation: Oral

**North Carolina's Hurricane Response Plan: Managing
Largemouth Bass in a Dynamic Environment**

Jeremy McCargo; North Carolina Wildlife Resources Commission, Raleigh, NC 27699;
jeremy.mccargo@ncwildlife.org

Chad Thomas; North Carolina Wildlife Resources Commission, Raleigh, NC 27699;
chad.thomas@ncwildlife.org

Kevin Dockendorf; North Carolina Wildlife Resources Commission, Raleigh, NC 27699;
kevin.dockendorf@ncwildlife.org

Abstract.—Numerous hurricanes and tropical storms, including Hurricane Fran in 1996, Floyd in 1999, Isabel in 2003, and most recently Irene in 2011, have caused significant fish kills in North Carolina's coastal rivers. As each storm passed, rapid flushing of hypoxic water and organic solids from backwater habitats into tributaries and rivers resulted in increased biological oxygen demand, a subsequent decrease in dissolved oxygen, and in turn, fish kills. Flooding from Hurricane Irene in 2011 created anoxic conditions for up to 30 days in many coastal systems. Results from population monitoring and stocking evaluations following previous hurricane-induced fish kills were used to develop a hurricane response plan that was first implemented following Hurricane Irene. The response plan included monitoring to document the extent of poor water quality and fish kills as well as sportfish population surveys 1 month, 6 months and 12 months following the storm. This step-wise approach afforded the ability to consider various management strategies intended to bolster Largemouth Bass *Micropterus salmoides* size structure and abundance. Partnerships with multiple federal and state agencies in addition to communication efforts with angling groups and other stakeholders were an important part of the response plan. Given the increase in the frequency of cyclones, management of Largemouth Bass in coastal North Carolina now centers on our ability to assess the extent of the kill areas following storm passage, understand natural recovery mechanisms, and consider and implement a wide range of strategies to expedite recovery.

Presenter: Jeremy McCargo

Contact Person: Same

Type of Presentation: Oral

**Riverine Smallmouth Bass Management: Historic and Current Efforts
for Western North Carolina Rivers and Streams**

David W. Goodfred; North Carolina Wildlife Resources Commission, 645 Fish Hatchery Road, Marion, North Carolina 28752; david.goodfred@ncwildlife.org

Amanda M. Bushon; North Carolina Wildlife Resources Commission, 20830 Great Smoky Mountain Expressway, Waynesville, NC 28786; Amanda.bushon@ncwildlife.org

Kevin J. Hining; North Carolina Wildlife Resources Commission, 4304 Highway 16 South, Moravian Falls, NC 28654; kevin.hining@ncwildlife.org

David L. Yow; North Carolina Wildlife Resources Commission, 57 Hill Top Road, Asheville, NC 28803; david.yow@ncwildlife.org

Abstract.—Rivers and streams containing viable Smallmouth Bass *Micropterus dolomieu* populations provide important fishery resources. Consequently, North Carolina Wildlife Resources Commission (NCWRC) began a three-year study to obtain riverine Smallmouth Bass data in western North Carolina. Study objectives were to identify Smallmouth Bass populations, collect life history information, and evaluate management opportunities. Fish were collected using a variety of sampling gears, including boat, cataraft, and backpack electrofishing, angling, and seines. During summer (May–September) 2007, 2008, and 2009, NCWRC personnel collected 2,859 total Smallmouth Bass, respectively. Smallmouth Bass total lengths ranged from 30 to 495 mm, with mean PSD, PSD-P, and PSD-M values of 24, 7, and 1. Relative weight values ranged from 59 to 140 (mean = 89; SE = 0.2). Sixteen age-classes were observed; however, the majority (71%) of fish were younger than age 3. Annual mortality (*A*) estimates ranged from 35% to 85% (mean = 60%; SE = 4.2) and were highest between age-1 and age-3 year-classes. Growth varied among Smallmouth Bass collections; however, fastest growth was observed among Atlantic drainage streams. The FAST Dynamic Pool Model was used to evaluate how changes in growth, natural mortality, and fishing mortality would affect Smallmouth Bass population responses to four minimum-size limits and two protective slot limits. Data incorporated from this study and angler feedback were used to guide recent regulation management decisions. In addition, information gathered through this research serves as a public outreach tool, informing stakeholders of Smallmouth Bass fishing access locations and site descriptions.

Presenter: David Goodfred
Contact Person: Same
Type of Presentation: Oral

ABSTRACT 13116

Feeding Ecology of Adult Red Drum from Coastal Waters of South Carolina: Dietary Changes as a Response to Spatial Differences in Prey Assemblages

Tyler Peacock, Department of Biology, East Carolina University, Greenville, North Carolina, 27858 peacockt11@students.ecu.edu

Anthony Overton, Department of Biology, East Carolina University, Greenville, North Carolina, 27858 overtona@ecu.edu

Steve Arnott, South Carolina Department of Natural Resources, Charleston, South Carolina, 29422 arnotts@dnr.sc.gov

Bill Roumillat, South Carolina Department of Natural Resources, Charleston, South Carolina, 29422 roumillatb@dnr.sc.gov

Abstract- Fisheries management plans have traditionally discounted the importance of predation mortality compared to fishing mortality, leading to reliance on incomplete information when policies are made. Holistic and multi-species management plans require characterization of the trophic relationships for a full understanding of the system. We characterized the trophic relationships of large adult red drum (>750mm TL), *Sciaenops ocellatus*, and their prey species in the coastal waters of South Carolina from 2007-2010 sampling years. Red drum were collected by the South Carolina Department of Natural Resources longline survey from several sampling locations along the South Carolina coast: Winyah Bay, Charleston Harbor, Saint Helena Sound, and Port Royal Sound. There were significant differences in % biomass contribution of stomach contents by location, shifting from Atlantic menhaden, *Brevoortia tyrannus*, to benthic invertebrates such as coarse handed lady crabs, *Ovalipes stephensoni*, Atlantic mud crabs, *Panopeus herbstii*, and stone crabs, *Menippe merceneria*. In Winyah Bay and Charleston Harbor, red drum fed heavily on Atlantic menhaden (24% and 30%, respectively, of consumed biomass), while in Saint Helena Sound near shore marine crab species constitute 35% of the consumed biomass. Port Royal Sound samples were evenly distributed between prey groups. Salinity changes and patchy pelagic prey distribution may affect the available prey assemblage, with Charleston Harbor at 32.9 ppt, Winyah Bay at 28.5 ppt, Port Royal Sound at 36.1 ppt, and Saint Helena Sound at 33.9 ppt. This information will aid in future fisheries management plans for red drum and the diverse prey species they consume.

Presenter: Tyler Peacock

Contact Person: Same

Type of presentation: Oral

**Use of Occupancy Models to Determine Seasonal Distribution
and Habitat Use of Stocked Robust Redhorse in the
Upper Reaches of the Ocmulgee River, Georgia**

William A. Pruitt; Georgia Cooperative Fish and Wildlife Research Unit, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Georgia 30602;
pruittw@forestry.uga.edu

James T. Peterson; USGS, Oregon Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon 97331;
jt.peterson@oregonstate.edu

Cecil A. Jennings; USGS, Georgia Cooperative Fish and Wildlife Research Unit, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Georgia 30602;
jennings@uga.edu

Abstract - Robust redhorse is an imperiled, migratory freshwater fish predominantly occupying large rivers in the Atlantic coastal plain regions of Georgia and the Carolinas. As part of a Candidate Conservation Agreement with Assurances (CCAA), robust redhorse were stocked into the upper Ocmulgee River to establish a refugial population within the piedmont region of Georgia above a major migration barrier. Previous studies on this population revealed that robust redhorse capture probability was extremely low, and other methods (e.g., occupancy models) should be explored to determine the status of the Ocmulgee River population. To determine habitat use and distribution of robust redhorse, fish capture data, physical in stream habitat, and water quality data were incorporated into occupancy models, and the scale of influence of various habitat characteristics on robust redhorse distributions were evaluated. Confidence set of occupancy models revealed robust redhorse had an average conditional detection probability of 0.518 (± 0.046). Detection was much higher than expected; however, occupancy was 0.281 (± 0.049) in units containing shoals with substrates dominated by bedrock and gravel and 0.038 (± 0.011) in non-shoal habitats containing large portions of woody debris. Our results suggest that fish are either (1) residing in the high-gradient, inaccessible shoals that contain large amounts of coarse substrates, or (2) robust redhorse have left the project site entirely, are unable to reenter the project site, and now occupy coastal plain habitats similar to those used by robust redhorse populations in other coastal plain rivers.

Presenter: William Pruitt

Contact Person: Same

Type of Presentation: Oral

**Empirical assessment of angler effort dynamics
in marine recreational fisheries**

Edward Camp, Fisheries and Aquatic Sciences Program, University of Florida, Gainesville, Florida 32605; edvcamp@ufl.edu

Kai Lorenzen, Fisheries and Aquatic Sciences Program, University of Florida, Gainesville, Florida 32605; klorenzen@ufl.edu

Robert Ahrens, Fisheries and Aquatic Sciences Program, University of Florida, Gainesville, Florida 32605; rahrens@ufl.edu

Micheal Allen, Fisheries and Aquatic Sciences Program, University of Florida, Gainesville, Florida 32605; msal@ufl.edu

Abstract. Recreational fisheries are increasingly recognized for both their substantial socioeconomic value and their potential to impact fish populations and ecosystems, largely via fishing mortality. Both these components depend in large part on fishing effort, which is commonly assumed proportional to some perceived quality of fishing. However, empirical assessments quantifying how effort is related to proxies of fishing quality or other metrics are scarce. In this study we assessed the relationships between estimated angler effort and a common proxy for perceived fish abundance, catch-per-unit-effort (CPUE) for a suite of key marine species in Florida. Using mixed models, we accounted for effects of species of fish targeted, temporal patterns and spatial regions to predict general fishing effort as a function of CPUE. Our results suggested effort is positively related to CPUE, but this relationship was weaker than expected. Additionally, the strength of this relationship varied substantially among even similar species. These results may have substantial implications for the suite of potential management strategies employed towards the end of optimizing trade-offs in recreational fisheries (e.g., stock enhancement, effort limitation, etc.).

Presenter: Edward Camp

Contact Person: Same

Type of Presentation: Oral

**Modeling Growth of Juvenile Blue Crabs
in the Wild by Using Coded Wire Tags**

Laila Melendez: University of Houston Clear Lake – Environmental Institute of Houston: 2700 Bay Area Boulevard, Houston, TX 77058; melendezlg@uhcl.edu

Glen Sutton: Texas Parks and Wildlife (TPWD) – Dickinson Marine Lab: 1502 Pine Avenue, Dickinson, TX 77539 glen.sutton@tpwd.state.tx.us

George Guillen: University of Houston Clear Lake – Environmental Institute of Houston: 2700 Bay Area Boulevard, Houston, TX 77058; guillen@uhcl.edu

Abstract.- The blue crab (*Callinectes sapidus*) is both ecologically and economically important to the coastal states of the Atlantic and Gulf of Mexico. Although most of blue crab life history has been described, there is still a lack of data concerning crab's growth parameters and patterns in the wild, making it harder to obtain an overall understanding of their population dynamics. Because blue crabs lack hard body parts commonly used to estimate age, such as otoliths and scales, they are difficult to age. Consequently, an age-based growth model cannot be calculated. Instead, incorporating growth increments into the growth model provides a better estimation of population growth parameters. Using micro Coded Wire Tags (CWT), we internally tagged juvenile blue crabs larger than 15 mm. CWT have previously been used to mark blue crabs because they are not shed between ecdysis (Fitz and Wiegart 1991). To compare growth trends of the blue crab in the wild versus in an enclosure, we also documented the growth of 24 blue crabs that were isolated in minnow traps. We fed half of the enclosed individuals weekly to observe the effects of food intake on growth. Using dates and size at mark and recapture events, growth curves were compared using variations of the Von Bertalanffy model, including Fabens, Munro, and Appeldoorn models. Salinity and water temperature are parameters known to influence blue crab's growth rates and were, therefore, monitored throughout the experiment. The effects of these parameters and seasonality on the growth of blue crabs were compared and will be presented.

Presenter: Laila Melendez
Contact Person: Laila Melendez
Type of presentation: Oral.

**Relationships between climate indices, water temperature
and estuarine fish populations in South Carolina**

Stephen A. Arnott; Marine Resources Research Institute, SC Department of Natural Resources,
PO Box 12559, Charleston, SC, 29422-2559; arnotts@dnr.sc.gov

J. David Whitaker; Marine Resources Research Institute, SC Department of Natural Resources,
PO Box 12559, Charleston, SC, 29422-2559; whitakerd@dnr.sc.gov

Abstract.- Climate variation has major effects on marine ecosystems. Understanding these effects is vital for ecosystem based management plans that address future climate change scenarios. This study examined relationships between large-scale climate indices and localized time series of water temperature (1950-present) and estuarine fish populations (1991-present) in Charleston Harbor, South Carolina. Mean annual water temperature increased by $\sim 0.13^{\circ}\text{C}$ per decade from 1950 to 2011, while spring temperature thresholds shifted to earlier in the year and fall temperature thresholds shifted to later in the year. Summer water temperatures were correlated with the Atlantic Multi-Decadal Oscillation (AMO), whereas winter temperatures were influenced by the Arctic Oscillation (AO), the North Atlantic Oscillation (NAO), and the El Niño - Southern Oscillation (ENSO). Water temperature was most variable during the winter months. Certain fish species that overwinter in near-shore habitats (e.g. spotted seatrout and silver perch) declined sharply after severe (cold) winters. These climate-driven population changes appear to have had broader effects on other species in the ecosystem, presumably due to trophic interactions, but the mechanisms involved are not yet fully understood.

Presenter: Stephen A. Arnott
Contact Person: Same
Type of Presentation: Oral

**Evaluation of Striped Bass stockings in Coastal
North Carolina with Microsatellite Markers**

Kevin Dockendorf; North Carolina Wildlife Resources Commission, Raleigh, NC 27699;
kevin.dockendorf@ncwildlife.org

Jeffrey Evans; North Carolina Wildlife Resources Commission, Raleigh, NC 27699;
jeff.evans@ncwildlife.org

Tanya Darden; South Carolina Department of Natural Resources, Charleston, SC 29412;
DardenT@dnr.sc.gov

Abstract.—Supplementation of anadromous Striped Bass *Morone saxatilis* stocks with hatchery-produced fry and fingerlings is a common fisheries management strategy. Evaluation of each stocking program is essential and often conducted with various tagging methods, including external tags, internal marks or a combination of external and internal tags. With advances in genetic microsatellite markers, genotyping broodstock from hatcheries provides a non-lethal and reliable marking method to ascertain hatchery origin and contribution to spawning stock as well as recreational and commercial fisheries. Our program currently utilizes donor striped bass broodstock from coastal rivers where stocking is intended for enhancement. Our interests focus on improving our understanding of hatchery contribution to each of these systems as well as monitoring movement among coastal North Carolina rivers. Fin clips from all adult Striped Bass utilized in hatchery production in 2010 and 2011 were genotyped to establish a unique genetic mark for each broodstock tank. These sets of markers were then compared to at-large candidates of potential stocked cohorts collected from the wild in spring of 2011 and 2012. Recovered progeny of hatchery origin from two coastal rivers were positively identified to individual broodstock spawning tanks. Initial results support the utilization of genetic markers as a viable evaluation tool for North Carolina's Striped Bass stocking program.

Presenter: Kevin Dockendorf

Contact Person: Same

Type of presentation: Oral

**Current efforts to understand crayfish distributions
and status within the Tennessee River system**

Jeffrey W. Simmons; Biological and Water Resources, Tennessee Valley Authority,
Chattanooga, Tennessee 37402; jwsimmons0@tva.gov

Abstract.- North America is home to almost 80% of the world's crayfish diversity, and approximately 75% of this diversity occurs within the southeastern United States. More specifically, the aquatic environments of Tennessee and Alabama contain more crayfish species than any other state. In this region, crayfish have not received as much attention as fish and mussels, thus large gaps exist in current understanding of taxonomy, distribution, and conservation status of many species. New species are being described each year, indicating that much more work is needed to adequately understand species occurrences within this diverse region. Focused efforts to document occurrences of native and non-native crayfish species within the Tennessee River system have been conducted by Tennessee Valley Authority (TVA) biologists during recent years. Observations of life-history traits, such as reproductive condition, fecundity, and habitat use were recorded. Voucher specimens retained during these efforts are being cataloged into a museum collection at TVA. Greater than 1200 lots have been identified and cataloged, which represent only half of current TVA collections. Sixty-five described species and several undescribed species are currently represented in the collection. These data are being shared with various fish and wildlife agencies and other crayfish biologists to further the understanding of both native and introduced crayfish distributions within this diverse river system. Several previously unknown species have been discovered during these efforts and are in the process of taxonomic evaluation.

Presenter: Jeff Simmons

Contact Person: Same

Type of Presentation: Oral

**Movement and Behavior of the New Zealand
Eagle Ray, *Myliobatis tenuicaudatus***

Jonathan Davis; Nekton Research Lab, University of New Orleans, New Orleans, LA 70148;
jldavis7@uno.edu

Abstract.- The ability of intertidal species to navigate through shallow estuarine habitats while orienting themselves in a mostly featureless environment is a continuing area of scientific interest. The New Zealand eagle ray (*Myliobatis tenuicaudatus*) is one of these intertidal species that has developed the ability to utilize highly productive intertidal habitats and avoid stranding. It has been suggested that the use of tidal information, particularly orientation to water current, may be used to avoid stranding on an outgoing tide. The movements of *M. tenuicaudatus* in relation to the tidal change were assessed by tracking individuals in an estuary. Data were analyzed using GPS data-loggers, telemetry transmitter and receivers, and software for behavioral modeling. The modeling divided movements into transiting or 'area-restricted behavior' (ARB) according to breaks in movement trajectories determined by changes in speed or heading angle. When the rays moved in a general direction without stopping the movement is categorized as transiting, while speed changes, extended periods of no movement, and abrupt direction changes are classified as ARB. The models show a definitive use of the tides for transiting movement in and out of the estuary during rising and falling tides. The movement data also show that *M. tenuicaudatus* rests and feeds in channels of the lower part of the estuary at low tide while occurring over the mudflats in different areas at times of high tide.

Presenter: Jonathan Davis

Contact Person: Same

Type of Presentation: Oral

**Red drum occurrence in an urban waterway
(Bayou St. John, New Orleans) and its relation to potential
prey abundances and changes in water quality variables.**

Patrick Smith; Nekton Research Laboratory, University of New Orleans, New Orleans,
Louisiana 70148; pwsmith@uno.edu

Abstract.-Red drum (*Sciaenops ocellatus*) occurrence and its relation to potential prey abundances and changes in water quality variables were analyzed from August to December 2010 in Bayou St. John (BSJ) as part of fishery restoration efforts. The occurrences of seven fish fitted with internal transmitters were documented by receivers moored at three sites along BSJ. Available prey abundances were estimated monthly using minnow traps which targeted a local crab species (*Rhithropanopeus harrisii*). Littoral fish assemblages were also assessed as potential prey. Continuous water quality variables (temperature, salinity, depth, conductivity, and dissolved oxygen) were measured at one location and were used to estimate temporal change. If there were no relations among these variables, then red drum occurrences, *R. harrisii* abundances, and littoral fish assemblages should not differ among sites. In addition, occurrences were compared to water quality variables by generalized estimating equation model reductions. Red drum did not occur equally among sites, preferring more northern habitats (ANOVA, $F=186.1$, $p < 0.001$; all pairwise p -values < 0.001). The abundances of *R. harrisii* did not differ significantly, while littoral fish assemblages did (Kruskal-Wallis, $X^2 = 2.3875$, $p = 0.3031$; ANOSIM, Global $R = 0.266$, $p \leq 0.001$; respectively). Temperature was found to be the best predictor overall for red drum occurrence in BSJ, whereas salinity and change in depth also were good predictors for certain sites. In BSJ, red drum appear to use some habitats over others and this information can be used to improve overall habitat quality in this urban waterway.

Presenter: Patrick Smith
Contact Person: Same
Type of Presentation: Oral

The effect of turbidity on young-of-year spotted gar

Bryan Frenette; Department of Biology, University of Oklahoma, Norman, Oklahoma 73071;
bryan.d.frenette-1@ou.edu

Abstract.- Lepisosteids are top level predators whose populations are in decline across much of North America. In Canada, the Spotted Gar (*L. oculatus*) has been listed as a threatened species. Increasing turbidity in Lake Erie has been suggested as a reason for decline of Spotted Gar in Canada, due to decreased growth rates in more turbid waters, particularly in the first year of life. To examine effects of turbidity on growth rates in the first year of life, I plan to assess rate of growth of young-of-year Spotted Gar over several months under several treatment levels of turbidity. I aim to assess if turbidity does impact the rate of growth in these fish, and at what level an effect begins to manifest. The intent of this poster presentation will be to outline my project goals and procedure in order to receive feedback on the design from experts in the fields of aquaculture and fisheries biology.

Presenter: Bryan Frenette

Contact Person: Same

Type of Presentation: Poster

Genomic Approaches to Understanding Behavioral Responses of Freshwater Mussels to Drought

Eric Peatman, Department of Fisheries and Allied Aquacultures, Auburn University, AL 36849; peatmer@auburn.edu

Andrew Gascho Landis, Department of Fisheries and Allied Aquacultures, Auburn University, AL 36849; amg0016@tigermail.auburn.edu

Chao Li, Department of Fisheries and Allied Aquacultures, Auburn University, AL 36849; czl0020@auburn.edu

James Stoeckel, Department of Fisheries and Allied Aquacultures, Auburn University, AL 36849; jas0018@auburn.edu

Abstract.- The southeastern US has experienced recurrent drought during recent decades. Increasing demand for water, as precipitation decreases, exacerbates stress on the aquatic biota of the Southeast: a global hotspot for freshwater mussel, crayfish, and fish diversity. Freshwater unionid mussels are ideal candidates to study linkages between ecophysiological and behavioral responses to drought. Previous work on co-occurring mussel species suggests a coupling of physiology and behavior along a gradient ranging from intolerant species such as *Pyganodon grandis* (giant floater) that track receding waters and rarely burrow in the substrates to tolerant species such as *Unio merus tetralasmus* (pondhorn) that rarely track receding waters, but readily burrow into the drying sediments. We utilized a next-generation sequencing-based RNA-seq approach to examine heat/dessication-induced transcriptomic profiles of these two species in order to identify linkages between patterns of gene expression, physiology and behavior. Sequencing produced over 425 million 100 bp reads. Using the *de novo* assembly package Trinity, we assembled the short reads into 321,250 contigs from giant floater (average length 835 bp) and 385,735 contigs from pondhorn (average length 929 bp). BLAST-based annotation and gene expression analysis revealed 2,832 differentially expressed genes in giant floater and 2,758 differentially expressed genes in pondhorn including a full complement of genes with known roles in heat shock and antioxidant responses. Pathway and comparative enrichment analyses between the two species are currently underway and will be discussed. Results will provide valuable insight as to the genetic and physiological basis of emergent behavioral phenotypes and species guilds in drought prone habitats.

Presenter: Eric Peatman
Contact Person: Same
Type of Presentation: Oral

**Quantification of the effects of fluctuating discharge
on temperature regimes below R. L. Harris Dam**

Elise. R. Irwin; USGS, Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, AL 36849; eirwin@usgs.gov

Emily Nichols; Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, AL 36849; ekn0001@auburn.edu

Abstract.- Adaptive management below R.L. Harris Dam, a hydropeaking facility on the Tallapoosa River, Alabama has been ongoing since spring 2005. Discharge has been experimentally manipulated at the dam to benefit multiple competing objectives of stakeholders (e.g., fish populations, boatable days, power production, and reservoir lake levels). Because water discharged through the turbines is drawn from depth in the reservoir, river water during power production is depressed. To quantify the effects of discharge on temperature regimes discharge data (2005-2012) were obtained from a USGS gage located below the dam and hourly temperature data were collected using temperature loggers at the same site. Similar data were collected in the unregulated upper river (above Harris Lake) and in Hillabee Creek, a large unregulated tributary. Water temperatures associated with power production are cooler versus water temperatures at unregulated sites. In addition, variation in temperature regime is drastic and includes up to a 10°C decrease in a short period of time (< 1 h). Subsequent re-warming of the river to pre-discharge maximum temperatures is prolonged (days). The effects of this alteration of the thermal regime on river fauna may include impacts to spawning, growth, survival and health. Because the tailwater supports a warm-water fish and invertebrate community, these impacts may be severe. These discharge-temperature data will be used to further refine flow regimes below Harris Dam consistent with stakeholder objectives in the adaptive management program.

Presenter: Elise Irwin

Contact Person: Same

Type of Presentation: Oral

Effects of experimentally fluctuating flows and water temperatures on early growth and survival juvenile of channel catfish, *Ictalurus punctatus* and Alabama bass *Micropterus henshalli*.

Taconya D. Goar; Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, AL 36849; pipertd@auburn.edu

Elise. R. Irwin; USGS, Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, AL 36849; eirwin@usgs.gov

Abstract.- We examined the effects of flow variation and decreased water temperatures on the early growth and survival of young-of-year (YOY) Alabama bass *Micropterus henshalli* and channel catfish *Ictalurus punctatus*, during three 28-d laboratory experiments. Twelve 38-L aquaria were fitted with Plexiglass inserts and variable flow water pumps to simulate high-velocity water flow conditions similar to those below R.L. Harris Dam, a hydropeaking facility on the Tallapoosa River, Alabama. Temperature was also manipulated to simulate daily declines associated with high water flow. Each experiment was designed with four treatments with three replicates: 1) high flow/decreased water temperatures; 2) high flow /ambient water temperatures; 3) pulsed flow/decreased water temperatures; and 4) control (constant flow/ambient water temperatures). Sixty YOY fish were stocked in each experimental tank and treatments for each tank were randomly assigned. We observed significant and early declines in survival among high flow/decreased temperature treatments and slower growth in high velocity-cold water treatments. The results from these experiments will be incorporated into models used to prescribe suitable flows below Harris Dam during spawning seasons and early growth periods.

Presenter: Taconya Goar

Contact Person: Same

Type of Presentation: Oral

**Effects of a Declining Hydrograph on Instream Habitats
and Fish Communities in a Semi-Arid Karstic Stream**

Stephen G. Curtis; Texas State University – San Marcos, Texas 78666; sc1556@txstate.edu

Kenneth P. Behen; Texas State University – San Marcos, Texas 78666; kb1716@txstate.edu

Timothy H. Bonner; Texas State University – San Marcos, Texas 78666; TBonner@txstate.edu

Abstract.- Low to subsistence flows are natural components of riverine hydrographs and are recommended to be maintained under the Natural Flow Paradigm. In Texas, subsistence flows are hydrologically defined as the 95th percentile of all daily mean flows in a historical hydrograph and biologically defined as discharge necessary to maintain biological communities for a short time period. Objective of this study was to quantify biological and habitat responses of a Texas stream community as the system transitioned from low base flows to subsistence flows with the purpose of assessing if the hydrological definition of subsistence flows is adequate to maintain biological communities. As the lower reach transitioned towards subsistence flows, instream mesohabitats increased in water temperature and conductivity and decreased in current velocity. Changes in biotic indices (CPUE, richness, diversity and evenness) were not detected. Fishes with affinities for specific habitat types (i.e., riffles, runs, pools) maintained similar habitat affinities. However in the lower reach, riffle specialists were restricted to current velocities > 0.6 m/s less than those in the upper reach and run specialists to current velocities > 0.4 m/s less than those in the upper reach. Following subsistence flows, flows within the lower reach ceased and the reach rapidly dewatered. Up to drying, our results suggest that subsistence flows were effective in maintaining biological communities based on the conditions observed and limitations encountered during our period of observations.

Presenter: Stephen Curtis

Contact Person: Same

Type of Presentation: Oral

**Variations in community fish production across
the southern Appalachians: implications for climate change**

Bonnie Myers, Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061; embonn8@vt.edu

C. Andy Dolloff, Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061; adoll@vt.edu

Andrew L. Rypel, Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA; andrew.rypel@wisconsin.gov

Abstract. - Climate change is thought to be a leading driver in the erosion of biodiversity and ecosystem sustainability at all scales. However little is known on how diverse ecosystems actually respond to temperature change. We used annual secondary production estimates of entire Appalachian stream fish assemblages to assess relationships between ecosystem function and climate at a large spatial scale. During summer 2012, we collected fish biomass, somatic growth, and habitat data for whole assemblages in 25 Appalachian streams spanning from Vermont to North Carolina. Average biomass of fish communities ranged from 0.7 to 12.0 g/m² in the northern sites and 0.9 to 5.0 g/m² in the southern sites. We also found a strong positive relationship between α -diversity (e.g., species richness) and average community biomass ($R^2=0.53$). Ultimately, estimates of annual fish assemblage production will be related to continuous temperature data being logged at each site while attempting to account for other potential covariates of production (e.g., habitat complexity, stream size, nutrient availability). This study will provide rare empirical estimates of whole assemblage production and how this aggregate ecosystem function, as well as species-specific production rates might respond to increasing temperatures.

Presenter: Bonnie Myers

Contact Person: Same

Type of Presentation: Poster

**Spawning habitat and bed success of shoal bass
Micropterus cataractae in the Chipola River, FL**

Ted Alfermann; Florida Fish and Wildlife Conservation Commission, 5300 High Bridge Rd., Quincy, FL 32351; ted.alfermann@myfwc.com

P. Andrew Strickland; Florida Fish and Wildlife Conservation Commission, 5300 High Bridge Rd., Quincy, FL 32351; andy.strickland@myfwc.com

Abstract - Shoal bass *Micropterus cataractae* are classified as a “species of greatest conservation need” by Florida’s Wildlife Legacy Initiative, and the Chipola River maintains the only reproducing population in the state. To relate shoal bass reproductive success with habitat features, we located 40 shoal bass spawning beds in a 6.5 km reach of the Chipola River, Florida from April-May 2012. Egg and fry counts, macrohabitat type, depth, temperature, latitude/longitude, and current velocity were recorded at the beds. Humminbird[®] side-imaging[®] sonar was used to classify bottom substrate into four categories: bedrock, boulder (> 35 cm diameter), rocky fine (5-35 cm diameter), and sand/gravel (<5 cm diameter). The percent availability of each macrohabitat type was then calculated based on the area of each habitat type divided by the total area of the mapped reach. Bedrock was the most abundant macrohabitat available (38.1%), followed by rocky fine (27.0%), boulder (17.2%), and sand/gravel (16.5%). Shoal bass used macrohabitats that were significantly different from that available (chi-square value (X^2) = 45.8, $p < 0.001$). Rocky fine and boulder accounted for 95% of habitat use. Estimated mean egg production was 698 ± 199 (95% CI), mean fry count was 324 ± 115 (95% CI), and mean success percentage was estimated at 36.4%. Using multiple regression, we found no environmental variables to significantly predict egg-to-fry; however, the mean number of hatched fry in a bed appeared to decrease with increased water surface velocity. This information will be used to identify potential restoration/protection zones for this species throughout the Chipola River.

Presenter: Andy Strickland
Contact Person: Same
Type of Presentation: Poster

Multiple matings as a mechanism for maintaining levels of genetic diversity in hatchery produced largemouth bass

John S. Hargrove; University of Florida, Department of Wildlife Ecology and Conservation, Gainesville, FL 32611 tractor@ufl.edu

Micheal S. Allen; University of Florida, School of Forest Resources and Conservation, Program of Fisheries and Aquatic Sciences, Gainesville, FL 32611 msal@ufl.edu

James D. Austin; University of Florida, Department of Wildlife Ecology and Conservation and the School of Forest Resources and Conservation, Program of Fisheries and Aquatic Sciences Gainesville, FL 32611 austinj@ufl.edu

Abstract.-Stocking of hatchery reared Largemouth bass is a management tool commonly employed by state agencies throughout the United States. While effectively increasing the numbers of bass available for angling, the practice poses potential risks to the genetic integrity of the native populations. In particular, the production of many offspring from few adults may increase the threat of stocking inbred and genetically homogenous individuals. In hatchery settings it is assumed that high levels of genetic diversity observed in eggs and fry is the result of most or all broodfish contributing to reproduction. To address this assumption, we collected genetic samples from broodstock and eggs from indoor spawning raceways at the Florida Bass Conservation Center. Microsatellite genotypes were generated for all brood fish as well as a subsample of spawned eggs, and the application of likelihood based parentage assignments allowed us to determine the number of times each individual adult mated. Overall, a significant number of males and females never spawned (30%); however, adults that did spawn typically did so multiple times and some renested up to 5 times during a 4 week period. Our results suggest that mating adults commonly paired with more than one partner (and seldom the same partner), and this pattern was partly responsible for maintaining heterozygosity levels observed in hatchery reared largemouth bass.

Presenter:	John Hargrove
Contact Person:	Same
Type of Presentation:	Poster

**Diet of invasive Rio Grande cichlids (*Herichthys cyanoguttatus*) in Louisiana:
habitat effects and implications for native species**

Maiadah Bader, Nekton Research Lab, UNO, New Orleans, LA mibader1@uno.edu

O. Thomas Lorenz, Nekton Research Lab, UNO, New Orleans, LA olorenz@uno.edu

Abstract.-Rio Grande cichlids (*Herichthys cyanoguttatus*) are non-native fish introduced into the Greater New Orleans Metropolitan Area (GNOMA) over 20 years ago. They have spread widely and their presence has been shown to impact native fishes. This species occurs in a variety of habitats, including cypress swamps, bayous, and concrete canals which indicates a potential concern for future spread. We examined the diet of *H. cyanoguttatus* to determine: 1. the breadth of their diet in these habitats; 2. potential diet overlap with native species; and 3. the possibility of *H. cyanoguttatus* predation on native species. We collected over 200 *H. cyanoguttatus* from GNOMA and surrounding areas. Half of these fish were from concrete canals and half were from sites with relatively natural substrates and vegetation. We also placed Hester-Dendy invertebrate traps at certain sites to determine prey availability. Cichlids collected from concrete canals exhibited a narrow diet consisting mostly of algae. Cichlids from more natural habitats exhibited more varied diets which included prey such as crayfish, fish scales, fish eggs, various arthropods, and mollusks. When *H. cyanoguttatus* diet was compared with available invertebrate prey items (as measured by Hester-Dendy sampling), it appears that cichlids are preferentially feeding on mollusks and crustaceans. These data indicate that the diet of *H. cyanoguttatus* is variable and that this species consumes native organisms such as crayfish and other fishes. We also found that the diet of some co-occurring native fishes overlaps with that of *H. cyanoguttatus* suggesting that they may be impacted by this invasive species.

Presenter: Maiadah Bader

Contact Person: Same

Type of Presentation: poster

Ecology and Conservation of Caribbean Island Stream Fishes

Augustin C. Engman; North Carolina Cooperative Fish and Wildlife Research Unit, Department of Biology, Campus Box 7617, North Carolina State University Raleigh, North Carolina 27695
gusengman@gmail.com

Thomas J. Kwak; U.S. Geological Survey, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Biology, Campus Box 7617, North Carolina State University, Raleigh, North Carolina 27695

Patrick B. Cooney, William E. Smith, Elissa N. Buttermore, and Christin H. Brown; North Carolina Cooperative Fish and Wildlife Research Unit, Department of Biology, Campus Box 7617, North Carolina State University Raleigh, North Carolina 27695

Abstract.- The native stream fish assemblages of the Caribbean are dominated by species with amphidromous life histories. Amphidromous adults grow and spawn in streams. After hatching, larvae float downstream and pelagic larvae live in the marine environment. After the larval period, post-larvae recruit to river mouths and migrate upstream. The prevalence of diadromous life histories on tropical islands creates an opportunity to conduct research applicable across broad scales. The marine larval phase allows for dispersal, which connects stream habitats across island archipelagos, and fish assemblages across island chains share common species and populations. Migratory life histories also create particular challenges for the conservation and management of these fishes. Migratory barriers (e.g., dams) extirpate native fishes from upstream reaches. Caribbean stream fishes also face many other anthropogenic threats, compounded by variable environmental regulation and enforcement. Despite these threats, there is a lack of knowledge about the ecology of these fishes and little effort has been allocated to their conservation. Our group completed a suite of research objectives on the Caribbean island of Puerto Rico, including development of a standardized protocol for quantitatively sampling stream fishes; an island-wide survey of stream fishes and their habitats; a study of contaminants in streams and fishes in relation to land use; a comprehensive survey of migration barriers and development of a predictive model of their effects on fish assemblages; and life-history and migratory behavior studies on native species. These findings are a significant advance in Caribbean stream fish ecology with broad-scale conservation and management applications.

Presenter: Augustin Engman
Contact Person: Same
Type of Presentation: Poster

Population Characteristics and Habitat Preferences of a State-Endangered Crayfish *Cambarus parrishi* in the upper Hiwassee River

Kacey Miller; Department of Biology, Young Harris College, Young Harris, Georgia 30582;
krmiller@yhc.edu

Amber Johnson; Department of Biology, Young Harris College, Young Harris, Georgia 30582;
amjohnson@yhc.edu

Johnathan Davis; Department of Biology, Young Harris College, Young Harris, Georgia 30582;
jgdavis@yhc.edu

Abstract.- Crayfishes are important keystone species in headwater aquatic ecosystems that process organic material, increase nutrient availability and engineer complex benthic stream habitat. Conservation of crayfish diversity is linked to local fish abundance and diversity and downstream biodiversity as well. This study defined population characteristics and habitat preferences of a state-endangered, data-deficient crayfish species, *Cambarus parrishi* in the upper Hiwassee River watershed in northeast Georgia. Crayfish were collected at 7 sites in the watershed over one year by seining and hand collection, and multiple habitat parameters including substrate size, depth, water velocity, and stream roughness were measured at a microhabitat scale. Length-frequencies were used to assign ages in order to examine growth rate and mortality. Correlation analysis identified habitat variables associated with presence which were incorporated into logistic regression models. *C. parrishi* (n=46) were less abundant at all sites than *Cambarus bartoni*, and due to low incidences of capture, data on reproduction was limited. Crayfish older than 2 years of age were rare in the sample with estimated annual mortality of 25%. *C. parrishi* prefer slower water velocities, cobble substrates and shallow depths whereas *C. bartoni* preferred faster velocities and tolerated greater depths. This study will be improved by continued research and larger sample sizes but provides relevant data useful in reviewing the conservation status of the species. Crayfishes as a group are understudied, occupy an important role in headwater streams, and perhaps contribute to the success of headwater fish communities.

Presenter: Kacey Miller and Amber Johnson

Contact Person: Johnathan Davis

Type of Presentation: Poster

The Nonindigenous Aquatic Species Program: Past, Present, and Future

Matt Cannister; USGS, Southeast Ecological Science Center, 7920 NW 71st Street, Gainesville, FL 32653; mcannister@usgs.gov

Pam Fuller; USGS, Southeast Ecological Science Center, 7920 NW 71st Street, Gainesville, FL 32653; pfuller@usgs.gov

Matt Neilson; Cherokee Nation Technology Solutions, contracted to USGS, Southeast Ecological Science Center, 7920 NW 71st Street, Gainesville, FL 32653; mneilson@usgs.gov

Amy Benson; USGS, Southeast Ecological Science Center, 7920 NW 71st Street, Gainesville, FL 32653; abenson@usgs.gov

Abstract.- The United States Geological Survey's Nonindigenous Aquatic Species (NAS) Database has been established as a repository for geo-referenced introduced aquatic species observations. The NAS program provides various scientific resources including: online queries, spatial data sets, interactive species distribution maps, regional contact lists, species accounts, and an alert system designed to quickly spread information on new introductions. The NAS Database maintains a high level of quality data that is frequently used by scientists, interagency groups, news outlets, and the general public. Since its inception, the NAS Database has been used in numerous products that include: peer reviewed journal articles, books and book chapters, press releases, agency reports, news articles, and other biodiversity databases. The NAS Alert System has an automated process that generates alerts when species are introduced into new geographic regions such as states, counties, or hydrologic units, and has produced over 1200 alerts since it came online in 2004. This reporting system is an important component in building a rapid response system that can be used by invasive species biologists and resources managers alike. Over the years, there has been an exponential increase in the amount of available high quality data on introduced species. The NAS Program is currently exploring strategies to take advantage of the increasing availability of online biodiversity information with tools such as a bulk data uploader, an environmental layers enhancement to current species distribution maps, as well as other potential future tools available through our website (nas.er.usgs.gov).

Presenter: Matt Neilson

Contact Person: same

Type of presentation: Poster

Genetic verification of weakfish (*Cynoscion regalis*) and the occurrence of sand seatrout (*C. arenarius*) and their hybrids along the southeastern U.S. Atlantic coast

Maggie Jamison; College of Charleston, Charleston SC 29412; SC DNR, Marine Resources Research Institute, Charleston, SC 29412; JamisonM@dnr.sc.gov

Pearse Webster; SC DNR, Marine Resources Research Institute, Charleston, SC29412; WebsterP@dnr.sc.gov

Tanya Darden; SC DNR, Marine Resources Research Institute, Charleston, SC 29412; dardent@dnr.sc.gov

Abstract. Weakfish, *Cynoscion regalis*, is federally regulated and comprises an important recreational and commercial fishery along the U.S. Atlantic coast. A potential range expansion of a closely related Gulf species, sand seatrout (*C. arenarius*), along the U.S. Atlantic coast as well as the occurrence of *Cynoscion spp.* hybrids are causing difficulties in morphological field identification, which is a critical foundation of stock assessment. Genetic markers were optimized to genetically identify all *Cynoscion spp.* and their hybrids found in the Atlantic. The resulting genetic tool was used to verify past and current collections of *C. regalis* along the southeastern U.S. Atlantic coast. Additionally, these collections were used to preliminarily investigate the extent and timing of *C. arenarius*' possible range expansion as well as the degree of hybridization among *Cynoscion spp.* Initial results indicate that only a small correction factor is needed for *C. regalis* datasets from the southeastern U.S. since 93.3% of *C. regalis* morphological identifications are accurate and hybridization is occurring with two out of the three *Cynoscion* species found in the Atlantic. Although a *C. arenarius* range expansion could not be documented in the time frame of our study, we only included samples back to 2001 and therefore are limited in the detection capability of shifts occurring prior to the sample period. Our study does support the establishment of a northern *C. arenarius* range along the U.S. Atlantic coast to southern Georgia; however, additional random samples will be analyzed to further investigate the range expansion and degree of hybridization of *Cynoscion spp.*

Presenter: Maggie Jamison
Contact Person: same
Type of Presentation: Poster

**Habitat Utilization of Three Separate Stocks of Adult Striped Bass
in the Inshore and Offshore Waters of North Carolina
Inferred through Otolith Microchemistry.**

Daniel Zurlo; Department of Biology, East Carolina University, Greenville, North Carolina 27858; zurlod12@students.ecu.edu

Roger Rulifson; Institute for Coastal Science and Policy and Department of Biology, East Carolina University, Greenville, North Carolina 27858; rulifsonr@ecu.edu

Abstract- Striped bass, *Morone saxatilis*, is an important, highly migratory commercial and recreational species with significant fisheries along the eastern American seaboard. Their broad migration patterns complicate management strategies. With three independently managed stocks, North Carolina is greatly influenced by the movement of these potentially intermixing stocks. In this study striped bass from three major management areas in North Carolina, the Albemarle and Roanoke River Management Area, Central/Southern Management Area, and the Atlantic Migratory Stock will be used to analyze stock migration patterns. Otolith microchemistry will be used as a proxy for migration patterns as otoliths incorporate trace elemental signatures of the watersheds the fish inhabit. Otolith microchemistry will be analyzed via LA-ICP-MS. Temporal variation in otolith microchemistry will be used to determine habitat utilization and migratory patterns of adult bass. It is expected that some fish from the Albemarle Sound will exhibit anadromy during their adult lives, while the Central/Southern fish will be largely resident. The results of this research will be significant, especially for the depleted Central/Southern stock, because it will be some of the little data providing accurate watershed use of adult Central/Southern striped bass. It will also help to clearly delineate separate stocks of striped bass in North Carolina, allowing fisheries managers to manage stocks more accurately.

Presenter: Daniel Zurlo

Contact Person: Same

Type of Presentation: Poster

Factors affecting nesting success in Florida bass *Micropterus floridanus*

Zachary Slagle; Fisheries and Aquatic Sciences, School of Forest Resources and Conservation, University of Florida, Gainesville, Florida, 32611; zjslugle@ufl.edu

Micheal S. Allen; Fisheries and Aquatic Sciences, School of Forest Resources and Conservation, University of Florida, Gainesville, Florida, 32611; msal@ufl.edu

Stephanie L. Shaw; Fisheries and Aquatic Sciences, School of Forest Resources and Conservation, University of Florida, Gainesville, Florida, 32611; slshaw@ufl.edu

Abstract.-Male Florida bass *Micropterus floridanus* provide parental care to their offspring, aggressively guarding their broods from predators. This behavior increases their chances of raising a successful brood, but also makes them vulnerable to angling. Factors such as timing of the spawn, brood size, and male total length have all been shown to influence nesting success for largemouth bass *Micropterus salmoides*, but have not been evaluated for Florida bass. The objectives of this project were to a) determine the fate of broods spawned in four study lakes from 2010 to 2012; b) and evaluate potential factors that determine brood fate. To evaluate these factors, we conducted snorkel surveys during the spawning season and measured the relative size of the nest (i.e., egg score 1-5), presence/absence of male, male total length, brood life stage (i.e., egg, larvae, fry), water depth, water temperature, vegetation, and other habitat variables. Among lakes and year, nest success varied from 59-100%. Male total length did not differ across lakes or years. Nest success did not vary between lakes or with presence/absence of the male fish. This study will aid managers in manipulating habitat for improved recruitment and in stocking allocation of Florida bass.

Presenter:	Zachary Slagle
Contact person:	Same
Type of Presentation:	Poster

THE EFFECT OF TURBIDITY ON SWIMMING PERFORMANCE OF GOLDEN SHINER

Emily Hildebrandt; Department of Biology, University of Mississippi, Oxford MS 38677;
ekhildebrandt@gmail.com

Glenn R. Parsons; Department of Biology, University of Mississippi, Oxford MS 38677;
bygrp@olemiss.edu

Abstract: A variety of environmental factors have been shown to influence swimming performance in multiple species of fishes. The purpose of this study was to examine the effect of turbidity on golden shiner, *Notemigonus crysoleucas* swimming performance, as represented by critical swimming speed (U_{crit}). Groups of eight fish at a time were tested at turbidity levels of 0, 10, 20 and 30 Nephelometric Turbidity Units (NTU) at both 22 and 28°C (n= 32/treatment, 128 total). There was no significant ((1) =0.21, $p > 0.05$) effect of temperature on critical swimming speed at any turbidity level. However, contrary to expectations, critical swimming speeds increased significantly ((3) =89.58, $p < 0.0001$) with rising turbidity values. Critical swimming speeds increased from 51.03 cm/s at 0 NTU to 79.84 cm/s at 30 NTU. To assess whether this increase in critical swimming speed was due to a decrease in stress as a result of the "concealing" effect of increased turbidity, we tested fish in clear water in full illumination and in a concealing environment (reduced illumination). No difference in critical swimming speed ($t(4) = -0.02$, $p > .05$) was detected between treatments. We propose that this phenomenon, which has not been previously observed in biological systems, is likely a result of suspended particulates dampening turbulent fluctuations in the boundary layer around the fish, thus reducing drag and allowing for an increase in critical swimming speed. The drag reducing effect of suspended particulates may have far reaching implications in biological systems.

Presenter: Emily Hildebrandt

Contact Person: Same

Type of Presentation: Poster

**Movement and Behavior of the New Zealand
Eagle Ray, *Myliobatis tenuicaudatus***

Jonathan Davis; Nekton Research Lab, University of New Orleans, New Orleans, LA 70148;
jldavis7@uno.edu

Abstract.- The ability of intertidal species to navigate through shallow estuarine habitats while orienting themselves in a mostly featureless environment is a continuing area of scientific interest. The New Zealand eagle ray (*Myliobatis tenuicaudatus*) is one of these intertidal species that has developed the ability to utilize highly productive intertidal habitats and avoid stranding. It has been suggested that the use of tidal information, particularly orientation to water current, may be used to avoid stranding on an outgoing tide. To test the response of *M. tenuicaudatus* to these cues, two tanks were fitted with water spray-bars attached to solenoids and timers that would simulate the tidal cycle by changing water flow direction every six hours and ~12-15 minutes with 15 minutes of slack tide in between. Two juvenile eagle rays were placed in these tanks and behavior was recorded for 13 days. Both animals exhibited positive rheotaxis approximately 100% of the time during rest. When flow changed, both animals reacted within 90 seconds by turning and facing the new current direction. When food was present both animals exhibited negative rheotaxis approximately 100% of the time which suggests the utilization of tidal flow to search for food. This is consistent with orientation behavior and movements observed in the field.

Presenter: Jonathan Davis
Contact Person: Same
Type of Presentation: Poster

Morphological variation in the fantail darter *Etheostoma flabellare* from the Cumberland and Tennessee River drainages

Aaron Ross and Rebecca Blanton Johansen; Austin Peay State University, Center of Excellence for Field Biology and Department of Biology, Clarksville, TN 37040

Abstract.- The widely distributed Fantail Darter, *Etheostoma flabellare* (Percidae), has been recognized as a complex of distinct, but undescribed species. Recent taxonomic studies have focused on eastern populations and resulted in elevation of one distinct form, *E. brevispinum*, from Atlantic Slope drainages of North Carolina, South Carolina, and Virginia. Although variation in genes and morphology among other populations has been previously noted and other taxa have been historically recognized, species boundaries, if present, have not been clearly defined for Tennessee and Cumberland River systems. To better elucidate potential species boundaries inferred by morphological diagnosability of populations of Fantail Darters from the Tennessee River and Cumberland River systems, standard meristic data were taken from multiple specimens and a minimum of two populations from each of the tributary systems of these two rivers. Although preliminary, Clinch and Little River (Tennessee River) populations consistently had higher scale and pore counts than other Tennessee systems examined. Within the Cumberland River, little variation was observed among tributaries, but overall modes of several characters were consistently different from those of the Tennessee River systems examined. Observed patterns of variation in morphology will be compared to patterns of genetic variation in these systems to further elucidate diversity in this species complex

Presenter: Aaron Ross
Contact Person: Same
Type of Presentation: Poster

**Size selection of channel catfish by recreational
Anglers in five Nebraska reservoirs.**

Christopher L. Wiley; Nebraska Cooperative Fish and Wildlife Research Unit, and School of Natural Resources, University of Nebraska-Lincoln, Lincoln, Nebraska 68583;
wiley9c@gmail.com

Kevin L. Pope; USGS Nebraska Cooperative Fish and Wildlife Research Unit, and School of Natural Resources, University of Nebraska-Lincoln, Lincoln, Nebraska 68583; kpop2@unl.edu

Abstract.- Size-selective harvest influences the dynamics of fish populations. The size selection of channel catfish by recreational anglers is unknown. Throughout the Midwestern and Southeastern regions of the U.S.A., channel catfish are managed by with harvest regulations and supplemental stockings. Identifying patterns of angler activity, such as size-selective catch and harvest of channel catfish, will assist state management agencies during future decision making. Length distributions of stock-length channel catfish caught with baited, tandem-set hoop nets in five reservoirs in Southeastern Nebraska were compared to the length distributions of channel catfish caught with terminal tackle to determine if catch and associated harvest of channel catfish by recreational anglers is size biased. Size distributions were different in some, but not all reservoirs. Thus, size selection of channel catfish by recreational anglers is water-body specific.

Presenter: Christopher L. Wiley

Contact person: same

Type of presentation: Poster

Past and present genetic structure of striped bass in the Carolinas

Andrew Anderson; College of Charleston Graduate Program in Marine Biology, Charleston, South Carolina 29412; andersona@dnr.sc.gov

Michael Denson; South Carolina Department of Natural Resources, Charleston, South Carolina 29412; densonm@dnr.sc.gov

Tanya Darden; South Carolina Department of Natural Resources, Charleston, South Carolina 29412; dardent@dnr.sc.gov

Abstract-In order to properly manage a species over a large geographic area, it is necessary to understand the genetic relationship both among and within river systems in order to identify appropriate management units. Determining changes in this relationship is also important in understanding how stocking may have and continues to influence these genetic relationships. We used a suite of 12 microsatellites developed for striped bass to evaluate patterns of gene flow both spatially and temporally across the Carolinas. Our results suggest striped bass in the Santee-Cooper river system have been and remain a single population. Additionally, the historical samples suggest that the population was undergoing inbreeding; however, the contemporary samples suggest that inbreeding is no longer occurring. Striped bass in the Roanoke and Cape Fear represent a single population most likely due to historical transfer stocking across the State from Roanoke River stock. Watersheds in South Carolina are genetically distinct from each other and North Carolina, although the genetic difference between the ACE Basin and Santee-Cooper System has dramatically decreased over fifteen years likely due to a large number of Santee-Cooper hatchery-produced fish being stocked into the ACE Basin. With a clearer picture of striped bass population dynamics across the Carolinas, managers can improve their efforts in genetic management and restoration of striped bass populations.

Presenter: Andrew Anderson

Contact Person: Same

Type of Presentation: Poster

Potential Changes to Juvenile Red Drum Habitat with Sea Level Rise

Rachel K. Guy; Warnell School of Forestry & Natural Resources, University of Georgia, Athens, Georgia 30603; rguy@uga.edu

Nathan P. Nibbelink; Warnell School of Forestry & Natural Resources, University of Georgia, Athens, Georgia 30603; nate2@uga.edu

Patrick Geer, Georgia Department of Natural Resources -Coastal Resources Division, patrick_geer@dnr.state.ga.us

Abstract - Reduction of coastal Georgia saltmarshes may reduce the available habitat to juvenile recreational fish species. According to the IPCC 2007 report, sea level is predicted to rise between 0.3 and one meter by the year 2100. A one meter sea level rise on the coast of Georgia has been modeled in the Sea Level Rise Affecting Marshes Model (SLAMM) to reduce the saltmarsh by as much as 45%. Saltmarsh in the estuary systems of Georgia is important habitat to juvenile and subadult red drum (*Sciaenops ocellatus*). Using gill net data of large juvenile and subadult red drum collected between 2005 and 2011 during the summer months by Georgia DNR Coastal Resource Division, we modeled the current probable habitat distribution around Little St. Simon's Island and south of Sapelo Island. While a variety of environmental datasets were considered, the final significant datasets included were saltmarsh edge density and percent saltmarsh cover. Maxent, a presence-pseudo absence inductive maximum entropy algorithm, was used for modeling distribution. The model performed well with an AUC = 0.854 (SD = 0.01), and edge density contributing to 90% of the model. Projections to the SLAMM one meter scenario predicted 17% reduction in suitable habitat, using the minimum training presence threshold. Our conclusions are that sea level rise will likely have an impact on red drum habitat, and potentially the populations. Future work will focus on finer scale habitat relationships with juvenile density and occupancy at earlier age classes.

Presenter: Rachel Guy

Contact Person: Same

Type of Presentation: Poster

**Effects of base flow and high flow pulses on drifting CPOM,
macroinvertebrates, and larval fishes**

Christopher Vaughn and David Ruppel; Department of Biology/Aquatic Station, Texas State University, San Marcos TX 78666 crv16@txstate.edu ; dsruppel@txstate.edu

Archis Grubh, Sarah McMillan, and Gordon Linam; River Studies Program, Texas Parks and Wildlife Department, San Marcos TX 78666

Tim Bonner ; Department of Biology/Aquatic Station, Texas State University, San Marcos TX 78666

Abstract.-Sound ecological environments of aquatic fluvial systems in Texas are currently managed under the theories of the Natural Flow Paradigm. Specifically, natural characters of the historical hydrograph, such as subsistence, base, and pulse flows, are protected by managing water withdrawals and capture. Purposes of this study are to quantify relationship between organic drift (CPOM, macroinvertebrates, and larval fishes) and discharge under base flow conditions and various tiers (i.e., one per season, one per year) of pulse flows in the San Antonio and lower Guadalupe rivers. Information from this study will be used to establish baseline conditions of organic drift, which will provide measures to evaluate further anthropogenic modifications to the base flow and pulse flow within the San Antonio and lower Guadalupe rivers.

Presenters: C. Vaughn
Contact Person: Same
Type of Presentation: Poster

**Contribution of Hatchery Reared Striped Bass to the
Cape Fear River Population Using Otolith Chemistry**

Evan Knight; East Carolina University, Department of Biology, Greenville, NC 27858;
knighte07@students.ecu.edu

Roger Rulifson; East Carolina University, Institute for Coastal Science and Policy, Greenville,
NC 27858; rulifsonr@ecu.edu

Abstract.- Since 1980 the Cape Fear River (CFR) population of Striped Bass (*Morone saxatilis*) has been sustained by stocking using broodstock from the Roanoke River. However, coast wide concerns over contamination of endemic populations from the introduction of non-native fish have caused a reexamination of this policy. In 2010, The North Carolina Wildlife Resources Commission (NCWRC) began a new stocking program by using CFR broodstock to stock the Cape Fear River. This program was started to determine if stocking fish of CFR parentage will increase the spawning population of striped bass in the CFR. We will examine striped bass collected by state agencies from the CFR watershed to assess the success and contribution of stocked hatchery fish in this population. Striped bass will be sampled by fishery independent gillnet and electrofishing surveys (NCDMF, NCWRC) in the CFR. Biological information will be collected to determine LSI and K factors. Scales and otoliths will be removed for ageing and otolith chemistry. Tissue samples will be taken to determine if CFR striped bass are resident or if they migrate to the ocean. Otoliths will be sectioned for age, and then examined by Laser Ablation-Inductively Coupled Plasma Mass Spectroscopy (LA-ICPMS) to determine changes in concentrations of elements that reflect habitats in North Carolina Watersheds. Wandering between watersheds and broodstock origin (wild-spawned or hatchery-spawned) will be assessed using otolith chemistry, and biological results will be compared between wild and hatchery-spawned fish. Results will assist managers in decisions about future stocking efforts for coastal populations.

Presenter: Evan Knight
Contact person: Same
Type of presentation: Poster

Assessment of catch-and-release mortality of snagged paddlefish in Oklahoma

Eric Brennan; Oklahoma Department of Wildlife Conservation, Northeast Region, Jenks, Oklahoma, 74037; ebrennanodwc@yahoo.com

Brent Gordon; Oklahoma Department of Wildlife Conservation, Northeast Region, Jenks, Oklahoma, 74037; bgordon02@sbcglobal.net

Abstract.-Snagging is the most common method of paddlefish take in Oklahoma. Paddlefish regulations in Oklahoma have been tightening over the past 30 years, ranging from a daily creel of five to the current daily creel of one. Over this period, catch and release has been allowed (1981-1991, 2003-Present), prohibited (1992-2002), and is now mandatory on Monday and Friday. Very little is known about catch and release mortality and furthermore, nothing is known about the effect of catch-and-release on the continuation of the spawning run. In late March and early April 2012 6 paddlefish (5 female, 1 male) had ultrasonic telemetry tags attached to them. Fish were snagged by anglers in upper Grand lake and the lower Neosho river and donated to ODWC for use in this project. When a fish was snagged the amount of time the angler spent fighting the fish and handling the fish were both recorded. Once the fish was turned over to ODWC length and weight were taken as well as notes and pictures of the snagging wound and any abnormalities with the fish. Once all data was taken an ultrasonic tag was attached to the dorsal fin. After being released fish movement was then monitored for the life of the tags using existing stationary SURs deployed throughout Grand Lake and its major tributaries. All tagged fish continued moving for the full life of the tag and all five continued upstream movement after being caught and released.

Presenter: Eric Brennan

Contact Person: Same

Type of Presentation: Oral

**Monitoring Paddlefish Movements in the Grand River System,
Oklahoma, using Temperature and Depth Sensing Ultrasonic Tags**

Brad Johnston; Oklahoma Department of Wildlife Conservation, Northeast Region, Jenks, Oklahoma, 74037; bjohnston02@sbcglobal.net

Jason Schooley; Oklahoma Department of Wildlife Conservation, Northeast Region, Jenks, Oklahoma, 74037; jschooley02@sbcglobal.net

Abstract.- The paddlefish population in the Grand River system is an economic boom to the region around Grand Lake and its tributaries. Since the opening of the Oklahoma Department of Wildlife Conservation (ODWC) Paddlefish Research and Processing Center (RPC) on Grand Lake in 2008, more than 20,000 adult paddlefish have contributed to studies on morphology, physiology, population demographics, and angler use, among other investigations. Though the RPC data are valuable in many respects, there are unanswered questions concerning the ecological requirements of the species. The objectives of the study are identifying paddlefish swimming depths and determining movements and successive year spawning of adult females. In January 2011, 30 sexually mature (and gravid) female paddlefish were captured with gill nets and surgically implanted with ultrasonic transmitters. The transmitters consist of two varieties: 15 depth and 15 temperature transmitters with extended battery life (48 months). Twenty submersible underwater receivers (SUR) were installed and equally distributed at fixed locations in the Grand Lake main pool to maximize coverage. The 4 lower most SUR's are relocated up into the rivers from January thru May. So far there have been over 200,000 total detections. One-hundred percent of functional transmitters were detected in the rivers during spring migration, as well as being recorded moving back down into the lake in 2011. 7 study fish were detected in rivers, and 7 were detected no higher than Gray's Ranch (Mid-Lake) in 2012. Ninety-five percent of the depth detections were within 10 meters of the surface, regardless of total depth.

Presenter: Brad Johnston

Contact Person: Same

Type of Presentation: Oral

Effects of Hydrology on Black Bass Growth and Size in the Arkansas River, Arkansas

Clint R. Peacock; Georgia Department of Natural Resources, Perry, GA 31069; clint.peacock@dnr.state.ga.us

M.A. Eggleton; University of Arkansas at Pine Bluff, Aquaculture/Fisheries Center, Pine Bluff, AR 71601

Abstract.- Hydrology has been shown to affect the sport fish populations. Long-term electrofishing data collected in the Arkansas River's Lake Dardanelle from 1991-2009 suggested a strong inverse relationship between largemouth bass *Micropterus salmoides* catch-per-unit effort and mean adjusted flows from the previous year. This relationship implies a probable link between bass recruitment and river hydrology. However, the effects that hydrology may have on cohort growth of black basses is less understood. In 2004, 2005, and 2010, largemouth bass and spotted bass *M. punctulatus* annual growth increments were generated from datasets collected throughout the Arkansas River, Arkansas. During the period 2007-2009, the lower Arkansas River experienced long durations of high water during three consecutive years. Mean annual flows exceeded the 42-year average by 52%, with summer flows averaging 107% above normal. During this time period, largemouth bass (n = 2,151) annual growth increments were positively correlated with growth years containing longer durations of lower flows (<425 m³/s). Two-way ANOVA analyses using backcalculated age and growth year hydrology (classified as high, average, and low flows based on historical hydrographs) as main effects suggested significant (P<0.05) hydrologic effects on largemouth bass growth. Significant (P<0.05) interaction between backcalculated age and growth year hydrology further suggested that flow affected growth differently across ages, with negative effects exhibited by the age 1-3 cohorts. Growth modeling also indicated that largemouth bass in 2010 needed an extra year to attain preferred size (381 mm) compared to 2004-2005, which followed a relatively dry 3-year period with below average flows. Spotted bass (n = 834) growth responses to hydrology were similar, though less pronounced, than largemouth bass. Results suggested that high-flow events that are typically beneficial to black bass populations in large river-floodplain systems may be dampened or non-existent in more highly regulated, impounded river systems such as the Arkansas River.

Presenter: Clint Peacock
Contact Person: Same
Type of Presentation: Oral

**Use of External Stress Indicators to Evaluate Black Bass
(*Micropterus* spp.) Condition at Catch and Release Tournaments**

George A. Maynard, Timothy B. Mihuc, Alejandro Reyes, Mark H. Malchoff, V. Alexei Sotola, and Siobhan Levere; Lake Champlain Research Institute at the State University of New York College at Plattsburgh. galphonsemaynard@gmail.com

Abstract.- Black bass tournament popularity on Lake Champlain has continued to increase over the past decade, especially large-scale events hosted in Plattsburgh, NY. As in any catch-and-release fishery, released fish exhibit varying amounts and types of stress potentially generating sub-lethal population level impacts. Recent research in marine commercial fisheries has shown that external indicators of stress can be used determine stress levels. We adapted some of these indicators (wounding, response to stimuli, etc.) to assess fish stress following weigh-in at Plattsburgh-based catch and release tournaments. Additionally, we collected data on lake temperature, fish capture locations, and tournament handling practices to determine which factors influenced fish stress levels. Stress indicators were divided into three categories for analysis; stress indicators thought to be influenced by livewell confinement (handling stress), barotrauma indicators (barotrauma), and stress indicators not influenced by livewell confinement or barotrauma (other stress). Generalized linear models generated using the R Project for Statistical Computing showed handling stress was strongly related to distance traveled in a livewell ($p = 0.02$) and lake temperature ($p < 0.01$), and that smallmouth bass are more likely to be affected by handling stress than largemouth ($p < 0.01$). Barotrauma indicators were not correlated with distance traveled in a livewell, temperature, or species. Other stress indicators were also correlated with lake temperature ($p < 0.01$) and tended to manifest in smallmouth bass more often than largemouth bass ($p < 0.01$). Further analysis of temperature and oxygen data from tournament holding tanks will be conducted to elucidate their impacts on fish stress. So far, our data corroborate current literature on bass tournaments and fish stress; that is, higher water temperatures and longer livewell transport lead to greater fish stress. Further research into improving tournament practices will help to minimize potential impacts of these popular events on bass populations.

Presenter: George Maynard
Contact Person: Same
Type of presentation: Oral

Smallmouth Bass Fishing in Missouri: Results from the 2011 Angler Survey

John R. Ackerson*, Craig J. Fuller, Jennifer A. Gironde, Kevin J. Meneau and Ronald A. Reitz
Missouri Department of Conservation, West Plains, MO 65775, John.Ackerson@mdc.mo.gov

Abstract.- In 2011 a mail survey was sent to Missouri resident anglers who reported they had fished for or caught smallmouth bass, asking their opinions and to report their 2010 stream smallmouth bass fishing activities. Eighty-two percent of anglers typically fished for smallmouth bass. Wade/bank fishing was the most often used method, followed by float fishing and designated public accesses were heavily used by anglers. Responding anglers took an average of 10.2 trips in 2010 and caught an average of 7.1 and harvested 1.9 smallmouth bass per trip. The statewide harvest rate for smallmouth bass was 31.8%. Anglers knew Stream Black Bass Special Management Areas (SBBSMA) existed (86.4%); however, only 12.3% reportedly fished them in 2010 and reported 10,524 fishing trips. Anglers that fished at least one SBBSMA in 2010 reported catching a higher average number of smallmouth bass per trip than anglers who did not. The top reason cited by anglers that did not fish a SBBSMA was “None close enough to me”. Few anglers indicated that they avoided fishing in SBBSMA because of the more restrictive harvest regulations. One-third of responding anglers thought existing regulations allowed the right amount of harvest. Anglers were about evenly split in preferring a single statewide regulation (36.8%), or a system with statewide regulations and SBBSMA (35.9%). Anglers preferred the existing 12” minimum length limit (37.8%), while others preferred a length limit of 14” (18.8%) or 15” (23.3%). Anglers that opposed a reduction of the statewide daily limit (six smallmouth bass) made up 27.1% of the respondents; however, some anglers supported a daily limit reduction to three (19.0%) or four (17.6%). Anglers were highly supportive of the no-harvest spring season and of those that favored changing the season, only five percent wanted to eliminate it.

Presenter: John Ackerson
Contact Person: same
Type of Presentation: oral

The brook trout management conundrum: A genetically differentiated and punctuated distribution

Matt Kulp, National Park Service, Great Smoky Mountains National Park, Gatlinburg, TN 37738
Matt_Kulp@nps.gov

Steve Moore, National Park Service, Great Smoky Mountains National Park, Gatlinburg, TN
37738 Steve_E_Moore@nps.gov

Jay Stauffer Jr., Pennsylvania State University, University Park, PA 16802 vc5@psu.edu

Tim King, U.S. Geological Survey, Leetown Science Center, Kearneysville, WV 25430

Abstract.- Effective management of imperiled species is often complicated because inadequate information exists for identification of species, subspecies, distinct population segments, or management units. Salmonid fishes inhabiting lower latitudes present this and other significant challenges to conservation biologists that attempt to maintain ecological and evolutionary processes within and among populations. Brook trout population dynamics have been routinely monitored both quantitatively and qualitatively in a suite of GRSM streams allowing population level and the factors that influence them to be studied. However, genetic relationships among GRSM brook trout populations have not been extensively investigated using contemporary molecular methods and thus constitute a critical gap in the Park's developing knowledge base. Recently, genetic variation has shown a high degree of genetic differentiation among drainages and among tributaries within those drainages. It is unclear if these isolating mechanisms are physiological, behavioral, physical or otherwise, yet recent genetics data suggests isolation among these fragmented populations may have led to the development of locally adapted gene complexes and perhaps of reproductive isolating mechanisms. Theoretical population genetics suggests that small, fragmented populations are unlikely to remain viable for an extended period of time due to the likelihood of stochastic extinction. Therefore, southern Appalachian brook trout are an ideal model for assessing the role that ecological and evolutionary processes play in affecting current and historical demography, population genetic structure, and deeper phylogeographic and phylogenetic differentiation. The loss of a single population within any stream is likely to result in a direct reduction in the park's existing biodiversity.

Presenter: Matt Kulp

Contact Person: Same

Type of Presentation: Oral

Assessment of wildfire effects on fishes of the Texas Gulf Slope drainages using a conceptual framework.

Virginia Eaton; Aquatic Biology Station, Texas State University, San Marcos, Texas 78666;
ginny.eaton@txstate.edu

Stephen Curtis; Aquatic Biology Station, Texas State University, San Marcos, Texas 78666;
sc1556@txstate.edu

Timothy Bonner; Aquatic Biology Station, Texas State University, San Marcos, Texas 78666;
TBonner@txstate.edu

Abstract.-In Texas, wildfires burned over 3.9 million acres in 2011, including over 828,000 acres of mixed use land that border ecologically significant stream segments. Studies assessing the effects of fire on aquatic communities are limited primarily to northern wildlands and might not be applicable to the arid and semi-arid regions of Texas Gulf Slope drainages. To better understand and manage the land-water interactions within the western gulf slope drainages, we propose a conceptual framework to serve as a basis for testing hypotheses on initial, mid and long-term effects of wildland fires on fish communities and for assessing factors that mitigate the effects (i.e., burn intensity, distance from stream reach, resiliency of the aquatic community). Assessments of community responses from two recent fires (Canon Ranch Fire, Independence Creek; Oasis Ranch Fire, South Llano River) suggest fish communities of gulf slope drainages are more resilient to initial effects of wildland fires than fish communities in more montane regions.

Presenter: Virginia Eaton

Contact Person: same

Presentation type: Poster

**Filling in the Gap: A survey of the Rutherford Fork
of the Obion River provides new localities for 25 species.**

Kristen Pilcher; Department of Biology and Center of Excellence for Field Biology, Austin Peay State University, Clarksville, TN 37040 kpilcher@my.apsu.edu

Rebecca Johansen; Department of Biology and Center of Excellence for Field Biology, Austin Peay State University, Clarksville, TN 37040

Abstract.- In the mid 20th century the Obion River in northwest Tennessee was largely channelized for agricultural purposes. The Rutherford Fork of the Obion River, adjacent to Milan Army Ammunitions Plant (MLAAP), received additional impacts from wastewater discharges containing heavy metals. Austin Peay State University has been involved in long-term monitoring of aquatic communities of MLAAP. However, studies have focused on macroinvertebrates and herpetofuana. Review of the distribution of fishes reported from the Obion River revealed a seemingly depauperate fish fauna for Rutherford Fork. The purpose of this study was to determine whether species common elsewhere in the Obion River system or region were absent from the Rutherford Fork, possibly due to extirpation associated with previous impacts, or if the lack of species records reflected few collection efforts in this tributary, and also to increase the knowledge of the overall health of the aquatic communities on and near MLAAP. Results of this survey showed that species diversity of the Rutherford Fork is considerably higher than previously reported. A total of 29 different species from 8 sites on the Rutherford Fork were collected. Of these, 25 species from 10 families, including intolerant taxa such as darters (Percidae) and madtoms (Ictaluridae), were not previously reported from the system, resulting in range extensions or new localities for these species. Future work will examine habitat parameters associated with the occurrence of intolerant benthic fishes to further evaluate factors influencing their distribution in the Rutherford Fork.

Presenter: Kristen Pilcher

Contact Person: Same

Type of Presentation: Poster

Selective Eradication of Gizzard Shad with Low-Dose Rotenone Applications

Grant Scholten; Biology Department, Tennessee Technological University, Cookeville, Tennessee 38505; gmscholten42@students.tntech.edu

Jesse R. Fischer; Department of Fisheries and Wildlife Sciences, University of Missouri Columbia, Missouri, 65211; FischerJR@missouri.edu

Michael C. Quist, PhD; U.S. Geological Survey, Idaho Cooperative Fish and Wildlife Research Unit, Department of Fish and Wildlife Resources, University of Idaho, Moscow, ID 83844; mcquist@uidaho.edu

Abstract-The use of rotenone to restore aquatic ecosystems is often necessary when undesirable fishes negatively impact physiochemical conditions (e.g., eutrophication) and other fish species. Gizzard shad *Dorosoma cepedianum* are an important prey source for several recreationally-important species, but can quickly exceed gape limitations of predators and dominate fish biomass in a system. At very high abundance, gizzard shad can have strong ecosystem effects (e.g., nutrient loading, altered zooplankton and phytoplankton assemblages) and are commonly targeted for removal or control. However, the use of rotenone is costly, time consuming, and results in the temporary loss of fisheries. The objective of this study was to experimentally evaluate the effects of low-dose rotenone concentrations (i.e., 0, 3, 6, 9, and 12 μgL^{-1}) on gizzard shad and common lentic sport-fish species such as bluegill *Lepomis macrochirus*, largemouth bass *Micropterus salmoides*, and walleye *Sander vitreus*. Additionally, five Iowa reservoirs with undesirable populations of gizzard shad were treated with rotenone in Fall of 2011. Our experimental evaluation demonstrated treatments of $\sim 9 \mu\text{gL}^{-1}$ and above resulted in 100% gizzard mortality. However, walleye were more susceptible than gizzard shad, whereas bluegill and largemouth bass were more tolerant to the rotenone treatments. Reservoir electrofishing samples before and after rotenone treatments corroborated experimental results and suggested that concentrations below $6 \mu\text{gL}^{-1}$ may not be effective at controlling gizzard shad. Overall, our study provided knowledge on the relative influence of rotenone concentrations that can assist fisheries managers to better target and more efficiently use resources for improving ecological integrity lakes ecosystems.

Presenter: Grant Scholten

Contact Person: Same

Type of Presentation: Poster

**Shifting Variance Structure as a Potential Indicator
of Fish-Population Responses to Large-Scale Perturbation**

Brian J. Irwin, U.S. Geological Survey, Georgia Cooperative Fish & Wildlife Research Unit,
University of Georgia, Athens, GA 30602 irwin@uga.edu

Tyler Wagner, U.S. Geological Survey, Pennsylvania Cooperative Fish & Wildlife Research
Unit, Pennsylvania State University, University Park, PA 16802 twagner@psu.edu

Abstract. -Fishery-independent surveys are widely used to provide essential information for the restoration and management of fish populations. It is generally assumed that these monitoring surveys produce representative data on how fish populations vary over space and time. For example, observed fish-population metrics may vary among repeated samples from a single location, from site-to-site within a lake, from lake-to-lake, and among sampling years. We will discuss the use of mixed models to quantify how the total variability of a response variable can be partitioned among spatial and temporal components. Further, we expect that the structure of variation (i.e., variance components themselves), not just the total variance, can be responsive to severe large-scale perturbation. For fish populations, large-scale perturbations may be influential via either direct (e.g., new sources of predation) or more indirect pathways (e.g., system changes following establishment of invasive species). In either case, a resulting shift in variance structure could have implications for monitoring programs (e.g., influencing the power to detect long-term trends from standardized sampling). We analyzed long-term survey data to explore the notion that an ecological perturbation may induce a shift in a population's underlying variance structure. Improved understanding of how population variability is responsive to perturbation will likely become increasingly important when predictions of future population dynamics in regards to anticipated large-scale influences, such as climate change, are needed.

Presenter: Brian Irwin
Contact Person: Same
Type of Presentation: Oral

Demographic Assessment of a Reintroduced Population of the Endangered Oyster Mussel (*Epioblasma capsaeformis*) in the Upper Clinch River, Virginia.

Caitlin S. Carey; Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; cscarey@vt.edu

Jess W. Jones; U.S. Fish and Wildlife Service, Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061 jess_jones@fws.gov; Robert Butler; U.S. Fish and Wildlife Service, Asheville Field Office, 160 Zillicoa Street, Asheville, NC 28801 Bob_butler@fws.gov; Eric M. Hallerman; Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061 ehallerm@vt.edu; Marcella J. Kelly; Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061 makelly2@vt.edu

Abstract.- Federal and State recovery plans for listed freshwater mussel species have identified the translocation of adult mussels and the release of laboratory-propagated juveniles as approaches to reintroduce species to historically occupied sites. In 2002, the Virginia Department of Game and Inland Fisheries designated an approximately 9.6-km reach of the upper Clinch River as an augmentation reach for the federally endangered oyster mussel (*Epioblasma capsaeformis*). As of 2010, three reintroduction techniques have been applied to separate locations within this reach including the translocation of adults and release of laboratory-propagated sub-adults (Site 1), the release of 8-week old laboratory-propagated juveniles (Site 2), and stream-side infestations (Site 3). The objective of this study was to determine the success of the three release strategies through population monitoring at each release location. Demographic data were collected in 2011 and 2012 by systematic quadrat sampling to estimate population size of *E. capsaeformis* at each location. Estimated population size of translocated and laboratory-propagated sub-adult *E. capsaeformis* at Site 1 was 2,579 and 2,345 individuals in 2011 and 2012, respectively. No *E. capsaeformis* were discovered at reintroduction Sites 2 and 3. In addition, mark-recapture sampling was performed at Site 1 so as to compare survey methodologies. Our results indicate that the translocation of adults and release of laboratory-propagated sub-adults are the most effective techniques for establishing populations of *E. capsaeformis*. We suggest that management should focus efforts on the release of larger individuals for the purposes of augmenting vulnerable or reestablishing extant populations of freshwater mussels.

Presenter: Caitlin Carey

Contact Person: Same

Type of Presentation: Poster

**Length Composition, Age Composition, and
Catch Per Unit Effort of Black Sea Bass (*Centropristis striata*)
in the U.S. South Atlantic Region based on Fishery-Independent Surveys**

Joseph C. Ballenger; Coastal Finfish Section, Marine Resources Division, South Carolina
Department of Natural Resources, Charleston, South Carolina 29412; ballengerj@dnr.sc.gov

Marcel J. M. Reichert; Coastal Finfish Section, Marine Resources Division, South Carolina
Department of Natural Resources, Charleston, South Carolina 29412; reichertm@dnr.sc.gov

Abstract.- The MARMAP program has studied reef fish species of recreational and commercial importance for over 40 years. MARMAP efforts have been expanded in recent years through two additional fishery-independent surveys, the SEAMAP-SA Reef Fish Survey and the SEFIS Program. Combined, these surveys provide the most comprehensive source of fishery-independent data for reef fish species in the U.S. South Atlantic Region, producing a continuous index of abundance for numerous species since 1990. Black sea bass is one of the most commonly encountered reef fish species of sizable recreational and commercial importance in the surveys. The 2011 SEDAR stock assessment indicates black sea bass experienced nearly continuous overfishing conditions from the late 1980's to 2010. Further, the SAFMC instituted a rebuilding plan in 2006 to address overfished conditions. In 2013, SEDAR is conducting an update stock assessment for the population to determine the status of the stock relative to the rebuilding schedule. This study updates the length composition, age composition, and catch per unit effort (CPUE) data for the U.S. South Atlantic black sea bass population in preparation for the update assessment. Length and age compositions are shifting to larger sizes and older ages. CPUE in 2011 and 2012 has increased, reaching levels in excess of any observed since 1990. Together, the improvements in the length/age compositions and CPUE indicate that the black sea bass population continues to rebuild in the region, though the current status with regards to the rebuilding schedule is unknown until the update assessment is completed.

Presenter: Joseph Ballenger
Contact Person: Same
Type of Presentation: Oral

Sources and effects of estrogens in the upper Conasauga River

Whitney Jacobs; Warnell School of Forestry, University of Georgia, 180 E Green Street, Athens, GA 30602 wnjacobs@uga.edu

Peter Lasier, USGS, Patuxent Wildlife Research Center, Athens, GA

Sayed Hassan; College of Agricultural and Environmental Sciences, University of Georgia, Athens, GA

Robert Bringolf; Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA

Abstract.- Recently, populations of rare and endangered fish have been declining in the upper Conasauga River (UCR), a reach widely recognized for its high biodiversity. Agriculture, such as row crops, dairy, and poultry production, is the primary land-use activity in the watershed. In a preliminary contaminant survey we measured high concentrations of estrogens in sediments throughout the UCR watershed. In addition to estrogens from animal waste (livestock and dairy production), several pesticides, herbicides, and fungicides used for row crop production can also act as estrogens in the environment. Estrogens have been associated with endocrine disruption and reduced reproductive fitness in fish, amphibians, and other wildlife, raising questions about the role of elevated estrogens in the species declines in the UCR. Our goal is to determine source(s) of estrogens and their effects on fish in the UCR. Specific objectives are to: 1) determine the effects of estrogen exposure on native fish reproductive parameters such as egg production, fertilization rate, and development and hatching success of eggs, 2) determine incidence and severity of intersex in a survey of multiple species of fish in the UCR, 3) assess vitellogenin induction in caged fish to determine if estrogenic compounds are present in UCR water and identify sources of estrogen inputs, and 4) assess the estrogenic potency of UCR sediments by measuring vitellogenin induction in fish exposed to the sediment. Preliminary results of this ongoing work will be presented.

Presenter: Whitney Jacobs

Contact Person: Same

Type of Presentation: Oral

**AIRSBBase: A BLASTable database for detection of aquatic
invasive and rare species in environmental (e) DNA studies**

Tim L. King, U.S. Geological Survey, Leetown Science Center, Kearneysville, WV 25430; (304) 724-4450; tking@usgs.gov

John J. Miller, U.S. Geological Survey, Leetown Science Center, Kearneysville, WV 25430; (304) 724-4577; jjmiller@usgs.gov

Jay Stauffer, Jr., School of Forest Resources, Penn State University, University Park, PA 16802; (814) 863-0645; vc5@psu.edu

James Grazio, Department of Environmental Protection, Tom Ridge Environmental Center, Erie, PA 16505; (814) 217-9636; jgrazio@pa.gov

Abstract.-The assessment of an invasive or rare species distribution is a first critical phase of biodiversity conservation. However, several species are difficult to detect, especially during particular time periods or developmental stages, potentially biasing study outcomes. The extraction of DNA from environmental samples allows the characterization of the organisms present. It can also provide information on extinct communities of macroorganisms since short DNA sequences can persist for long time periods, as shown by the studies on old sediments, permafrost and ice cores. While short DNA sequences may be present at high density in the environment, their potential for the study of present-day communities of organisms has been substantially unexplored. Molecular methods for aquatic invasive species monitoring can range from relatively straightforward applications (e.g., confirmation of specimen identity or detection of target species in simple environmental samples) to the extraordinarily complicated (e.g., complete enumeration of species identity and abundance in a complex sample), and availability of tools for deployment in the field has been limited principally to the former. Increasingly, there is a need for new ways of comparing multiple metagenomics datasets, and for fast and user-friendly implementations of such approaches. The generation of genomic shotgun sequences from aquatic invasive and rare species will dramatically increase the probability of early detection of these due to presence of known DNA sequences for the targeted species. This presentation will describe the creation of a database containing thousands of annotated DNA sequences for many aquatic invasive and rare species. This database will allow researchers to BLAST the results of eDNA sequences to efficiently detect the presence of invasive and/or rare species.

Presenter: Tim King

Contact person: same

Type of presentation: oral

**Effects of an Unprecedented Coal-ash Spill on Fish Health
in an East Tennessee River System**

Mark Bevelhimer; Environmental Sciences Division, Oak Ridge National laboratory, Oak Ridge, Tennessee 37831; bevelhimerms@ornl.gov

Allison Fortner; ARCADIS, 114 Lovell Road, Knoxville, TN 37934; fortneram@ornl.gov

Teresa Matthews; Environmental Sciences Division, Oak Ridge National laboratory, Oak Ridge, Tennessee 37831; bevelhimerms@ornl.gov

Abstract.- In December 2008, an ash dike at the Tennessee Valley Authority Kingston Fossil Plant ruptured and released over 1 billion gallons of coal fly ash into the Emory and Clinch Rivers, making this the largest recorded spill of coal combustion waste in history. Coal fly ash is not currently regulated as hazardous waste, but may contain several contaminants which are of concern from an ecological and human health risk perspective. Oak Ridge National Laboratory scientists have been engaged at the Kingston ash spill site since January 2009 to assess the impacts of fly ash associated contaminants on the aquatic ecosystem. Studies include *in situ* assessments of contaminant bioaccumulation in fish, insects, and other animals as well as assessments of the toxic effects of exposure to fly ash in both field-exposed and laboratory-exposed fish. Bluegill sunfish *Lepomis macrochirus*, redear sunfish *L. microlophus*, largemouth bass *Micropterus salmoides* and channel catfish *Ictalurus punctatus* were collected from 2009 to 2012 in spring and fall from three sites in close proximity to the spill and from three reference sites. Fish health investigations included collection of a variety of physical, physiological, and reproductive metrics, including blood chemistry, energetic indices, and organ condition. Data analyses evaluated temporal (seasonal and annual) and spatial (affected versus spill sites) trends. To date our results have shown no evidence of accumulation of ash-associated contaminants above toxic thresholds, and have shown no significant long term toxicological effects of exposure to fly ash at the spill site. These results are being used in risk assessments and to guide decisions on remediation and long term monitoring at the site.

Presenter: Mark Bevelhimer

Contact Person: Same

Type of Presentation: Oral

**Black Bass Diversity: Multidisciplinary
Science for Conservation**

POSTERS

ABSTRACT 13158

Is the Conservation Genetic Status of Shoal Bass *Micropterus cataractae* in the Chipola River, Florida, Threatened by Hybridization with Both Native and Invasive Congeners?

Michael D. Tringali; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL; mike.tringali@myfwc.com

Andy Strickland; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, Quincy, FL.

Richard A. Krause; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, Holt, FL.

Seifu Seyoum, Brandon L. Barthel, Alicia Alvarez, and Cecilia M. Puchulutegui; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg.

Abstract.- Upon receiving reports of possible incursions by invasive Spotted Bass *Micropterus punctulatus* into the Chipola River, Florida, we initiated a genetic survey to assess potential risks to the native population of Shoal Bass *M. cataractae* caused by introgressive hybridization. Invasive Spotted Bass and native Largemouth Bass *M. salmoides* were sampled from the Apalachicola River, which is confluent with the Chipola River, to serve as reference specimens. Eighteen microsatellite markers were assayed. In 2007, we identified several hybrids among the 45 presumptive Shoal Bass specimens tested. Several hybrids involved backcrosses to Spotted Bass and Largemouth Bass. However, the exogenous parental taxon of one hybrid specimen was not identifiable based on available reference data. This taxon was later determined to be a novel micropterid species provisionally named Choctaw Bass (*M. haiaka*), which, ostensibly, is native to the coastal-plain rivers of the Eastern Gulf of Mexico. From 2008-2010, an additional 270 presumptive Shoal Bass were tested, resulting in the identification of 22 additional hybrids. Overall, 9.7% of the presumptive Shoal Bass were hybrids and the genomic proportion of exogenous alleles was 6.3%. Most exogenous alleles originated from the newly described Choctaw Bass (2.8%). Analysis of population structure within Choctaw Bass across the Florida panhandle indicated that the Choctaw Bass alleles in Chipola River Shoal Bass hybrids likely originated from the neighboring Choctawhatchee River. Largemouth Bass contributed the next highest genomic proportion of exogenous alleles (2.4%). Spotted Bass alleles were found to occur at a genomic proportion of 1.1%. Thus, while there is a non-trivial amount of exogenous alleles in the Chipola River Shoal Bass population, the majority of introgression appears to involve native taxa at present. However, should Spotted Bass become established in the Chipola River, the genetic risk to Shoal Bass will magnify. Monitoring will continue at three-year intervals.

Presenter: Michael Tringali
Contact Person: Same
Type of Presentation: Poster

**Springs as Thermal Refugia: Movement and Habitat Use
Patterns of Smallmouth Bass in an Ozark River**

Hope R. Dodd; National Park Service

Michael J. Siepker; Missouri Department of Conservation, West Plains, MO 65775;
mike.siepker@mdc.mo.gov

Abstract.- The Ozark Highlands is host to a diverse fish community and many endemic species due to the presence of karst features (springs, caves, etc.) that create various thermal and physical habitats. As climate change occurs in this region, temperature shifts and changes in precipitation could affect fish species abundance, range, and behavior through reduction of both thermal and physical habitat heterogeneity; however, springs may mitigate these effects. We examined the use of large springs and timing of movement to and from these habitats by an indicator species, the smallmouth bass. In January 2011, we installed water temperature loggers and tracked thirty smallmouth bass tagged with radio transmitters near Big Spring in the Current River, Missouri. We found timing of movement between the spring and the river was driven by temperature, although smallmouth bass did not collectively move from the Big Spring confluence in spring or make a mass movement into the confluence in winter. During winter, smallmouth bass inhabited the warmer water of Big Spring, and by March, moved into the river once temperatures became similar to those of the spring confluence. Most fish moved less than 16 km from Big Spring during this year long study. Twenty of the smallmouth bass moved downstream of the confluence with the largest total movement downstream of 51 km. The remaining ten fish moved upstream of the confluence with four of these fish moving more than 53 km upstream. By late fall when river temperatures dropped below that of Big Spring, fish began returning to this thermal refuge. Collection of baseline data on temperatures in springs and adjacent areas of the river coupled with data on fish movement patterns within these habitats will be crucial for future evaluations of the effects of climate change on these thermal refugia.

Presenter: Michael Siepker
Contact Person: Same
Type of Presentation: Poster

**Movement and Habitat Use of Shoal Bass, *Micropterus cataractae*,
in a Regulated Section of the Chattahoochee River**

Laurie A. Earley; Red Bluff Fish and Wildlife Office, Red Bluff, CA 96080;
laurie_earley@fws.gov

Steven M. Sammons; Department of Fisheries and Allied Aquaculture, Auburn University,
Auburn 36849; sammosm@auburn.edu

Abstract.- Shoal bass, *Micropterus cataractae*, are endemic to the Apalachicola drainage and have been designated a species of High Conservation Concern in Alabama and of Special Concern in Georgia and Florida. Much of their original distribution in the Chattahoochee River has been reduced due to impoundments, particularly in the Fall Line region, where 9 dams occur in a 64-km reach. However, isolated populations persist in the headwaters or tailwaters of these dams. The section of the river is regulated by West Point Dam, which is a hydro-peaking facility. To examine the habitat use and behavior of shoal bass in this section, 40 shoal bass were collected and implanted with 3.6-g radio tags in the headwaters of Bartletts Ferry Reservoir, below a small lowhead dam. These fish were tracked approximately every 7-d over a 35-week period for a total of 784 locations. During July-September, seven diel surveys were conducted, where 8 fish were tracked throughout a 12-h period. The goal of these surveys was to determine the effects of hydropeaking operations on fish distribution, movement, and habitat use. Home ranges were also calculated using fixed kernel density estimation in ArcMap 9.3. Shoal bass were commonly found using bedrock and boulder habitat rather than vegetated and sandy habitat, especially during times of higher flow. Fish movement was the highest in the spring, which can be associated to spawning, and lowest in late-fall due to cooler water temperatures. Several fish moved back and forth between the tailwater and a nearby tributary stream that flowed into the Chattahoochee River, possibly for refuge from peaking hydropower flows for spawning. However, no fish moved through the reservoir to access other tributaries with quality habitat. Thus, dams may not only present a physical barrier to upstream movement, but also the reservoirs formed by dams may hinder movement. During the diel surveys fish displayed greater movement throughout the day compared to a weekly basis. As flows increased fish moved into areas with current, possibly for foraging. This suggests the fish are not negatively affected by the hydropeaking operation. Although the effects of hydropower peaking flows and dam fragmentation on obligate river species continue to be poorly understood, this study suggests several strategies used by these species to adapt to altered flow regimes.

Presenter: Laurie Earley
Contact Person: Same
Type of Presentation: Poster

**Evolutionary Conservation Genetics and Historical Demography
of Bartram's Bass (*Micropterus* sp. cf. *M. coosae*)**

Kenneth Oswald; Honors Program, Northern Kentucky University, Highland Heights, KY
41099; oswaldk2@nku.edu

Jean Leitner; South Carolina Department of Natural Resources

Byron Freeman; University of Georgia

Joseph Quattro; University of South Carolina

Abstract.- Bartram's bass *Micropterus* sp. cf. *M. coosae*, a species endemic to the Savannah River, is threatened with extirpation via hybridization with Alabama bass *M. henshalli*, an introduced Micropterid that has become widespread in the drainage. Estimation of various evolutionary and demographic parameters has now become critical to formulate plans designed to assist in conservation and management of Bartram's bass. In this study, we sequenced one mitochondrial and three nuclear loci to ascertain evolutionary genetic variation in Bartram's bass. Phylogenetic reconstructions and haplotype frequency analyses of mitochondrial DNA revealed a moderate amount of population structure and substantial genetic divergence within the middle and upper Savannah River, suggesting that multiple conservation units are distributed throughout these segments. Coalescent analyses of mitochondrial and nuclear DNA loci returned small local effective population sizes, recent times since population separation, and appreciable population migration rates among higher-latitude riverine provinces. These results, taken in conjunction with the history of introductions of non-native black basses into the Savannah River, present a dim prognosis for long-term preservation of Bartram's bass.

Presenter: Kenneth Oswald

Contact Person: Same

Type of Presentation: Poster

Enhanced Genetic Resources for Largemouth Bass

Eric Peatman; Department of Fisheries and Allied Aquacultures, Auburn University, AL, 36849; peatmer@auburn.edu

Chao Li; Department of Fisheries and Allied Aquacultures, Auburn University, AL, 36849

Huseyin Kucuktas; Department of Fisheries and Allied Aquacultures, Auburn University, AL, 36849

Abstract.- Largemouth bass (Florida subspecies (*Micropterus salmoides floridanus*) and Northern subspecies (*M. salmoides salmoides*)) are important sport fishes, but also play critical roles in the maintenance of ecosystem health within their natural ranges, making them an increasingly popular model for studies of aquatic toxicology and a target for genetic conservation efforts. Our ability to answer a variety of questions relevant to the biology and culture of black basses (hybridization patterns, stress responses, selection of “trophy” lines, sex determining systems, stocking effectiveness, population structures, etc.) depends heavily on the availability and utility of molecular genetic resources. Next generation sequencing technology has recently drastically reduced the cost and time involved in generation of needed molecular resources for non-model species. We utilized genotyped, sexed Florida subspecies largemouth bass (St. John’s/ Kissimmee region and West Coast region) and Northern subspecies, along with F1 hybrid samples for sequencing on the Illumina HiSeq 2500 platform. One hundred individual bass in all were included in barcoded sequencing pools differentiated based on genotype and sex. Sequencing generated over 400 million 100 base-pair reads. Assembly using Trans-ABYSS generated 343,632 high quality sequence contigs of average length 788.9 bp. Using stringent BLAST parameters, 28,953 unique gene-coding transcripts were annotated. A total of 29,277 contigs contained a microsatellite with adequate flanking sequences for primer design. We also bioinformatically mined single nucleotide polymorphism (SNP) markers from the pooled individuals. SNP markers are being rapidly adopted for population genetic/genomic surveys as a reproducible, low cost marker solution that is amenable to a high level of multiplexing. Applying stringent filtering parameters, we identified 774 subspecies-specific SNPs and 970 Florida population-specific SNPs. A subset of these SNPs is currently being validated. The assembled genetic resources should prove valuable for enhancing study and management of largemouth bass natural and stocked populations.

Presenter: Eric Peatman
Contact Person: Same
Type of Presentation: Poster

**Two Steps Forward – Protecting the Genetic Integrity of
Florida Largemouth Bass Populations in Florida**

Wes F. Porak; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, Eustis FL 32726; wes.porak@myfwc.com

Brandon L. Barthel; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL. Rick B. Stout; Florida Bass Conservation Center, Florida Fish & Wildlife Conservation Commission, Webster, FL. Michael Matthews; Florida Bass Conservation Center, Florida Fish & Wildlife Conservation Commission, Webster, FL. William F. Pouders; Southwest Regional Office, Florida Fish & Wildlife Conservation Commission, Gainesville, FL. James D. Austin; Department of Wildlife, Ecology & Conservation, University of Florida, Gainesville, FL. David P. Philipp; Center for Aquatic Ecology, Illinois Natural History Survey, University of Illinois, Champaign, IL. Michael D. Tringali; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL

Abstract.- The Florida Fish and Wildlife Conservation Commission (FWC) has applied guidelines outlined in its Genetic Policy for the Release of Finfishes in Florida to the conservation and management of Florida bass *Micropterus salmoides floridanus*. State-wide genetic studies were initiated after hybrid largemouth bass were found in 10% of a bass sample collected from Lake Parker, which is located 150 km south of the recognized intergrade zone, in 1999. Genetic structure was resolved among 48 widely distributed populations of Florida and intergrade largemouth bass using allozyme polymorphism, mitochondrial DNA RFLP, and microsatellite genotypes. Based on the relationships detected among the sampled populations and hydrologic unit boundaries, the FWC designated four geographical regions of Florida as Genetic Management Units and prohibited government agencies from moving largemouth bass between regions. All brood fish at the state's Florida Bass Conservation Center hatchery are genetically certified as pure Florida bass prior to spawning, and wild fish are regularly added to the spawning stock to avoid hereditary domesticated traits. In addition, research has been conducted to estimate the amount of genetic diversity lost through the culture of hatchery fingerlings and ensure that it is minimized. A Florida statute was created making non-native Northern largemouth bass *M. s. salmoides* and their hybrids 'conditional species' south and east of the Suwannee River, so that now it is illegal to possess them within the native range of Florida bass without a FWC permit. Standards were developed to genetically authenticate and manage the brood stock from private fish hatcheries that intend to get a FWC permit to possess, sell, or transport hatchery Florida largemouth bass within the regulated region of the state. Similar guidelines were developed for private pond management companies and other organizations that intend to obtain a permit to relocate and stock wild Florida bass

Presenter: Wes Porak
Contact Person: Same
Type of Presentation: Poster

**Use of the Opercular Bone to Estimate Ages of Black Bass
(*Micropterus spp.*) in Lake Champlain**

V. Alex Sotola, George Maynard, and Erin M. Hayes-Pontius; Lake Champlain Research Institute, SUNY Plattsburgh, NY galphonsemaynard@gmail.com

J. Ellen Marsden; University of Vermont.

Timothy B. Mihuc and Mark Malchoff; Lake Champlain Research Institute, SUNY Plattsburgh, NY.

Abstract.- Scales and otoliths are routinely used by fisheries managers in North America to age *Micropterus salmoides* (largemouth bass) and *Micropterus dolomieu* (smallmouth bass). Scales are often used for aging because they can be collected without sacrificing or injuring the fish, although there are known problems with accuracy and precision. Otoliths are the most widely accepted aging structure for a variety of species; however, processing them can be time consuming and requires an investment in training and equipment. The opercular bone is routinely used by fisheries managers in the United Kingdom to age *Perca fluviatilis* (European perch) and have been validated for use in the United States for *Morone saxatilis* (striped bass); both are also *Perciform* species. While they require sacrificing the fish, opercles are much easier to remove and process; however, they have not been validated for black bass. Fish (>300mm) were collected from anglers in Plattsburgh, NY, and smaller fish (<300mm) were collected using boat electrofishing. Three readers were used to estimate the age of the fish using each structure; two readers had previous experience and one had no prior aging experience. Out of the opercle samples aged, readers agreed on 69% of samples; in comparison, readers agreed on 47% of dorsal spines, 44% of otoliths, and 32% of scales. Opercles showed the highest CV (coefficient of variance), a measure of the precision of each structure used. Estimating the age of fish of certain populations can assist in better management policies and practices by providing demographic information. Since black bass are popular and widely managed, it is vital for managers to have the most effective and precise techniques available for estimating fish ages.

Presenter: V. Alex Sotola
Contact Person: Same
Type of Presentation: Poster

**Black Bass Diversity: Multidisciplinary
Science for Conservation**

ORAL PRESENTATIONS

ABSTRACT 13200

Black Bass Management in the 21st Century: Staying Relevant

Fred Harris
Fisheries Conservation Foundation
fahadh92@hotmail.com

Keynote Address

NO ABSTRACT

Fisheries Induced Evolution in Largemouth Bass – Reductions in Parental Care and Vulnerability to Angling

David Philipp; Illinois Natural History Survey, University of Illinois, Champaign, IL

Julie Claussen; Illinois Natural History Survey, University of Illinois, Champaign, IL 61820; juliec@illinois.edu

Jeff Koppelman; Missouri Department of Conservation, Columbia, MO 65201

Steve Cooke; Carlton University, Ottawa, ON, Canada

Cory Suski and David Sutter; University of Illinois, Champaign, IL 61820

Robert Arlinghaus; Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin.

Abstract.- Long-term studies in Ontario, Canada on largemouth bass have clearly demonstrated that angling nesting males (both catch-and-harvest and catch-and-release) has negative impacts on the reproductive success for the captured individual. Unfortunately, the male bass that are the most capable of having the greatest relative contribution to the year class are also those individuals that provide the best and longest parental care for their offspring. As a result, those males are the most aggressive within the population and hence, are the most vulnerable to angling. We postulate that angling for nesting bass results in selection against the “best dads” in a population, and the result is the evolution toward less aggressive characteristics that diminish parental care attributes, a classic example of Fisheries Induced Evolution (FIE). Controlled, long-term selective breeding experiments over 20+ years have documented the heritability of vulnerability of bass to angling. Controlled reproductive competition experiments further demonstrated that the highly vulnerable (HV) strain of bass indeed had greater reproductive success than the less vulnerable strain (LV) – because the LV bass acquired lower mating success and provided less parental care for their offspring than did their HV counterparts. Because angling for largemouth bass has been occurring on many of our bass populations for many years, we also postulated that there should be some evidence in the wild of this FIE. In fact, the level of vulnerability to angling of nesting male largemouth bass in lakes that have had little to no exploitation is significantly greater than nesting males in moderately and heavily angled populations. The long-term impacts of angling bass during the reproductive season is presented in the form of a conceptual model, which then serves as the basis for recommendations on what management changes are needed to assure long-term sustainability of wild populations.

Presenter: Julie Claussen

Contact Person: Same

Type of Presentation: Oral

**Associated Habitat of Nesting Shoal Bass *Micropterus cataractae*
in the Chipola River, FL**

Roger Bitz; Tennessee Wildlife Resources Agency, Morristown, TN 37814; roger.bitz@tn.gov

Andy Strickland; Florida Fish and Wildlife Conservation Commission, Quincy, FL 32351;
andy.strickland@myfwc.com

Ted Alfermann; Florida Fish and Wildlife Conservation Commission, Quincy, FL 32351;
ted.alfermann@myfwc.com

Jennifer Bock; Florida Fish and Wildlife Conservation Commission, Tallahassee, FL 32301;
jennifer.bock@myfwc.com

Abstract.- Shoal bass *Micropterus cataractae* are one of the rare black bass *Micropterus spp.* endemic to limited sections within the Apalachicola, Chattahoochee, and Flint River system. The restricted range of this species has resulted in a paucity of life history information. Knowledge regarding the reproductive ecology and spawning habitat requirements of shoal bass coincides with the objectives of the Southeast Native Black Bass Keystone Initiative. Thus, the objective of this study was to use radio telemetry as an instrument to document nesting shoal bass and associated habitat in the Chipola River, FL. Available macrohabitat for the Chipola River was quantified using side-scan sonar and classified into four groups: bedrock, boulder (>35 cm dia.), rocky fine (5-35 cm dia.), and gravel/sand (\leq 5 cm dia.). In February 2011, 30 male shoal bass \geq 295 mm were implanted with internal radio transmitters. Five fish were excluded from the sample as a result of mortality, transmitter expulsion, and/or transmitter failure shortly after deployment. Of the 25 tagged fish, 18 individuals constructed a total of 23 nests. Half of all tagged fish nests (50%) were constructed within the boulder macrohabitat type (17% availability). Rocky fine (27% availability) was the second most selected macrohabitat, containing 32% of tagged fish nests. An additional 67 nests of un-tagged shoal bass were found in 2011 and 2012 to quantify habitat use; with 81% of nests found in either boulder or rocky fine habitat. Mean depth at which nests were constructed was 102 cm. Mean temperature for all nests was 22.5°C. Mean flow taken 4 cm above the nest was 0.02 m/s, and mean turbidity for all nests was 2.00 NTU. Defining critical nesting habitats for shoal bass provides managers with the criteria needed for habitat protection, and/or enhancement in the Chipola River, FL.

Presenter: Roger Bitz

Contact Person: Same

Type of Presentation: Oral

The effects of disease-related mortality on the recruitment of young-of-year smallmouth bass in the Susquehanna River Basin, Pennsylvania

Geoffrey Smith; Pennsylvania Fish and Boat Commission, Division of Fisheries Management, Pennsylvania Fish & Boat Commission, Harrisburg, PA 17106; geofsmith@pa.gov

Vicki Blazer; U.S. Geological Survey, National Fish Health Research Laboratory, Kearneysville, WV 25430

Heather Walsh; West Virginia University, Morgantown, WV 26506

Cliff Starliper; U.S. Geological Survey, National Fish Health Research Laboratory, Kearneysville, WV 25430

Luke Iwanowicz; U.S. Geological Survey, National Fish Health Research Laboratory, Kearneysville, WV 25430

Adam Sperry; West Virginia University, Morgantown, WV 26506

Abstract.- In recent years, wide-scale mortality of young-of-year (YOY) smallmouth bass *Micropterus dolomieu* has affected recruitment from the Susquehanna River and a number of tributaries. Investigations have determined that these mortality events are associated with changes in various components of water quality in the presence of multiple pathogens. Outbreaks have been characterized by lesions colonized by several species of bacteria including motile *Aeromonas* spp., *Flavobacterium columnaris*, and *Pseudomonas aeruginosa*. Further, heavy infestations by the myxozoan parasite *Myxobolus inornatus* and trematode metacercariae have been documented in affected fish. Many of the specimens submitted for analysis have also been infected by largemouth bass virus (LMBV); however, the relationship between this virus and outbreaks remains unclear. Histological analysis of pre-spawn adult bass has documented frequent and severe cases of intersex (i.e., testicular oocytes and measurable concentrations of vitellogenin) in male smallmouth bass; suggesting the presence of endocrine disrupting compounds in the system. It is uncertain what compounds are present or how these compounds contribute to immune suppression of YOY smallmouth bass that may allow for bacterial and parasite colonization. A complex relationship of several factors seems to be at play. While the smallmouth bass is not native to the Susquehanna system, it could be a case study as to how changes in water quality and multiple pathogens could pose a threat to conservation of populations of black bass species with low densities and limited distribution.

Presenter: Geoffrey Smith
Contact Person: Same
Type of Presentation: Oral

Drivers of Brood Abandonment in Largemouth Bass

Cory Suski; University of Illinois, Urbana, IL, 61801; suski@illinois.edu

Zachary Zuckerman; University of Illinois, and Illinois Natural History Survey, Urbana, IL, 61801

David Philipp; Illinois Natural History Survey, Urbana, IL, 61801; philipp@illinois.edu

Abstract. Parental investment decisions are rooted in tradeoffs between a number of internal and external factors. When the cost of care- is outweighed by potential future reproductive potential, a parent may forfeit current investment in an effort to maximize future reproductive success. Few studies have approached parental care decisions using offspring abandonment as an outcome, and fewer yet have adopted a holistic approach to test how intrinsic and extrinsic factors compare in influencing abandon decisions by a parent. We performed two separate, yet complementary, studies to test for the effects of several factors on brood abandonment decisions in largemouth bass. First, we quantified whether mating success and simulated brood depredation affect the decision by paternal largemouth bass to abandon a brood. Second, we used a multivariate approach to jointly test the influence of nutritional condition, hormonal stress, androgen concentration, and oxidative stress of brood-guarding paternal largemouth bass, and the threat of brood depredation (i.e., brood predator density), on brood abandonment decisions. Together, results suggested a threshold for brood loss at which paternal largemouth bass were more likely to abandon what remains of a depredated brood, and that a high threat of depredation and reduced androgen concentration also influenced decisions. Results have implications for management of largemouth bass, and also offer a novel approach for testing the inter-related effects of various abiotic and biotic factors on parental care decisions across taxa.

Presenter: Cory Suski
Contact Person: Same
Type of Presentation: Oral

Evaluation of a Five-Year Shoal Bass *Micropterus cataractae* Conservation-Stocking Program in the Upper Chattahoochee River, Georgia

Michael J. Porta; Oklahoma Cooperative Fish and Wildlife Research Unit; Department of Natural Resource Ecology and Management; Oklahoma State University; Stillwater, OK 74078; mike.porta@okstate.edu

James M. Long; U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Department of Natural Resource Ecology and Management, Oklahoma State University; Stillwater, OK 74078; longjm@okstate.edu

Abstract.- In 2003, the Georgia Department of Natural Resources and the National Park Service initiated a five-year shoal bass stocking program below Morgan Falls Dam in the Chattahoochee River, Georgia with a goal of rehabilitating population abundance to historic levels and to provide further sport-fishing opportunities. Shoal bass were marked with oxytetracycline (OTC) and stocked as juveniles at one of two size classes (Phase I [~25 mm, TL] and Phase II [~60 mm, TL]) in spring (April – June) each year (2003-2007). Contribution to the adult population was evaluated by collecting adult shoal bass with boat electrofishing from 2007-2011 and viewing their otoliths for the presence of an OTC mark. Stocked shoal bass dominated the total sample of adult fish collected (62%) and most of these fish (41%) were stocked at the larger size class. Based on results from multiple regression modeling, age-3 shoal bass catch-per-unit-effort was positively related to mean size at stocking and spring water temperatures. Natural mortality of shoal bass in this population was low (20%) with increased longevity (14 years) and low growth rates. Overall, the five-year shoal bass stocking program was successful in increasing shoal bass abundance in the Chattahoochee River below Morgan Falls Dam.

Presenter: Michael Porta
Contact Person: Same
Type of Presentation: Oral

Natural Gene Expression Changes During the Reproductive Season in Largemouth Bass

Nancy D. Denslow; University of Florida, Department of Physiological Sciences and Center for Environmental and Human Toxicology, Gainesville, FL 32611; ndenslow@ufl.edu
Christopher Martyniuk; Canadian Rivers Institute and Department of Biology, University of New Brunswick, Saint John, NB, E2L4L5, Canada. Melinda Prucha; Department of Physiological Sciences, University of Florida, Gainesville, FL 32611. Kevin Kroll; Department of Physiological Sciences, University of Florida, Gainesville, FL 32611. Wesley F. Porak; Florida Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, Eustis, FL 32726; wes.porak@myfwc.com. Gustavo Dominguez; Department of Global and Environmental Health, University of Florida, Gainesville, FL 32611. Tara Sabo-Attwood; Department of Global and Environmental Health, University of Florida, Gainesville, FL 32611

Abstract.- Largemouth bass (*Micropterus salmoides*) are one of the most popular sportfish throughout North America. They are sensitive to environmental contaminants and thus serve as good bio-indicator species. To better understand how environmental contaminants may affect their normal physiological development, largemouth bass were collected over an eighteen month period from a location that had minimal influence of industrial effluent and limited impacts from agricultural runoff. Fish were weighed, and reproductive parameters were collected. In females, molecular pathways and temporal changes in gene expression patterns were investigated as a function of oocyte maturation to begin to understand the molecular sequence of events underlying ovary development. Specific genes known to be important to reproduction were investigated including the three estrogen receptors, steroidogenic acute regulatory protein (StAR), vitellogenin and the vitellogenin receptor, among others. We used microarray analysis to investigate eight morphologically diverse stages of ovarian development that spanned from primary oocyte growth to maturation and atresia. Early changes in gene expression revealed that the immune system is increased as oocytes move out of their primary stages, but then decreased in ovulation. Some oocytes do not ovulate but instead become atretic, and experience an increase in oxidative stress and differential regulation of pathways involved in gap junction and actin cytoskeleton regulation. Other significant pathways that have a role in oocyte maturation included genes regulated by members of the TGF-beta superfamily (activins, inhibins, bone morphogenetic protein 7 and growth differentiation factor 9), as well as the neuregulin 1, retinoid X receptor, and nerve growth factor. This study offers novel insight into the gene networks underlying vitellogenesis, ovulation and atresia and generates new hypotheses about the cellular pathways regulating oocyte maturation. This information can be useful for future research that attempts to understand the relationships between environmental contaminants and endocrine disruption in black bass species.

Presenter: Nancy Denslow
Contact Person: Same
Type of Presentation: Oral

**What are Field and Mesocosm Studies with Black Bass
Telling Us about Endocrine Disruption?**

Donald E. Tillitt; USGS, Columbia Environmental Research Center, Columbia, MO, 65201;
dtillitt@usgs.gov

Diana M. Papoulias; U.S. Geological Survey, Columbia Environmental Research Center,
Columbia, MO, 65201

Cathy A. Richter; U.S. Geological Survey, Columbia Environmental Research Center, Columbia,
MO, 65201

Jo Ellen Hinck; U.S. Geological Survey, Columbia Environmental Research Center, Columbia,
MO, 65201

Nancy D. Denslow; University of Florida, Department of Physiological Sciences and Center for
Environmental and Human Toxicology, Gainesville, FL, 32611; ndenslow@ufl.edu

Abstract.- The importance of black bass species in unraveling environmental issues related to endocrine disrupting chemicals (EDCs) has increased over the past two decades. Largemouth bass (*Micropterus salmoides*) and smallmouth bass (*Micropterus dolomieu*) have become model species for biomonitoring efforts and reproductive toxicological studies in the field and laboratory. Black bass were the preferred top predator species in the Biomonitoring Environmental Status and Trends (BEST) program, a national fish health and chemical contaminant assessment program in large rivers across the United States. Black bass species are relevant environmental model fishes from an ecological standpoint as top predators and have high recreational fisheries value, thus making them good candidates for development as a toxicological model fish species. However, use of black bass species for toxicological testing and assessment of endocrine disruption has been limited due to knowledge gaps in molecular endocrinology, sex determination, developmental biology, and reproductive biology of these species. The interpretation of findings from environmental biomonitoring efforts with black bass also suffers limitations due to these same knowledge gaps. Therefore, characterization of the fundamental biological processes, development of normal distributions for steroid hormone concentrations and other reproductive biomarkers, and development of molecular tools (genomic sequencing) for black bass are critical. This presentation summarizes our research and available literature on the characterization of black bass as a toxicological model for endocrine disruption, including field monitoring studies and laboratory/mesocosm exposures to endocrine disrupting chemicals.

Presenter: Donald Tillitt

Contact Person: Same

Type of Presentation: Oral

Factors Associated With Intersex Bass in the Southeastern U.S.

Robert Bringolf; University of Georgia, Warnell School of Forestry & Natural Resources, Athens, GA 30602; bringo@uga.edu

Kristen Kellock; University of Georgia, Warnell School of Forestry & Natural Resources, Athens, GA 30602

Brian Irwin; U.S. Geological Survey, Georgia Cooperative Fish and Wildlife Research Unit, University of Georgia, Athens, GA 30602

Abstract.- We recently reported that small impoundments (surface area <100 acres) had a higher proportion of intersex bass (males with testicular oocytes) than larger impoundments and rivers in the southeastern U.S. Intersex has previously been reported in fish collected near municipal and industrial effluent discharges containing endocrine disrupting compounds (EDCs) such as environmental estrogens. The small impoundments had no input of wastewater and were located in rural areas with mixed land use with no known source of EDCs. Therefore, we sought to identify biotic and abiotic factors associated with high rates of intersex to help elucidate causative factors for intersex in bass. Our objectives were to: 1) identify landscape level and physiochemical properties of surface waters associated with intersex in bass, 2) determine the estrogenic potency of water and sediments in impoundments and rivers where intersex bass were collected, and 3) examine the potential for nitrate and cyanobacteria to cause endocrine disruption in fish. We used hierarchical linear regression with model selection to identify landscape-level and limnological characteristics associated with intersex and we used a variety of in vitro and in vivo techniques to assess the estrogenicity of surface waters and sediments from rivers and impoundments where intersex bass were captured. Intersex rates were highest in the smallest and shallowest impoundments which also had the highest nutrient levels but intersex was not always found in waters with the highest estrogenic potency. Nitrate and cyanobacteria both demonstrated potential to cause endocrine disruption in fish. Findings from this study suggest that factors involved in the high rate of intersex bass in small impoundments may be different from those in intersex fish in river habitats, and may have implications for pond management.

Presenter: Robert Bringolf
Contact Person: Same
Type of Presentation: Oral

Common Diseases of the Black Basses and their Impact on Conservation and Management

Jeffery S. Terhune; Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849; jsterhune@auburn.edu

Benjamin H. Beck; USDA-ARS Stuttgart National Aquaculture Research Center, Stuttgart, AR 72160

Abstract.- Disease issues relevant to black bass populations arise from infectious as well as noninfectious etiologies. While disease outbreaks can occur via direct means, as is the case with primary pathogens, mortality events can also be linked to factors that disrupt the delicate balance between the environment, host, and pathogen. Indeed, black bass are found in a variety of geographies and habitats, and irrespective of their locale, fish are subject to environmental fluctuations such as changes in dissolved oxygen, temperature, water quality, as well as physical affronts such as handling and confinement. These and other associated stressors can disrupt homeostasis and result in physiologic perturbations that are central to the pathophysiology of disease in black bass. Many pathogens that affect black bass are ubiquitous and opportunistic, and commonly have limited impacts on populations as a whole unless a dysregulation of environmental conditions occurs that predispose fish to disease or exacerbate disease development. Examples include common aquatic bacterial pathogens (e.g. *Aeromonas* sp. and *Flavobacterium columnare*), fungal, and parasitic infections, especially commensal protozoan parasites. In recent years, viral pathogens have been linked to large-scale fish mortalities in extensive, natural habitats as well as managed recreational impoundments. The underlying mechanisms behind these outbreaks remain largely undefined, yet significant concerns regarding biosecurity practices have surfaced due to the tremendous economic impacts that black bass fisheries support. Additionally, some grossly obvious phenotypic alterations of unknown etiologies (e.g. neoplasms and hyperpigmentation) may be indicative of environmental concerns that warrant further exploration.

Presenter: Jeffery Terhune
Contact Person: Same
Type of Presentation: Oral

**Biology and Ecology of Genetically Distinct Neosho
and Ouachita Smallmouth Bass**

Shannon K. Brewer; U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, OK 74078; shannon.brewer@okstate.edu

James M. Long U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, OK 74078; longjm@okstate.edu

Abstract.- Smallmouth bass (*Micropterus dolomieu*) native to the Arkansas River and Red River basins are genetically distinct from each other and the remainder of the smallmouth bass species throughout their range. The populations in the Arkansas River basin inhabit streams throughout the Ozark ecoregion and were separated as a subspecies (Neosho smallmouth bass, *M. dolomieu velox*) in 1940, whereas the Red River basin populations inhabit streams of the Ouachita ecoregion, but do not have a formal taxonomic assignment. Both of these genetically-distinct forms are of conservation importance in the states where they occur, but a comprehensive summary of their ecology is lacking. We reviewed published and gray literature associated with Neosho and Ouachita smallmouth bass. Substantial inter-stream variation appears to occur within these population particularly related to age (Neosho: max age reported was 6-10 years; Ouachita: max age reported was 3-6). Several general patterns occur within these populations. The Neosho subspecies is more abundant, grows faster, and lives longer than Ouachita smallmouth. Recruitment is highly variable among streams for both populations, but appears related to hydrology. Some evidence indicates the Neosho subspecies is declining when compared to other black basses. Information on seasonal trends is lacking and definitive conclusions about abundance trends between streams are difficult because of different sampling periods and issues associated with gear efficiencies.

Presenter: Shannon Brewer
Contact Person: Same
Type of Presentation: Oral

Largemouth Bass in Coastal Estuaries: A Comprehensive Study from the Mobile-Tensaw River Delta, Alabama

Dennis R. DeVries; Department of Fisheries and Allied Aquacultures, Auburn University, AL 36849; devridr@auburn.edu. Troy M. Farmer; Aquatic Ecology Laboratory, the Ohio State University, Columbus, OH 43212. David C. Glover; Center for Fisheries, Aquaculture, and Aquatic Sciences, Southern Illinois University, Carbondale, IL 62901. Michael R. Lowe; Department of Coastal Sciences, University of Southern Mississippi, Ocean Springs, MS 39564. Alicia J. Norris; Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA, 23062. Adam C. Peer; Chesapeake Biological Laboratory, University of Maryland Center for Environmental, Science, Solomons, MD, 20688. Russell A. Wright; Department of Fisheries and Allied Aquacultures, Auburn University, AL 36849

Abstract.- Although largemouth bass are typically thought of as a freshwater species, populations occur in estuaries throughout the US Atlantic and Gulf of Mexico coasts, often with established fisheries. These coastal populations must deal with the physiological stresses associated with salinity variation, and are generally isolated from inland freshwater populations, increasing the potential for differentiation. We quantified a diverse array of individual and population parameters for largemouth bass in the Mobile-Tensaw River Delta in southwest Alabama during 2003-2008 (including population demographics, feeding ecology, movement, recruitment, bioenergetics) in an effort to understand factors important to these coastal populations to facilitate their management. Large individuals were rare (only 7 out of 9530 individuals were >2.3 kg) and fish condition increased with increasing salinity influence. Growth responses were more complex, varying with both fish age and salinity. Faster growth was observed in the brackish, downstream areas for fish <age-2, while growth of older fish was faster in freshwater upstream sites. Using bioenergetics modeling, we demonstrated that a complex combination of spatial variation in water temperature, prey energetic content, and metabolic cost of salinity was responsible for age-specific spatial variation in growth. Combining traditional tag-recapture and telemetry techniques with more sophisticated otolith microchemical analyses, we found that largemouth bass of all ages moved very little, even in response to increasing salinity (up to 15 ppt) in downstream areas. Our more recent work suggests that largemouth bass experiencing variable and seasonal salinity influxes may face energetic constraints relative to how they allocate their energy resources and may help explain the slow growth/high body condition paradox common to these populations. Management of coastal largemouth bass populations will require different approaches compared to their freshwater counterparts, including different goals, expectations, and likely even requiring consideration as unique populations.

Presenter:	Dennis DeVries
Contact Person:	Same
Type of Presentation:	Oral

Population and Individual Responses of Alabama Bass *Micropterus henshalli* and Redeye Bass *Micropterus coosae* to Altered Flow Regimes in a Regulated Portion of the Tallapoosa River, Alabama

Laurie Earley; Red Bluff Fish and Wildlife Office, Red Bluff, CA 96080; laurie_earley@fws.gov

Steve M. Sammons; Department of Fisheries and Allied Aquaculture, Auburn University, Auburn, AL 36849; sammosm@auburn.edu

Abstract.- The Tallapoosa River, Alabama, has been extensively impounded for flood control, hydro-power, water supply and navigation on the Alabama River. The river has four dams on it, including R.L. Harris Dam, completed in 1983, and supports a significant sport fishery. Native sportfish include two important black bass species, Alabama bass *Micropterus henshalli* and redeye bass *Micropterus coosae*. Previous research has been completed on the Tallapoosa River but minimal work has focused on the sportfish response to the altered flow regime. The objective of this study was to investigate the impacts of an altered flow regime on growth, movement, habitat use and the physiological stress response of these two species. Annual growth was evaluated in response to different flow variables. We found that age was the best explanatory variable describing annual growth increments for both species, but growth rates were higher in unregulated sites compared to two regulated sites. Overall, it appeared that growth was not severely impacted by the altered flow regime. Telemetry data was collected over the course of 37 weeks to better understand the movement and habitat use of both these species. Results showed that movement was strongly associated to season, but there was no major difference in movement in regards to altered flows. Small shifts in habitat use were observed during different flows, which may be due to fish relocating to more suitable habitat or better foraging. The stress response of these two species was studied by looking at baseline and response levels of plasma cortisol and leukocyte profiles. Results indicated that fish exposed to the altered flow regime have an altered stress response, based on higher baseline levels in both biomarkers. In conclusions, it appears that the populations of these species in this section of the Tallapoosa River may be more affected physiologically than behaviorally.

Presenter: Laurie Earley
Contact Person: Same
Type of Presentation: Oral

Movement and Habitat Selection of Redeye Bass (*Micropterus coosae*) from the Regulated Tallapoosa River and Hillabee Creek (Alabama, USA)

John R. Knight II; Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, AL 36849; m_coosae@yahoo.com

Taconya P. Goar; Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, AL 36849

Elise R. Irwin; U.S. Geological Survey, Alabama Cooperative Fish and Wildlife Research Unit, Auburn University, Auburn, AL 36849

Abstract.- Specific habitat characteristics critical to quality redeye bass populations are needed on multiple scales (from microhabitat to watershed). We combined specific microhabitat habitat and fish movement data in the regulated Tallapoosa River and an unregulated tributary to identify critical habitats and/or management units and determine the proper scale (e.g., stream reach or watershed) for protection or enhancement of redeye bass populations. To monitor movement and habitat use, we radio tagged fish in Hillabee Creek and in the mainstem Tallapoosa River near Wadley, Alabama. Fish (N = 12) in Hillabee Creek moved an average of 66.5 m/relocation; and over 50% of the fish remained in localized areas associated with instream cover and coarse substrata. Habitat use overwhelmingly included association with areas near shore (< 5 m from shore), shallow water (< 0.5 m), moderately fast velocities (> 0.05 m/s), large substrata, and < 10% canopy cover. Fish (N = 10) in the Tallapoosa River moved less between relocations and less overall and occupied similar habitats to tributary residents, but were located farther from shore (> 30 m). A hydropeaking facility, R. L. Harris Dam, is located 14 RM upstream from Wadley; typically water is released once or twice daily in pulses that vary greatly in discharge; consequently the river fluctuates between extreme high and low flows. Relations between fish movement and flow components indicated that fish moved more when the number of generation events and mean daily flows between relocations were low. Conversely, fish in Hillabee Creek moved more during high flow events. Fish in the mainstem Tallapoosa may move less to compensate for fluctuating flows delivered by Harris Dam. These findings were important in assessment of availability and persistence of specific habitat features at multiple scales in the regulated Tallapoosa River and an unregulated tributary under natural and managed conditions.

Presenter: John Knight
Contact Person: Same
Type of Presentation: Oral

**A Tale of Two Rivers: Population Characteristics of Shoal Bass
in the Chattahoochee and Flint Rivers**

Steve M. Sammons; Department of Fisheries and Allied Aquaculture, Auburn University,
Auburn, AL 36849; sammosm@auburn.edu

Abstract.- Shoal bass (*Micropterus cataractae*) are endemic to the Apalachicola drainage in Alabama, Florida, and Georgia. Shoal bass are habitat specialists, occupying shallow, rocky riffles and shoals in medium- to large-sized streams and rivers and are intolerant of reservoir conditions. This species has been assigned a status of “Special Concern” by the Endangered Species Committee of the American Fisheries Society, mainly because of habitat loss and associated distributional declines. Shoal bass populations have followed distinctly different paths over the last 100 years in the two main river systems that comprise the Apalachicola watershed. The Flint River in Georgia is one of only 42 rivers in the U.S. with > 200 km of unimpeded flow, and shoal bass populations in that river are characterized by relatively high recruitment and a balanced size structure. In addition, these fish have been observed to make long (> 100 km) migrations in the spring to large shoal complexes, presumably to spawn. In contrast, shoal bass were impacted by dams in the Chattahoochee River watershed beginning in the early 20th century, restricting fish movement and inundating shoal habitat. More dams were constructed on the Chattahoochee River in the latter half of the 20th century, ultimately eliminating roughly half the shoal bass habitat found above the Fall Line of that river. Currently, shoal bass in much of the Chattahoochee Basin exist in small isolated populations found immediately downstream of dams and in shoals of large tributaries. These populations are characterized by low recruitment and size distribution heavily skewed towards large, old adults. Likewise, the tributary populations have been effectively cut off from mainstem shoal habitats by dams and are now isolated. Alabama has lost most of its natural shoal bass populations, with only one remaining that currently has < 100 individuals. The overall effect of dams in the Chattahoochee River has been to reduce a continuous population of shoal bass into a series of isolated populations of limited genetic diversity and low effective population size, with an increased likelihood of extinction.

Presenter: Steve Sammons

Contact Person: Same

Type of Presentation: Oral

History of Black Bass Management in the United States

James M. Long; U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, OK 74078; longjm@okstate.edu

Micheal S. Allen; Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville, FL 32653; msal@ufl.edu

Wesley F. Porak; Eustis Fisheries Research Laboratory, Florida Fish and Wildlife Conservation Commission, Eustis, FL 32726; wes.porak@myfwc.com

Cory Suski; Department of Natural Resources and Environmental Sciences, University of Illinois, Urbana, IL, 61801; suski@illinois.edu

Abstract.- The history of black bass management can be traced back approximately 200 years beginning with the scientific description of largemouth bass *Micropterus salmoides* and smallmouth bass *M. dolomieu* in 1802. Much of the beginnings of black bass management centered on stocking and moving fish, especially in areas where pollution and overharvest had reduced fish numbers. The conservation movement at the turn of the 20th century led to the creation of state and federal laws meant to curb harvest of black bass, especially those that were commercially harvested. Just prior to the U.S. involvement in World War II saw the scientific descriptions of more black bass species, many that were first described but rejected as valid species in the early 1800s. After the war, reservoir construction expanded, leading to increased rates of fish stocking, which expanded the range of some black bass species, but at the expense of native habitat for others. The era of reservoir construction, along with the concomitant boom in black bass fishing, led many states to enact more restrictive rules regulating harvest. Angler groups helped reduce the impact of recreational harvest through the promotion of catch-and-release fishing, which has now become so successful that traditional approaches to black bass management, such as bag and minimum-size limits, have become less effective. Furthermore, the use of genetic tools has resulted in additional black bass species described by science, typically occupying small ranges in areas impacted by past anthropogenic manipulation. Similarly, genetics has identified incidences of hybridization and lost genetic integrity from past-stocking actions. Currently, black bass conservation is increasingly focused on restoring native populations and native habitats requiring the use of additional tools not traditionally employed by fisheries managers to ensure continued success.

Presenter: James Long
Contact Person: Same
Type of Presentation: Oral

**Population Assessment and Exploitation of Shoal Bass
Micropterus cataractae in the Lower Flint River**

Travis R. Ingram; Georgia Department of Natural Resources, Albany, GA 31701;
travis.ingram@dnr.state.ga.us

John M. Kilpatrick; Georgia Department of Natural Resources, Albany, GA 31701

Abstract. - One of the largest native populations of shoal bass *Micropterus cataractae* is found in the Flint River and for the most part, remains relatively unstudied. We defined population characteristics for shoal bass in the lower Flint River, Georgia during 2009–2011. Electrofishing catch rates for shoal bass averaged 13.0 fish per hour over the study. Weight–length relationship is described as $-5.56 * TL^{(3.27)}$. Fish (N=187) were sacrificed for age and growth analysis. Ages of sampled fish ranged from age 1 to age 11. Model parameters (von Bertalanffy) were defined as 564 mm (L_{∞}), 0.322 (K), and -0.059 (t_0). Male and female growth rates were similar, with average fish requiring 2.35 years to reach 305 mm and 5.11 years to reach 457 mm. Growth of shoal bass was faster than that of largemouth bass *Micropterus salmoides* in the river and in Lake Blackshear. Annual total mortality averaged 44% and ranged from 42–47% annually. Seven hundred and forty shoal bass were tagged with internal anchor tags to evaluate exploitation. When adjusted for tag non-reporting, we estimated the percentage of legal-sized shoal bass harvested to average between 8.4–10.4% and ranged from 3.4–20.8%. With current population dynamics and exploitation levels, an increase in the minimum length limit would likely not increase yield to the recreational fishery.

Presenter: Travis Ingram
Contact Person: Same
Type of Presentation: Oral

**Stock Assessment of Shoal Bass *Micropterus cataractae*
in the Chipola River, Florida**

Katie L. Woodside; Florida Fish & Wildlife Conservation Commission, Division of Freshwater Fisheries Management, Panama City, FL 32409; katie.woodside@myFWC.com

Christopher J. Paxton; Florida Fish & Wildlife Conservation Commission, Division of Freshwater Fisheries Management, Panama City, FL 32409; chris.paxton@myFWC.com

Nicole C. Kierl; Florida Fish & Wildlife Conservation Commission, Division of Freshwater Fisheries Management, Panama City, FL 32409; nicole.kierl@myFWC.com

Abstract.- A stock assessment of shoal bass *Micropterus cataractae* was conducted in the upper Chipola River in Jackson and Calhoun Counties Florida from 2007 to 2012. This evaluation was conducted in accordance with the Florida Fish and Wildlife Conservation Commission's Black Bass Management Plan to aid in conservation of native black bass. Previous shoal bass research in Florida was limited in terms of the amount of habitat or numbers of individual specimens sampled. Although one of the potential threats to shoal bass in the Chipola River has been described as sedimentation; no information existed regarding abundance or assessed the existing population as a sport fishery. Shoal bass collected via boat electrofishing were weighed, measured, fin clipped, and released for mark recapture population estimates. Modified Schnabel population estimates described abundance in 2009, 2010, and 2011 for three study reaches. Targeted habitat types were shoals, riffles, runs and pool areas containing limestone outcropping. Total annual mortality was estimated and mean total length at age was described by Von Bertalanffy growth curves for shoal bass collected in 2008 and 2010. Missing or underrepresented year classes from the 2008 and 2010 age samples indicated recruitment fluctuations. Seasonal hydrologic variables were incorporated into catch curve regressions to clarify recruitment fluctuations. A population specific standard length weight equation was developed from shoal bass collected between 2007 and 2012 to describe relative condition. A roving creel survey was conducted in 2010 and 2011 to provide effort, catch, success, and harvest estimates. Shoal bass are currently listed as a listed as a species of "Special Concern" by the American Fisheries Society and are a harvested species in Florida. Estimates suggest a robust population with low harvest and directed effort. However, shoal bass remain potentially threatened by sedimentation, variable hydrologic events, and its confined range and habitat requirements.

Presenter: Katie Woodside
Contact Person: Same
Type of Presentation: Oral

Largemouth Bass Management in a Multi-species Sportfishery: Implications for Intra-specific Growth and Walleye Populations in Northern Wisconsin

Jonathan F. Hansen; Wisconsin Department of Natural Resources

Greg G. Sass; Escanaba Lake Research Station, Boulder Junction, WI 54512; gregory.sass@wisconsin.gov. Jereme W. Gaeta; Center for Limnology, University of Wisconsin-Madison. Gretchen A. Hansen; Center for Limnology, University of Wisconsin-Madison. Daniel A. Isermann; University of Wisconsin-Stevens Point. Joseph M. Hennessy; Wisconsin Department of Natural Resources. John D. Lyons; Wisconsin Department of Natural Resources. M. Jake Vander Zanden; Center for Limnology, University of Wisconsin-Madison. Stephen R. Carpenter, Center for Limnology, University of Wisconsin-Madison.

Abstract.- Largemouth bass (LMB) *Micropterus salmoides* are one of the most popular sportfish in the United States and are intensively managed across much of their range. Along with increasing rates of voluntary catch-and-release, beginning in 1989, Wisconsin implemented more restrictive harvest regulations for LMB including increased minimum length limits, reduced bag limits, and a catch-and-release only season during the spawning period across much of northern Wisconsin. Over the last decade, several indices indicate strong intra- and inter-specific responses to increased LMB abundances in Wisconsin. We describe trends in LMB relative abundance, growth, and angler catch and harvest in relation to bass management policies in Wisconsin from 1990-2011. We also examine potential sportfish community responses to changes in LMB abundances using walleye *Sander vitreus* as an example. Angler catch rates and electrofishing catch per unit effort of LMB greater than eight inches increased significantly statewide, particularly in northwest Wisconsin. Mean length of age-6 LMB decreased significantly statewide. Harvest rates have declined significantly from about 15% to 2% during 1990-2011, respectively. Reductions in harvest could be attributed to regulatory changes as well as increased voluntary release. Concurrent lake-specific declines in walleye population metrics, such as densities of age-0 walleye, have also been observed in northern Wisconsin. Ongoing research is being conducted to test for interactions between LMB and walleye and to test for other environmental drivers potentially associated with increased LMB abundances. Our results suggest that LMB populations in northern Wisconsin have responded favorably to changes in harvest regulations and angler behavior, but these changes have had some negative effects on LMB growth and may be negatively affecting walleye stocks. We suggest that management goals for LMB must consider intra- and inter-specific consequences, particularly in water bodies where the sustainability of multi-species fisheries is desired.

Presenter: Greg Sass
Contact Person: Same
Type of Presentation: Oral

Biology and Fisheries of Smallmouth Bass in Lake Erie

Kevin Kayle; Fairport Harbor Fisheries Research Station, ODNR, Division of Wildlife, Fairport Harbor, OH 44077; kevin.kayle@dnr.state.oh.us

Abstract.- Smallmouth bass are endemic to Lake Erie nearshore waters, harbors, lacustrine boundaries and larger tributaries. Expansion into the lake was from multiple glacial refugia, and populations have become somewhat localized. Tagging and genetic research results have shown low to moderate movement of adult fishes, while long distance inter-basin movement is low. Lake Erie has four U.S. state agencies and one Canadian provincial agency that manage smallmouth bass populations independently. Assessment data and management strategies are shared and reviewed by agency biologists and managers under the auspices of the Great Lakes Fishery Commission's Lake Erie Committee. Smallmouth bass growth and recruitment rates in Lake Erie have changed with productivity fluctuations and the establishment of nuisance exotic species. Annual recruitment is subject to great variability. Lake Erie smallmouth bass length-weight relationships have been compared over time and between different regions of the lake. Age structure of the population has changed over time, with older fish being observed. Some of this change is due to changes in age reading techniques, but some effect is related to reductions in exploitation. Sources of natural mortality recently observed include: upwellings related to weather events, viral infections, avian predation, and sea lamprey predation. Lake Erie smallmouth bass sport fisheries are managed with minimum size limits, daily bag limits, and seasonal regulations (or closures) to protect spawning fishes. Tournament fishing, especially in the late spring spawning season, is also controlled by most agencies. Private and charter angler effort has changed in response to these regulations. Fishing techniques have also transformed in response to changing lake conditions and bass populations. Angler harvest patterns have also evolved, with more anglers now practicing catch and release. Lake Erie management agencies have implemented human dimension surveys to gauge attitudes, preferences and demographics of Lake Erie smallmouth bass anglers.

Presenter: Kevin Kayle
Contact Person: Same
Type of Presentation: Oral

Balancing Recruitment and Fishing Mortality to Protect Largemouth Bass Populations in the Potomac River

Joseph W. Love, Maryland Department of Natural Resources, Division of Inland Fisheries, Annapolis, MD 21401; jlove@dnr.state.md.us

Mary Groves; Maryland Department of Natural Resources, Division of Inland Fisheries, Annapolis, MD 21401

Abstract.- Fishing mortality for largemouth bass *Micropterus salmoides* in the Potomac River (Maryland) is due to effects of recreational harvest and catch-and-release mortality. Relatively few anglers harvest largemouth bass because most practice catch-and-release. Catch-and-release anglers participating in largemouth bass tournaments often hold bass throughout the fishing day, but observe that less than 5% of all caught bass die. Unfortunately, largemouth bass released after tournaments may suffer imminent death (i.e., delayed mortality). Because of the difficulty in assessing delayed mortality, many people have questioned the sustainability of a population that is encumbered by intensive competitive sportfishing. Since 2009, we worked with competitive sportfishing organizations to assess delayed mortality during summer (June – August). Delayed mortality appeared to be greatest 2 – 3 days after fish were released from a tournament. Based on counts of dead fish and mark-recapture studies, we determined that delayed mortality during summer could be as high as 35%. Using five hypothetical levels of recruitment and population modeling, we determined whether our estimate of delayed mortality was sufficient to elicit negative growth for the population. When recruitment per female was 1% of average fecundity (or 150 recruits per female), we observed positive growth of the Potomac River population. Negative population growth occurred when recruitment was less than 42 recruits per female. Because annual stock assessments indicate that the Potomac River population has not declined in abundance, the current level of recruitment per female is likely sufficient despite relatively intensive levels of competitive sportfishing throughout the year. However, the combination of nest failure during spring fishing, persistent effects of land management on water quality, and novel effects by invasive species (northern snakehead, *Channa argus*) on recruitment may ultimately force largemouth bass anglers to consider even better handling strategies to ensure conservation of their resource.

Presenter: Joseph Love
Contact Person: Same
Type of Presentation: Oral

**Understanding and Using Bass Tournament Anglers and Tournaments
as a Component of Fisheries Management**

Noreen Clough; B.A.S.S. LLC, Clermont, FL 34711; nclough@bassmaster.com

Abstract.- B.A.S.S. LLC conducts hundreds of tournaments each year throughout the country, at the B.A.S.S. Nation club level, state levels and on the professional Open and Elite series circuits, as well as the Bassmaster Classic, deemed the “super bowl” of fishing. This presents a seldom-used opportunity for state fisheries biologist to collect data and observations regarding black bass populations, health, age structure, etc. At the professional Open and Elite tournament levels, once B.A.S.S. files for a permit, the state is always invited to provide biologists on-site at a tournament for any or all days. In most cases the state declines. The talk will present information from states where biologists have been present, and encourage partnerships between B.A.S.S. Conservation and the state fishery agencies to collect data that will benefit both bass management and good tournament practices.

Presenter: Noreen Clough
Contact Person: Same
Type of Presentation: Oral

ABSTRACT 13222

Post-Tournament Movement and Fate of Shoal Bass Translocated from the Lower Flint River into Lake Worth, Georgia

Andrew T. Taylor; Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30602; taylora@warnell.uga.edu

Douglas L. Peterson; Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30602

Abstract.- The shoal bass *Micropterus cataractae* is a popular sport fish endemic to the southeastern U.S. The species faces a suite of potential threats, including high angling mortality. However, no published studies have assessed the potential effects of angling-related translocation of shoal bass into reservoirs – a common practice during fishing tournaments. In this study, our objective was to evaluate survival and short-term movement of tournament-captured shoal bass following translocation from riverine to reservoir habitats. Results showed that 83% of telemetered shoal bass displaced in the spring months returned to the river in an average of 21 d (SD = 8). Eventual fates of telemetered fish and monitoring survival of tournament-caught shoal bass revealed that the effects of translocation may vary seasonally, with mortality reaching approximately 33% during the summer months. We suggest that future studies investigating post-release mortality and sub-lethal effects of translocated shoal bass are needed to better understand the population-level effects of fishing tournament translocation.

Presenter: Andrew Taylor
Contact Person: Same
Type of Presentation: Oral

**Recreational Effort and Economic Impact of Guadalupe Bass
Angling in Central Texas Streams**

Zachary A. Thomas; Texas Tech University, Department of Biological Sciences, Llano River Field Station, Junction, TX 76849; zachary.thomas@ttu.edu

Thomas L. Arsuffi; Texas Tech University, Llano River Field Station

Stephan Magnelia; Texas Parks and Wildlife Department, River Studies Program

Abstract.- The Guadalupe bass *Micropterus treculii* is a Central Texas endemic black bass species occurring only in streams and rivers draining the Edwards Plateau ecoregions. It is designated the state fish of Texas and provides a popular sport fishery. The angling experience is often compared to those shared by trout enthusiasts; i.e. size of fish caught is less important than the overall fishing experience. Past human dimensions research has focused more on reservoirs, while little is known about fishing effort, economic impact and preferences of stream anglers who target black bass species. A Web-based open-access survey of anglers was initiated in August 2012 to quantify recreational effort, assess attitudes, and the economic impact of anglers fishing in a 24 county area (many counties are sparsely populated) of Central Texas streams in the preceding 12 months, with a focus on anglers who specifically targeted Guadalupe bass. To date, 522 anglers have participated in the survey. Thirty-nine percent of anglers ranked black bass as their most preferred sportfish species. Forty-five percent of anglers reported spending more than half their time fishing specifically for Guadalupe bass. While total economic impact includes synopsis of three levels of impact; direct, indirect, and induced, only direct impacts (angler expenditures) have been assessed thus far. An estimated \$3.3 million in direct angler expenditures (underestimate thus far) was spent on fishing trips to central Texas streams by the anglers surveyed. On average anglers took an average of 16 fishing trips per year lasting 2 days, and spent an average of \$328 per trip. The three highest expenditure categories were gasoline for auto/boat, lodging, and food and drinks, mainly restaurants. These findings indicate significant angler expenditures are made by anglers who fish Central Texas streams, many of whom prefer to fish for black bass and specifically target Guadalupe bass.

Presenter: Zachary Thomas
Contact Person: Same
Type of Presentation: Oral

Is Catch and Release Angling a Potential Disturbance of Recruitment Processes? The Importance of Parental Care in Determining Largemouth Bass Recruit Abundance

Jeffrey A. Stein; Illinois Natural History Survey, Prairie Research Institute, University of Illinois, Champaign, IL 61820; jastein@illinois.edu

David P. Philipp; Illinois Natural History Survey, University of Illinois; Champaign, IL 61820

Abstract.- Traditional research approaches examining variation in recruitment dynamics in largemouth bass have largely focused on evaluating factors influencing growth and survival of young-of-the-year during the first summer and winter of life. This approach has largely ignored the importance of parental care behaviors in determining reproductive success and ultimately abundance of potential recruits. Using a conceptual model for largemouth bass recruitment as a framework, we examined the relative influence of brood predation, angling catch rates, and reproductive success on recruit abundance using a combination of manipulative experiments, field studies and model selection analyses. Physical removal of 50% of embryos from all nests in experimental ponds resulted in a significant reduction in fall recruit abundance and biomass when compared to control ponds. Experimental angling of nesting male bass in the wild resulted in high levels of brood predation on unattended nests, indicating that even rapid release of angled nesting bass can result in reduced reproductive output. Model selection analyses demonstrate the influence of angling catch rates and brood predator densities on recruit abundance, indicating the relative importance of offspring survival at different life stages in determining recruit abundance.

Presenter: Jeffrey Stein
Contact Person: Same
Type of Presentation: Oral

Year-Class Production of Black Bass Before and After Opening of a Spring Catch and Release Season in New York: Case Studies from Three Lakes

James R. Jackson; Cornell Biological Field Station, Bridgeport, NY 13030; jrj26@cornell.edu

Donald W. Einhouse; New York State Department of Environmental Conservation, Dunkirk, NY 14048; dweinhou@gw.dec.state.ny.us

Abstract.- Impacts of angling for black bass (*Micropterus* spp.) during the nesting stage have received much recent attention, with particular focus on individual nest and genetic implications. However, few empirical studies of population-level impacts have been conducted. New York State historically protected nesting bass with a closed season. In 1994, a special spring bass season was opened in the New York waters of Lake Erie, and in 2007, a spring catch and release season was opened in most of New York's remaining waters. Long-term monitoring programs were in place on two inland lakes and New York's portion of Lake Erie prior to the regulation changes, facilitating assessment of impacts on year class production of liberalized regulations. In Canadargo Lake (surface area 787 ha), fall electrofishing surveys sampled both young-of-year largemouth (*M. Salmoides*) and smallmouth bass (*M. dolomieu*). Mean catch per hour of largemouth bass during the four years prior to the spring season was 21.8, compared to 38.8/hr over the post-change years ($p = 0.34$). For smallmouth bass in Canadargo Lake, pre-change catch rates averaged 2.13/hr, with a rate of 3.58/hr after the change ($p=0.70$). In Oneida Lake (surface area 20,700 ha), a trawl survey provided an index of young-of-year smallmouth bass. Average catch-per-haul during the five years prior to the regulation change was 0.4, compared to 1.3/haul during the following five years ($p=0.10$). A gill net survey of age-2 smallmouth bass in Lake Erie produced a year class index of 3.0/net over 16 years prior to opening of a spring bass fishery and a catch of 5.7/net over the following 15 years ($p=0.18$). In all cases, year class production increased following the opening of spring angling for bass, although no results were statistically significant. Our results suggest that population level impacts on bass recruitment do not result from spring fishing in large lake systems.

Presenter:	James Jackson
Contact Person:	Same
Type of Presentation:	Oral

Native Black Bass Initiative: Implementing Watershed-Scale Conservation of Native Fish Populations in Southern US Rivers and Streams

Scott Robinson; Southeast Aquatic Resources Partnership, Social Circle, GA 30025;
scottr@southeastaquatics.net

Timothy Birdsong; Texas Parks and Wildlife Department, Austin, TX

Dick Krause; Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL

Jean Leitner; South Carolina Department of Natural Resources, Eastover, SC

James M. Long; U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Stillwater, OK

Steven Sammons; Auburn University, Auburn, AL

Joe Slaughter; Georgia Power Company, Atlanta, GA

Abstract.- Rivers and streams of the southern US harbor a diversity of aquatic species and habitats unparalleled in North America. More than 1,800 species of fishes, mussels, snails, turtles and crayfish can be found in the more than 70 major river basins of the region; more than 500 of these species are endemic. Of the nine described species of black bass, six are endemic to southern US rivers and streams: Guadalupe bass, shoal bass, redeye bass, Florida bass, Alabama bass, and Suwannee bass. However, many undescribed forms also exist and most of these are in need of conservation measures to prevent them from becoming imperiled. The Native Black Bass Initiative provides a framework for watershed-scale conservation of native fishes in the southern US. Additionally, the Native Black Bass Initiative Business Plan identifies regional conservation objectives, strategies and targets to restore and preserve key processes that support healthy functioning habitats and sustainable populations of endemic black basses in rivers and streams of the region. This presentation will highlight specific conservation strategies being implemented through the initiative, discuss progress towards identified conservation targets for focal species and watersheds, and highlight opportunities to expand the initiative.

Presenter: Scott Robinson
Contact Person: Same
Type of Presentation: Oral

Endemic Black Basses as Drivers of Watershed Conservation and Restoration: Combining Emerging Technologies and Traditional Fisheries Techniques to Evaluate the Use of Guadalupe Bass as a Keystone Species in Texas Streams

Timothy B. Grabowski; U.S. Geological Survey, Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, TX 79409; t.grabowski@ttu.edu

Timothy Birdsong; Texas Parks and Wildlife Department, Austin, TX 78744; Timothy.Birdsong@tpwd.state.tx.us

Preston T. Bean; Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, TX 79409; preston.bean@ttu.edu

Brandon D. Cheek; Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, TX 79409; brandon.cheek@ttu.edu

Jillian R. Groeschel; Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, TX 79409; jillian.groeschel@ttu.edu

Abstract.- The National Fish and Wildlife Foundation Native Black Bass Keystone Initiative provided strategies for using endemic black basses *Micropterus* spp. as flagship species to promote conservation of watersheds and streams in the southeastern United States. In Texas, the initiative has provided funding for numerous conservation and restoration projects throughout the range of Guadalupe bass *Micropterus treculii*. However, it is unclear if actions that benefit Guadalupe bass provide broader benefits to the overall stream community. In this presentation, we will describe how addressing the question of whether Guadalupe bass can serve as a reliable indicator of stream health has forced us to confront larger uncertainties inherent to most restoration projects, such as “What does the successful outcome of a conservation or restoration action look like?” and “What metrics should be used to measure success?” Furthermore, we will discuss how combining emerging technologies, such as low-cost side scan sonar mapping and unmanned aerial vehicle surveys, with traditional fisheries techniques and surveys, provides insights into these questions at multiple spatial scales in a cost-effective manner.

Presenter: Timothy Grabowski
Contact Person: Same
Type of Presentation: Oral

Chipola River Watershed Threats Assessment

Christopher Metcalf; U.S. Fish and Wildlife Service, Panama City, FL 32405;
chris_metcalf@fws.gov

Abstract.- The Chipola River Watershed is located in northwest Florida and southeast Alabama, and traverses over 100 miles through 812,800 acres. Over 200,000 acres are utilized in crop production, which is vital to the economy of the region and is the primary socio-economic resource. The Chipola River and its subunits Dead Lakes, Muddy Branch and Otter Creek are EPA 303(d) listed segments due to agricultural non-point source pollution within the watershed area. A great diversity of habitats exist within the watershed from xeric upland longleaf pine forests, to bottomland hardwood swamps, freshwater wetlands, numerous natural springs, and meandering creeks with multiple tributaries. These habitats support rich animal communities with several hundred species of fish and wildlife. There are six federally threatened and endangered mussel species that occur within the Chipola River along with a unique shoal bass fishery. A GIS watershed threats assessment was conducted by the U.S. Fish and Wildlife Service in 2007 to document potential physical impairments in the watershed. Based on the results, approximately 9% (i.e., 156 miles) or 471 threatened stream stretches of the Chipola River Basin had various impairments that included nearly half lacking any riparian buffer. Of these threatened stream segments, approximately 151 unpaved road stream crossings exist and roughly 266 point impacts were identified, including impoundments and borrow pits. These threats are significant to the health and habitat for listed mussels and shoal bass. Restoration needs for future projects will be ranked for the 471 identified threatened stream stretches according to three factors (1) fish and wildlife habitat value, (2) cost, and (3) probability of completing a successful restoration project (i.e., willingness of landowner, logistics and accessibility, and design technique risk).

Presenter: Christopher Metcalf
Contact Person: Same
Type of Presentation: Oral

Approaches to Stream Habitat Restoration Techniques in the Southeast United States

Christopher Metcalf; U.S. Fish and Wildlife Service, Panama City, FL 32405;
chris_metcalf@fws.gov

Abstract.- The aquatic resources of the Southeast Region are extremely diverse, unique and significant. The Southeast includes more than 70 major river basins with more freshwater aquatic species than any other area (62 percent of the nation's freshwater fishes and 75 percent of its freshwater mussels) in the United States. Of the endangered, threatened and species of special concern, about 34 percent of freshwater fishes and 90 percent of native mussel species are found in the Southeast. Many watershed threats to the aquatic ecosystems in the Southeast include agricultural runoff, unpaved road stream crossing, streambank instability, stream dredging and channelization, aquatic organism passage barriers, urban expansion and other construction activities. Stream restoration has become a major focal point for abating declines in freshwater habitats and related water quality attributes of the Southeast. Approaches to stream restoration techniques have advanced in the last decade with integrated and comprehensive methods specifically improving and restoring fragile aquatic systems. Traditional approaches to planning and designing stream restoration has been associated with bioengineering techniques (vegetation revetment), instream habitat structures and rigid, one-dimensional channel hydraulics. These methods initially meet simple project objectives for an improved fish habitat or reduced stream bank erosion; however, many typically lead to continued stream instability and emerging problems. Implementation of different methodologies has led to successful projects that reintroduce lost fish populations from stream reaches and improving water quality parameters (i.e., dissolved oxygen, nutrient runoff, and sedimentation). However, some methods, or the implementation of those methods, have been unsuccessful resulting in little, if any, restoration action above existing conditions. Several techniques will be presented to include a tertiary approach using passive, simple and aggressive methodologies. A discussion on the effectiveness of these methods will also be documented to facilitate options during the development of restoration goals and objectives.

Presenter: Christopher Metcalf
Contact Person: Same
Type of Presentation: Oral

**Providing the Catalyst: Accelerating Your Project through Money,
Training, Partnerships and Information**

Jeff Hastings; Driftless Area Restoration Effort – Fish Habitat Partnership, Westby, WI 54667;
jhastings@tu.org

Abstract.- The mission of The Driftless Area Restoration Effort – Fish Habitat Partnership is “Working together to protect, restore, and enhance cold, cool, and warmwater streams for fish and other aquatic communities in the Driftless Area region for future generations.” Now in its sixth year of existence, the Project Manager will reflect on lessons learned and how he has changed tactics depending on where in the project area they are trying to accelerate the initiative, and what has been most successful.

Presenter: Jeff Hastings
Contact Person: Same
Type of Presentation: Oral

**Smallmouth Bass and Ozark Hellbender In-Stream Habitat
and Stream Bank Remediation in the Eleven Point River
with Game Fish Responses to Hydrology Improvements**

Stephen R. O'Neal; Arkansas Game & Fish Commission, Stream Team Program;
sroneal@agfc.state.ar.us

Sam Henry; Arkansas Game & Fish Commission,

Kelly Irwin; Arkansas Game & Fish Commission,

Jeremy Risley; Arkansas Game & Fish Commission,

Abstract.- An Ozark stream, the Eleven Point River in northeast Arkansas, was selected as a demonstration project to show effective streambank stabilization techniques, thalweg management, alternative cattle watering technology, riparian area restoration, fisheries enhancements and instream game and non-game species amendments in the form of habitat and improved hydrology. The project was funded via the landowner, a State Wildlife Grant, Arkansas Game and Fish Commission Stream Teams, and FSA/NRCS technical assistance. The project thus far has been a success on several fronts which will be discussed during the presentation.

Presenter: Stephen O'Neal

Contact Person: Same

Type of Presentation: Oral

Guadalupe Bass Restoration Initiative

Gary Garrett; Texas Parks and Wildlife Department, Mountain Home, TX 78058;
gary.garrett@tpwd.state.tx.us

Timothy Birdsong; Texas Parks and Wildlife Department, Austin, TX 78744

Megan Bean; Texas Parks and Wildlife Department, Mountain Home, TX 78058

Abstract.- Texas Parks and Wildlife Department has initiated an innovative approach to fish and wildlife conservation in Texas. By working with alliances of landowners, we provide a holistic approach to technical guidance and help to secure funding for restoration and conservation actions throughout targeted watersheds. Although we have projects in many locations in the state, our most successful utilizes the State Fish of Texas as an iconic symbol that provides a positive, high-profile image of the need and benefits of conservation. We chose the Llano River Watershed to initiate the Guadalupe Bass Restoration Initiative and to date, have initiated 16 restoration projects in the watershed that encompass 53,000 acres and 35 miles of rivers and streams. Projects focus on actions that restore riparian areas, reduce soil erosion and runoff, increase infiltration and aquifer recharge, improve water quality and enhance habitat for both aquatic and terrestrial species. Through the initiative, we promote awareness and stewardship of fish and wildlife habitats, share Best Management Practices, organize community involvement in local habitat conservation projects provide technical guidance and planning assistance, and help leverage available resources. Additionally, in 2011 and 2012, we stocked over 275,000 genetically-pure Guadalupe bass in the South Llano River to reverse the trend of hybridization with the non-native smallmouth bass. We also supported studies on fish community and habitat analysis in the Llano River Watershed and partnered with landowners to develop a Watershed Conservation Plan. We are now in the process of developing a Habitat Conservation Demonstration Area (CDA) that extends over an eight-kilometer segment of the Llano River. The CDA will provide fishing, paddling and hiking opportunities, promote sustainable public use of the river, and highlight restoration actions through educational kiosks placed along paddling and upland hiking trails.

Presenter: Gary Garrett
Contact Person: Same
Type of Presentation: Oral

Expanding Public Support for Conservation of Native Black Bass Populations through Increased Recreational Access and Sustainable Use of Texas Rivers

Timothy Birdsong, Texas Parks and Wildlife Department, Austin, TX 78744;
timothy.birdsong@tpwd.state.tx.us

Abstract.- A recent survey conducted by Texas Parks and Wildlife Department (TPWD) observed a 300 percent increase over the past 10 years in the number of Texans that canoe and kayak, many of whom are targeting rivers and streams. Angler interest in river fishing is also on the rise and a number of high-quality river fishing opportunities exist in the state for black basses. As interest in river fishing grows, so does the demand for expanded public access, and increased use of the resource is not without conflict or concern. The Devils River has long been considered one of the most pristine rivers in Texas, providing a wilderness experience for paddlers and high-quality fishing opportunities for non-native smallmouth bass and a unique, endemic form of largemouth bass. The 2010 acquisition of the Devils River Ranch State Park by TPWD expanded public access to the Devils River, but also exacerbated concerns from anglers, paddlers, conservationists, and private landowners on potential user conflicts and sustainable management of the river. To minimize user conflicts and support sustainable use, a constituent workgroup was formed to identify strategies that would be included in a Devils River Use Management Plan. Strategies identified by the workgroup focused on approaches to manage public access to avoid or minimize negative impacts to aquatic resources, preserve the wilderness experience, and maintain natural functional processes in the watershed that support healthy habitats and sustainable populations of native fishes. These strategies are now being applied by TPWD as guiding principles for a new river fishing access initiative implemented through public-private partnerships with landowners and local community organizations. This presentation will focus on how the initiative has been used to expand angler access, reduce user conflicts, promote stewardship of Texas rivers, and enhance the management and conservation of native fishes and their habitats.

Presenter: Timothy Birdsong
Contact Person: Same
Type of Presentation: Oral

Re-establishment of Guadalupe Bass in Two Central Texas Rivers

G.W. Linam and S. Magnelia, Texas Parks and Wildlife Department; P.O. Box 1685, San Marcos, TX 78666 stephan.magnelia@tpwd.state.tx.us

T. Bonner, S. McMillan and C.A. Craig, Texas State University; E. Moran and S. Lusk, San Antonio River Authority; R. Ranft, The Nature Conservancy

Abstract.- Habitat loss and hybridization with smallmouth bass *Micropterus dolomieu* are pervasive throughout the range of the Guadalupe bass *Micropterus treculii*, a native black bass endemic to Central Texas. Re-establishment efforts are underway in the San Antonio and Blanco Rivers, Texas. It is believed the original spring runs and pre-development habitats of the Upper San Antonio River supported a historical population of Guadalupe bass, but the species was extirpated by habitat loss due to water quality impairments associated with urbanization and channelization to alleviate urban flooding. Eight miles of degraded riverine ecosystem south of downtown San Antonio is in the final stages of restoration under the San Antonio River Improvements Project. Goals of the restoration project are to maintain flood control protection while reducing erosion, improving water quality and aquatic habitats, providing overall ecosystem lift, and creating an environment more suitable for recreation and wildlife. Guadalupe bass (N=20) implanted with radio transmitters were stocked into this reach to determine whether habitat and water quality improvements made to date were adequate for survival. Additional stockings of adult Guadalupe bass are planned in an attempt to fully re-establish this species should the survival of radio-tagged fish be confirmed. Land development and fragmentation, and hybridization with smallmouth bass stocked in the 1970's threaten the Guadalupe bass population in the Blanco River. The Nature Conservancy is using a multi-prong approach working with private landowners to reduce land use impacts in the watershed. Efforts to re-establish pure Guadalupe bass are also underway. Taking advantage of extreme drought conditions in summer 2011, smallmouth bass and their hybrids were removed from enduring pools in a 15 mile stretch of river. Pure Guadalupe bass fingerlings (N=124,000) were subsequently stocked after flow conditions improved in spring 2012. Additional stocking and follow-up monitoring will be conducted to assess the status of the population in this stretch of the river.

Presenter: Stephan Magnelia

Contact Person: Same

Type of Presentation: Oral

**Effects of Large-scale Habitat Enhancement Strategies
on Florida Largemouth Bass Populations**

Jason R. Dotson; Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute, Gainesville, FL 32653; jason.dotson@myfwc.com. Brandon Thompson; Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute, Eustis, FL 32726. Nick Trippel; Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute, Eustis, FL 32726. Kim Bonvechio; Florida Fish & Wildlife Conservation Commission, Fish & Wildlife Research Institute, Eustis, FL 32726. Kevin McDaniel; Florida Fish & Wildlife Conservation Commission, Division of Habitat and Species Conservation, Kissimmee, FL. Beacham Furse; Florida Fish & Wildlife Conservation Commission, Division of Habitat and Species Conservation, Okeechobee, FL 34974. Steven Gornak; Florida Fish & Wildlife Conservation Commission, Division of Habitat and Species Conservation, Okeechobee, FL 34974. William E. Pouder; Florida Fish & Wildlife Conservation Commission, Division of Freshwater Fisheries Management, Lakeland, FL 33811

Abstract.- Many of Florida's natural lakes have experienced degradation of habitat resulting from anthropogenic influences, including the introduction of non-native aquatic plant species, advanced eutrophication due to increased nutrient loading, and water stabilization, all of which can impact largemouth bass *Micropterus salmoides floridanus* fisheries. Over the past forty years, the Florida Fish and Wildlife Conservation Commission (FWC) and cooperating agencies have employed a variety of enhancement strategies to combat these habitat changes. We provide an historical overview of these habitat changes, large-scale habitat enhancement strategies that have been conducted, and resulting effects these strategies have had on largemouth bass recruitment and fisheries. We also provide a case study evaluation of four different enhancement strategies: (1) directed water level drawdown conducted on Lake Griffin, Florida in 1984; (2) mechanical removal of macrophyte and organic sediment under dewatered conditions at Lake Tohopekaliga, Florida in 2004; (3) hydraulic dredging of macrophyte and organic sediment under inundated conditions at Lake Panasoffkee, Florida from 2005-2008; and (4) lake-wide herbicide treatment of hydrilla over a 25-year period at Lake Istokpoga, Florida. We document changes in the habitat resulting from enhancement activities and evaluate their effect on largemouth bass populations.

Presenter: Jason Dotson
Contact Person: Same
Type of Presentation: Oral

**The Genetics of Black Bass Conservation – Historical Perspectives
of the Good, the Bad, and the Ugly**

David P. Philipp; Illinois Natural History Survey, University of Illinois, Champaign, IL 61820;
philipp@illinois.edu

Abstract.- Fisheries scientists working with the black basses (and other centrarchids) took their lead in the early-mid 1970s from a handful of geneticists that were using starch gel protein electrophoresis to study the population genetic structure of a variety of wild organisms. It was a range-wide genetic survey of largemouth bass populations published in 1983 that provided the impetus for discussions regarding the existence of need genetically divergent stocks of largemouth bass, and the to conserve them ... the Good. At that time, past and ongoing stocking programs had introduced non-native stocks, non-native species, and even non-native genera within the Centrarchidae to many populations within the native ranges of this group. Being centrarchids, the result was rampant hybridization, accompanied by the widespread introduction of non-native genes into native populations ... the Bad! Even as our science has evolved to encompass the spectrum of modern molecular techniques (e.g., the raft of PCR-DNA based techniques that now allow us to identify parents of an individual, gene chip arrays that let us assess how the regulation of gene expression differs among individuals, and selective breeding experiments that allow us to assess how human-induced selection pressures can change bass behavior and life history characteristics) has our conservation efforts kept up? Unfortunately, ill-advised stocking practices (both within the public and private sectors) and unscientific approaches to the evolutionary status of this group continue to hamper our conservation efforts for the many populations that are at risk from our own management actions ... the Ugly.

Presenter: David Philipp
Contact Person: Same
Type of Presentation: Oral

Shoal Basses, a Clade of Cryptic Identity

Bud Freeman; Georgia Museum of Natural History and Odum School of Ecology, University of Georgia, Athens, GA 30602; budfree@uga.edu

Andrew Taylor; Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30602; taylora@warnell.uga.edu

Ken Oswald; Northern Kentucky University, Highland Heights, KY 41099; oswaldk2@nku.edu

Mary Freeman; U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, MD 20708; mcfreeman@usgs.gov

Joe Quattro; Marine Science Program and Department of Biological Sciences; University of South Carolina; Columbia, SC 29208; quattro@biol.sc.edu

Jean Leitner; South Carolina Department of Natural Resources Fisheries Research, Eastover, SC 29044; leitnerj@dnr.sc.gov

Abstract.- Shoal basses are a cryptic clade composed of *Micropterus* spp. restricted to the Apalachicola River system and three Atlantic slope river drainages in the southeastern US. This reciprocally monophyletic clade includes the Shoal Bass *Micropterus cataractae* Williams and Burgess (endemic to the Apalachicola River system) and an undescribed form from each of the Chattahoochee, Altamaha, and Savannah river drainages. Members of the shoal bass clade can be distinguished from all other species of *Micropterus* using 20 diagnostic characters (character attributes, CA) found in ND2 sequences. Each member of the clade additionally possesses unique CAs, which along with morphological and meristic characters, can be used to diagnose this cryptic biodiversity. Biologists and managers have previously regarded the shoal basses in the Chattahoochee, Savannah and Altamaha river systems as belonging to a single taxon synonymous with the Redeye Bass *M. coosae* which natively occurs in the Mobile River drainage. With these and previous analyses (including description of the Shoal Bass), we now recognize that what was once considered a single taxon actually comprises at least five species, each of which is endemic to a single southeastern drainage. Introductions of non-native basses, including Spotted basses *M. punctulatus*, *M. henshalli* and Smallmouth Bass *M. dolomieu* currently threaten the genetic integrity of native shoal bass species in streams of the Chattahoochee, Altamaha and Savannah river systems. Recognizing and documenting the actual diversity of *Micropterus* species provides important information for managers and anglers who may wish to avoid stocking or translocations that could further compromise native bass populations.

Presenter: Bud Freeman
Contact Person: Same
Type of Presentation: Oral

**Molecular and Morphological Evidence for a Novel Black Bass Species
Native to Rivers of the East Gulf Coastal Plain**

Michael D. Tringali; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; mike.tringali@myfwc.com

Brandon L. Barthel; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; brandon.barthel@myfwc.com

Seifu Seyoum; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; seifu.seyoum@myfwc.com

John Knight; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; john.knight@myfwc.com

Abstract.- While investigating shoal bass *Micropterus cataractae* hybrids in the Chipola River, Florida, we encountered a distinctive introgressive signal from an unknown taxon. We soon pinpointed the signal's source to bass inhabiting rivers of the East Gulf Coastal Plain. Superficially, these bass resemble spotted bass *M. punctulatus* and have been considered as such historically. Genetically, however, members of this taxon are characterizable by 13 autapomorphies at 10 nuclear-DNA intron loci and the mtDNA COI gene. They are further diagnosable by Bayesian and multivariate clustering using 17 microsatellite loci. In nuclear-gene phylogenies, this monophyletic taxon shares a common ancestor with spotted bass and Guadalupe bass *M. treculii*; remaining micropteryids are more distantly related. Morphologically, they differ from spotted bass and Guadalupe bass in mean counts of soft anal-fin and dorsal-fin rays; they further differ from Guadalupe bass in mean counts of scales above and below the lateral line and scales around the caudal peduncle. Little is known about the biology and life history of the new taxon. It appears to occupy different mesohabitats than those of sympatric congeners and its habitat preferences seem to be most similar to those of the Guadalupe bass. Criteria for elevation to species status are satisfied for 13 of the 18 applicable species concepts, with two unresolved. Regarding the only three concepts for which criteria are not satisfied, we note analogous shortfalls for all recognized black basses. Accordingly, we recommend this endemic taxon be elevated to species status and hereafter recognized by the common name 'Choctaw bass' and scientific name *Micropterus haiaka*. The specific name is pronounced 'high-ah-kah' and translates to "revealed" or "made manifest" in the Choctaw Native American language. Choctaw bass populations, unrevealed and unrecognized, could be susceptible to negative ecological and genetic impacts while serving as vectors of similar damage within congener populations.

Presenter: Michael Tringali

Contact Person: Same

Type of Presentation: Oral

**Addressing the Evolutionary History of Santee River
Drainage Bartram's Bass**

Joseph M. Quattro; Marine Science Program and Department of Biological Sciences, University of South Carolina, Columbia, SC 29208; quattro@biol.sc.edu

Jean Leitner; South Carolina Department of Natural Resources Fisheries Research, Eastover, SC 29044; leitnerj@dnr.sc.gov

Ken Oswald; Northern Kentucky University, Highland Heights, KY 41099; oswaldk2@nku.edu

Abstract.- Bartram's Bass is a unique species of redeyed bass restricted to the Savannah River drainage. Impoundments on the upper reaches of the Savannah and the concomitant introduction of exotics have put this species at risk of extirpation. Recently, small, somewhat isolated populations of Bartram's Bass have been discovered in the adjacent Santee River drainage. These populations have been treated, by several sources, as either native or introduced, but, clearly, the status of the Santee drainage population(s) is of critical importance to the management of the species. We present here genetic surveys of Bartram's Bass populations in the Savannah and Santee River drainages. In addition, we take a comparative phylogeographic approach to this question by assaying patterns of genetic divergence among similarly distributed species. These data are used to address the status of the Santee River drainage population(s) of Bartram's Bass.

Presenter: Joseph Quattro
Contact Person: Same
Type of Presentation: Oral

**Genetic Variation Among Virginia Smallmouth Bass Populations
Supports Inference of Watersheds in Which They Are Native**

Eric M. Hallerman; Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; ehallerm@vt.edu

Nathan Johnson; U.S. Geological Survey, Southeast Ecological Science Center, Gainesville, FL 32653; najohnson@usgs.gov

Dan Dutton; U.S. Geological Survey, Southeast Ecological Science Center, Gainesville, FL 32653

Abstract.- Virginia is at the edge of the range of smallmouth bass *Micropterus dolomieu dolomieu* and there is uncertainty regarding watersheds in which it is native. Patterns of genetic variation could inform our knowledge of natural history and provide the basis for management of the species. Three-hundred sixteen individuals representing 13 populations were screened at 10 microsatellite DNA loci. Numbers of alleles per locus ranged from 2 to 10. Native populations were more variable (4.5 alleles/locus) than introduced populations (3.9 alleles/locus), although ranges for the respective groups overlapped. More genetic variation was found within (82.7%) than between (17.3%) populations. Matrices of G_{ST} , R_{ST} , ρ , D_{ps} , and D_{kf} metrics were subjected to cluster analyses to construct population trees. Results were broadly convergent, tending to show clusters of: (1) Caddo Lake, Arkansas, the *M.d. velox* out-group, (2) the native, Tennessee drainage populations, and (3) all other, introduced populations, including that in the upper New River. The Maury and Jackson river populations clustered with Tennessee drainage populations for some metrics, likely reflecting historic stocking events. Our ability to reach definitive inferences regarding sources of historic stocking was limited by lack of samples from the lower New and Ohio rivers and Lake Erie. On the basis of our findings, we recommend that the Tennessee River populations be regarded as one management unit, and all other populations as another. Native, Tennessee system stocks are likely to be locally adapted and should not be subject to stocking from outside sources. Introduced stocks likely would not have become locally adapted, and a more permissive stocking regime would be justifiable.

Presenter: Eric Hallerman
Contact Person: Same
Type of Presentation: Oral

**Range-wide Genetic Study of Endemic Populations of
Suwannee Bass *Micropterus notius***

Brandon L. Barthel; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; brandon.barthel@myfwc.com

Wes Porak; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; wes.porak@myfwc.com

Michael D. Tringali; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; mike.tringali@myfwc.com

David P. Philipp; Illinois Natural History Survey, University of Illinois, Champaign, IL 61820; philipp@illinois.edu

Thomas Near; Yale University, New Haven, CT 06520; thomas.near@yale.edu

Abstract.- Suwannee bass *Micropterus notius* have the smallest range of all black basses. For decades, they were believed to only inhabit the Ochlockonee and Suwannee River drainages in Florida and Georgia. Over the last 15 years, additional populations have been discovered in the Wacissa, Wakulla, and St. Marks Rivers in Florida, leading to speculation that these populations have resulted from unsanctioned angler releases. Tissues collected from Suwannee bass inhabiting six streams in northern Florida were used to resolve genetic structure across the species range and to investigate the possibility that some populations have been introduced. Nuclear DNA variation assayed at 11 polymorphic microsatellite loci and three allozyme loci revealed highly significant genetic differentiation between the fish inhabiting the Suwannee River drainage and those from four streams to the west (including the Ochlockonee River). Analysis of molecular variance indicated that >50% of the genetic variation was partitioned between these two regions. Consistent with observed patterns of differentiation in the nuclear genome, specimens from these two regions were also found to have divergent Nd2 gene sequences. As noted, the recently discovered populations were found to be genetically similar to fish from the Ochlockonee River, and we did not uncover evidence of recent stockings. Indeed, Suwannee bass collected from these streams had modest levels of genetic variability, but levels were similar to that of the Ochlockonee River collection. As a result, we cannot reject the possibility that these are natural populations that have gone undetected until very recently. Given the genetic divergence between populations inhabiting Suwannee River system and drainages to the west, translocations should be prohibited to preserve the genetic diversity of this rare, endemic species.

Presenter: Brandon Barthel

Contact Person: Same

Type of Presentation: Oral

Hybridization as a Natural, Confounding Phenomenon in Black Bass Conservation

Jeff Koppelman; Missouri Department of Conservation, Columbia, MO 65201;
Jeff.Koppelman@mdc.mo.gov

Abstract.- Hubbs, in his 1927 diagnosis of a third species (Kentucky black bass), concluded “the new bass cannot be regarded as a variant of either of the currently recognized species, nor as a hybrid between them. “ When Childers considered interspecific hybridization in *Micropterus* to be rare, the author was considering the six species recognized in 1975 and those species in their native habitats. We have come a long way since both classic works in the bass literature, adding multiple taxa while continuing to change the environments the species inhabit. There is no doubt that occurrences of the hybrid phenomenon have increased due to additionally described taxa – a semantic argument, of course. However, most certainly an increase in hybrid occurrence has been due to massive alteration of those habitats. Management practices have changed, using innovative stocking alternatives and regulations that can be selective against a native species. Climate change and corresponding temperature and water level fluctuations have likely also exacerbated hybridization events. Childers had concluded that when spatial, temporal, or habitat barriers failed to maintain reproductive isolating mechanisms, it fell on differences in coloration and courtship and spawning behaviors to keep the species apart. Ecological and behavioral separation, however, are rarely absolute. Unfortunately, when interspecific hybridization does occur it usually sets off a sequence of descendants that represents neither pure species; instead of missing production of just the original set of mixed parents, multiple generations of pure parents lose their production as well. This process confounds not only the performance of the pure species in that body of water, but when it occurs within the range of a rarer black bass species, it also threatens that species’ genetic diversity -- and thus, its continued existence.

Presenter: Jeff Koppelman
Contact Person: Same
Type of Presentation: Oral

**Genetic Analysis and Conservation Status of Native Populations
of Largemouth Bass in Northeastern Mexico**

Francisco Javier García-de-León; Laboratorio de Genética para la Conservación CIBNOR,
Instituto Politécnico Nacional 195, Playa Palo de Santa Rita Sur, La Paz, B.C.S. México C.P.
23096; fgarciadl@cibnor.mx

Rocío I. Rodríguez-Martínez, Instituto Tecnológico de Ciudad Victoria, Tamaulipas, México

Dean A. Hendrickson, Texas Natural Science Center, Texas Natural History Collection,
University of Texas at Austin, Austin, TX; deanhend@austin.utexas.edu

Abstract.- *Micropterus salmoides* ranges naturally in México from the bi-national Río Grande basin, including its isolated Cuatro Ciénegas valley, Coahuila, southward through the next two Gulf Coast drainages, Río San Fernando and Río Soto la Marina. Within this native range, Florida largemouth have been introduced in the Río Grande and Vicente Guerrero (or Guerrero) reservoir in the Soto La Marina basin. We provide the first genetic variability study of *M. salmoides* populations in México, and evaluate the degree of genetic introgression of Florida bass into, and conservation status of, native populations. We sampled five localities in Cuatro Ciénegas, one in the San Fernando basin, extensively throughout all major tributaries of the Río Soto la Marina basin, and in Vicente Guerrero Reservoir. We also analyzed comparative samples of Florida bass from Texas (Heart of the Hills Research Station, Texas Parks and Wildlife Department). We inspected a fragment (RFLP) between the mtDNA 12s and 16s rRNA genes and five microsatellite loci. Genetic variation within and among populations was evaluated. Introgression of Florida largemouth alleles was estimated by hybrid indexes and assignment tests, using two diagnostic loci and five microsatellite loci. *Micropterus salmoides* showed lower nuclear diversity, but higher mtDNA diversity, than *M. floridanus*. Microsatellite data revealed three genetically pure native populations of *M. salmoides* in Cuatro Ciénegas (Charcos Prietos, Las Playitas and Canal del Tio Julio), but hybrids in another part of the valley (Río Garabatal). Another pure population was found in Río El Tigre of the Soto la Marina drainage. Our results could be explained by geographic dispersal barriers, sex-differential dispersion, hybrid mating disadvantage, and selection for co-adapted gene complexes. More extensive surveys are needed in México, but remnant pure northeastern Mexican native bass populations are important to protect and we advocate that their remaining ranges be managed as Genetic Conservation Sanctuaries.

Presenter: Francisco Javier García-de-León
Contact Person: Dean Hendrickson
Type of Presentation: Oral

Hybridization Between Largemouth Bass and Florida Bass in the Devils River, Texas: Influence of Reservoir Stocking on Upstream Populations

Preston T. Bean; Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University, Lubbock, TX 79409; preston.bean@ttu.edu

Megan G. Bean; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, Mountain Home, TX 78058; megan.bean@tpwd.state.tx.us

Dijar Lutz-Carrillo; Texas Parks and Wildlife Department, A. E. Wood Laboratory, San Marcos, TX 78666; dijar.lutz-carrillo@tpwd.state.tx.us

Gary P. Garrett; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, Mountain Home, TX 78058; gary.garrett@tpwd.state.tx.us

Abstract.- Florida bass *Micropterus floridanus* have been stocked in reservoirs across much of the range of largemouth bass *Micropterus salmoides*. However, little is known of the effects of stocking fish in reservoirs on upstream populations. We examined hybridization between native largemouth bass and introduced Florida bass in the Devils River, Texas, upstream of Amistad International Reservoir using a panel of six diagnostic microsatellite loci. Hybrids comprised the majority of the population in the Devils River both above and below Dolan Falls, and only three non-hybrid largemouth bass were detected. Among hybrids, mean proportion of observed alleles derived from Florida bass was 0.46 and ranged from 0.08 to 0.58. These results indicate that stocking of fish in reservoirs can have pronounced effects on upstream populations and might present a threat to the conservation of native populations.

Presenter: Preston Bean
Contact Person: Same
Type of Presentation: Oral

Conservation Impacts of Hybridization between Native “Bartram’s Bass” *Micropterus sp. cf. M. coosae* and Two Introduced Species, Alabama Bass *M. henshalli* and Smallmouth Bass *M. dolomieu*, in the Savannah Basin

Jean Leitner; South Carolina Department of Natural Resources, Eastover, SC 29044:
leitnerj@dnr.sc.gov

Ken Oswald; Northern Kentucky University, Highland Heights, KY 41099; oswaldk2@nku.edu

Joe Quattro; Marine Science Program and Department of Biological Sciences; University of South Carolina; Columbia, SC 29208; quattro@biol.sc.edu

Abstract.- Bartram’s bass *Micropterus sp. cf. M. coosae* is endemic to the Savannah basin of South Carolina and Georgia. Hybridization between this native species and introduced Alabama bass *M. henshalli* is widespread in the upper portions of the drainage. Recent studies have documented a precipitous decline in genetically pure Bartram’s bass in Savannah River reservoirs, and a corresponding increase in fish of hybrid origin. We surveyed tributary populations associated with the reservoirs and with the Savannah main stem in 2004 and 2010. Results indicate an increased occurrence of hybrids in Bartram’s bass native stream habitats over time, and also document the new occurrence of a second non-native species, the smallmouth bass *M. dolomieu*. Both smallmouth bass and their hybrids with Bartram’s bass were collected from shoals in the Savannah River near the lower extent of the Bartram’s bass range. Bartram’s bass is a species of highest conservation concern in South Carolina, due to a limited native range and threats associated with hybridization. Conservation actions directed at this species, and its native stream habitats, will need to consider the establishment of non-natives in the drainage, and their potential to impact tributary populations over time.

Presenter: Jean Leitner
Contact Person: Same
Type of Presentation: Oral

Distribution and amount of hybridization between Shoal Bass *Micropterus cataractae* and the invasive Spotted Bass *Micropterus punctulatus* in the lower Flint River, GA

Alicia Alvarez; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; alicia.roberts@myfwc.com

Andrew Taylor; Georgia Department of Natural Resources

Michael D. Tringali; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; mike.tringali@myfwc.com

Brandon L. Barthel; Fish & Wildlife Research Institute, Florida Fish & Wildlife Conservation Commission, St. Petersburg, FL 33701; brandon.barthel@myfwc.com

Abstract.- Shoal bass *Micropterus cataractae* are endemic to the Apalachicola drainage, including the Chattahoochee (Alabama & Georgia), Flint (Georgia), and Chipola (Florida) river systems. Habitat modification and construction of hydrologic dams have reduced and eliminated shoal bass from many areas of their native range. The most abundant shoal bass populations reside in the Flint River, but they appear to be hybridizing with the invasive spotted bass *M. punctulatus*, which have become established in this system. To assess the threat that hybridization poses to the genetic integrity of shoal bass in the Flint River, presumptive shoal bass were collected from multiple locations above and below the Crisp County Dam, and from Ichawaynochaway Creek, a southern tributary. These were genotyped using 17 polymorphic microsatellite loci and also sequenced for the mitochondrial DNA 16S ribosomal RNA gene. Above the Crisp County Dam, 12% of the specimens carried non-native alleles; however, sample genomic proportions of these alleles were low (1%). Below the Crisp County Dam, the percentage of hybrid specimens ranged from 18-43% and sample genomic proportions increased to 6-7%. In Ichawaynochaway Creek, the percentage of hybrid specimens was 27% and the sample genomic proportion was 7%. Pure spotted bass were collected below the Crisp County Dam; most F₁ hybrids were collected in Ichawaynochaway Creek. Maternal ancestries in hybrids indicated that shoal bass males cross with spotted bass females more frequently than the converse. Hybridization was bidirectional; i.e., hybrids were found to backcross to both spotted bass and shoal bass. Because introgressive hybridization occurs, the flux of non-native alleles in this system should be monitored and all brood fish in stocking programs should be screened. Studies should be implemented to determine if natural genetic mechanisms (e.g., disruptive selection) will be sufficient to maintain the integrity of the species boundaries.

Presenter: Alicia Alvarez
Contact Person: Same
Type of Presentation: Oral

**Hybridization Threatens Shoal Bass populations
in the Upper Chattahoochee River Basin**

Beth Dakin; Department of Biological Sciences, Duquesne University, Pittsburgh, PA 15282;
bethdakin@gmail.com

Brady Porter; Department of Biological Sciences, Duquesne University, Pittsburgh, PA 15282;
porterb@duq.edu

Bud Freeman; Georgia Museum of Natural History and Odum School of Ecology, University of
Georgia, Athens, GA 30602; budfree@uga.edu

James M. Long; U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research
Unit, Oklahoma State University, Stillwater, OK 74078; longjm@okstate.edu

Abstract.- Shoal bass *Micropterus cataractae* are native only to the Apalachicola-Chattahoochee-Flint river system of Georgia, Alabama, and Florida, and are vulnerable to extinction as a result of population fragmentation and introduction of non-native species. We assessed genetic integrity of isolated populations of shoal bass in the upper Chattahoochee River basin (above Lake Lanier, Big Creek, and below Morgan Falls Dam) and sought to identify rates of hybridization with non-native, illegally stocked smallmouth bass *M. dolomieu* and spotted bass *M. punctulatus*. Using ten highly polymorphic microsatellite markers and the population assignment software STRUCTURE, shoal bass below Morgan Falls dam showed evidence for high levels of hybridization with smallmouth bass and possibly spotted bass, while a population of shoal bass in Big Creek showed evidence for the presence of smallmouth bass individuals and lower levels of hybridization between shoal bass and smallmouth bass. The only shoal bass population not impacted by congeneric hybridization was found upstream of Lake Lanier, in the headwaters of the Chattahoochee River. Conservation actions, such as a program to reduce or eliminate non-native black bass species and their hybrids, could help maintain the genetic uniqueness of these shoal bass populations in the upper Chattahoochee River basin and lessen their susceptibility to local extinction.

Presenter: Beth Dakin

Contact Person: Same

Type of Presentation: Oral

Inferred Reproductive Behavior of Captive Guadalupe Bass

Dijar J. Lutz-Carrillo; Texas Parks and Wildlife Department, A. E. Wood Laboratory, San Marcos, TX 78666; dijar.lutz-carrillo@tpwd.state.tx.us. Chris Thibodeaux; Texas Parks and Wildlife Department, A. E. Wood Fish Hatchery, San Marcos, TX 78666; chris.thibodeaux@tpwd.state.tx.us. Megan Elliott; Volt Information Sciences. Nicholas A. Rathjen; Kansas City University of Medicine and Biosciences. Carl Kittel; Texas Parks and Wildlife Department, A. E. Wood Fish Hatchery, San Marcos, TX 78666; carl.kittel@tpwd.state.tx.us. Loraine T. Fries; Texas Parks and Wildlife Department, A. E. Wood Laboratory; San Marcos, TX 78666; loraine.fries@tpwd.state.tx.us. Gary P. Garrett; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, Mountain Home, TX 78058; gary.garrett@tpwd.state.tx.us

Abstract.- Attempts to infer mating systems in wild fish populations can be limited by the logistics of locating nests and thoroughly sampling potential participants. Captive populations are more easily evaluated but may exhibit altered behavior. Understanding mating systems, including the effects of captivity on behavior, should enhance conservation efforts, particularly when supplemental stocking programs are involved. We used microsatellites (17 loci) to determine parentage in production offspring, and infer the mating system of raceway spawned Guadalupe bass *Micropterus treculii*, which are part of a supplemental stocking program. Offspring were collected over the course of two production seasons (n=303 and 492, respectively). During the first year of captivity fewer males (21 of 60) than females (49 of 61) spawned. Most spawning males (90%) participated with multiple females while 61% of spawning females participated with a single male. However, only 3% of mating pairs were monogamous. Inequalities between the number of participating males and females, and the number of nest locations used, suggest that males recruited females to territories that included one to a few nest locations. Individuals that did spawn were significantly larger, by length and weight, than individuals that did not. This predominantly polygynous mating system contrasts with the reported monogamous systems of congeners in the wild and resulted in an effective number of breeders (N_b) <30% of the number of penned brood fish. Quarantining particularly prolific males to separate pens during the second year of captivity had little effect on mating behavior, as other males filled their roles. Our data represents the first documentation of mate choice and fidelity in Guadalupe bass and suggest that an approach that limits access to females could increase male participation, create a more symmetrical sex ratio, and reduce the variance in family size thus enhancing N_b and efforts to conserve neutral and quantitative variation.

Presenter:	Dijar Lutz-Carrillo
Contact Person:	Same
Type of Presentation:	Oral

**Reducing Hybridization and Introgression in Wild Populations
of Guadalupe Bass through Supplemental Stocking**

Paul Fleming; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, Mountain Home TX 78058; paul.fleming@tpwd.state.tx.us

Gary P. Garrett; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, Mountain Home TX 78058; gary.garrett@tpwd.state.tx.us

Nathan G. Smith; Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, Mountain Home TX 78058; nate.smith@tpwd.state.tx.us

Abstract.- Intra-specific hybridization among micropterids was once thought to be rare, but has been documented in several cases of North American endemics. Introduction of the non-native smallmouth bass across Texas has threatened to eliminate the Guadalupe bass *Micropterus treculii* genome in all of its native range through introgression between the species. In 1992, the Texas Parks and Wildlife Department began research in the Guadalupe River, to test the effectiveness of intensive stocking on genetic restoration of the local population. A total of 970,348 hatchery reared, genetically pure Guadalupe bass fingerlings (approximately 30 mm, TL), were stocked into 3 tributaries and the main stem segment that form the headwaters of the river. Stocking in Johnson Creek was conducted for 19 years and in the other two tributaries and the main stem river for five years. Annual genetic monitoring of the wild population showed that stocking was able to significantly reduce hybridization in all stream segments ($p < 0.001$). Initial hybridization rates were high and ranged from 20-100% (mean = 43.4%) and were reduced to 0-24.2% (mean 11.4%) at the termination of stocking. Linear regression models indicated that hybridization in all stream segments except the North Fork of the Guadalupe River declined at approximately the same rate of 2.2% per year. The North Fork of the Guadalupe River declined much faster, at approximately 15.5% per year. Even though challenges exist, such as obtaining sufficient genetically pure brood stock, these data show that supplemental stocking is an effective approach to genetic restoration of compromised populations. Therefore it should be considered as a viable management and conservation tool.

Presenter: Paul Fleming
Contact Person: Same
Type of Presentation: Oral

ABSTRACT 13250

Symposium Summary

Joe Slaughter; Georgia Power Company. Atlanta, GA jeslaugh@southernco.com

NO ABSTRACT

ABSTRACT 13251

**A Path Forward: Connecting Partners and Moving the Needle
on Conservation of Endemic Black Bass Populations**

Rebecca Wodder, Senior Advisor to Secretary of the Interior; U.S. Fish and Wildlife Service,
Washington, D.C.

NO ABSTRACT