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Georgia Chapter of the American Fisheries Society

February 11-13
Athens, Georgia

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2014 GA-AFS Annual Meeting
Program

Tuesday, February 11, 2014		
11:00-1:00	Registration	
1:00-1:05	Welcome/Opening Comments	Tim Bonvechio
1:05-1:20	State of the State WRD	John Biagi
1:20-1:40	State of the state CRD	Pat Geer
1:40-2:00	**BREAK**	
2:00-4:50	**Session 1**	
2:00-2:20	Black bass (genus Micropterus) community composition upstream of impoundment in two southeastern rivers	Andrew Taylor (OSU)*
2:20-2:40	Atlantic sturgeon recruitment in the Savannah River, Georgia	Derek Bahr (UGA)*
2:40-3:00	Fecundity of Alabama Shad (*Alosa alabamae*) from the Apalachicola and Flint Rivers	Hannah Grice (Berry College)*
3:00-3:20	Evaluation of sampling methods for monitoring the Sicklefin Redhorse *Moxostoma* sp. In Georgia	David Atwood (Young Harris College)*
3:20-3:30	**BREAK**	
3:30-3:50	Habitat preferences and population characteristics of a state-endangered crayfish in the Upper Hiwassee River	Brittany Henry (Young Harris College)*
3:50-4:10	Impacts of local watershed development to a biodiverse mountain headwater stream fish community	Alex Spiegel (Young Harris College)*
4:10-4:30	Distribution of black bass in tributary streams of the Middle Chattahoochee River, Georgia and Alabama	Chase Katechis (Auburn)*
4:30-4:50	Identification of critical habitat and spawning migrations of Atlantic Sturgeon Acipenser oxyrinchus oxyrinchus in the Altamaha River System, Georgia	Evan Ingram (UGA)*
5:45---	Student Social Mixer (Dirty Birds)	

*Student presentation

2014 GA-AFS Annual Meeting
Program

	Wednesday, February 12, 2014	
7:30-3:00	Registration	
8:00-11:10	**Session 2**	
8:00-8:20	Macroinvertebrate community responses to annual flow variation from river regulation: an 11-year study	Courtney Holt (UGA)*
8:20-8:40	A mixed modeling approach to quantify Blackside Dace abundance in the Cumberland River System	Cassandra Jansch (UGA)*
8:40-9:00	Analysis of the spawning behavior and microhabitat of the Tallapoosa Darter (*Etheostoma tallapoosae*)	Joshua Hubbell (University of West Georgia)*
9:00-9:20	Historical analysis of commercially and recreationally important nekton in relation to habitat loss in Barataria Bay, Louisiana, USA	Kristy Lewis (LSU)*
9:20-9:50	**BREAK (Refreshments Provided)**	
9:50-10:10	Geoffrey Mitchell (UGA) – Food habits of Blue Catfish (*Ictalurus furcatus*) introduced into Lake Oconee, Georgia.	Geoffrey Mitchell (UGA)*
10:10-10:30	Modeling culvert passability using landscape variables	Evan Collins (UGA)*
10:30-10:50	Assessing the economic impact of tournament black bass angling on Lake Guntersville, Alabama	Patrick Snellings (Auburn)*
10:50-11:10	Sources and effects of estrogens in the upper Conasauga River	Whitney Jacobs (UGA)*
11:10-11:20	**BREAK**	
11:20-3:25	**Session 3**	
11:20-11:40	Update on the Go Fish Georgia Education Center	Jeremy Wixson (GADNR)
11:40-12:00	Fish tissue monitoring: Consumption guidance and beyond	Jeremy Smith (EPD)
12:00-1:00	**Lunch (on your own)**	
1:00-1:20	Vemco Tags	Chris Kalinowsky (GADNR)
1:20-1:40	The quest for the holy grail: trophy bass production in small ponds	Steve Sammons (Auburn)
1:40-2:00	Lake Lanier striped bass research and monitoring efforts	Patrick O'Rouke (GADNR)
2:00-2:20	Evaluation of growth and costs with use of higher protein fish food diets on Bluegill (*Lepomis macrochirus*)	Greg Grimes (Aquatic Environmental Services)
2:20-2:30	**BREAK**	
2:30-2:45	Pitch, pickle, or photograph: increasing the value of fish distribution data for conservation	Brett Albanese (GADNR)
2:45-3:05	Climate change and a disturbance mediated stream fish assemblage in the southeastern United States	Gary Grossman (UGA)
3:05-3:25	Alligator Gar YOY research	Peter Sakaris (Southern Polytechnic)
3:25-3:45	**BREAK**	
3:45-4:45	**Business Meeting**	
6:00~8:30	Banquet, & awards ceremony (Flinchum's Phoenix on UGA Campus)	

2014 GA-AFS Annual Meeting
Program

Thursday, February 13, 2014		
7:30-10:00	Registration	
8:00-11:30	**Session 4**	
8:00-8:20	Ready to start mapping lakes and reservoirs? An introduction to the capabilities and requirements of various sonar systems	Bob Bahn (UGA)
8:20-8:40	Evaluating reservoir fish assemblages: how much sampling is enough?	Don Dennerline (UGA)
8:40-9:00	West Point Lake fishing survey	Brent Hess (GADNR)
9:00-9:20	Youth Kayak Fishing	Steven Patrick (UGA)
9:20-9:50	**BREAK (Refreshments provided)**	
9:50-10:10	Invasive crayfishes in Georgia	Christopher Skelton (Georgia College & S.U.)
10:10-10:30	Lessons learned: management of a unique trophy largemouth bass fishery in Georgia	Tim Bonvechio (GADNR)
10:30-10:50	Georgia's Marine Sportfish carcass recovery project	Ryan Harrell (GADNR)
10:50-11:10	Dawson Hatchery herbicide tests	Josh Tannehill (GADNR)
11:10-11:30	Shoal basses, a clade of cryptic identity	Bud Freeman (UGA)
11:30-12:30	**RAFFLE & SILENT AUCTION**	
12:30	MEETING ADJOURN	

ABSTRACTS

Black Bass (genus *Micropterus*) Community Composition Upstream of Impoundment in Two Southeastern Rivers

Andrew T. Taylor [1, 4], Patrick O'Rouke [2], and James M. Long [3]

[1] – College of Agricultural Science and Natural Resources, Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, OK

[2] – Georgia Department of Natural Resources, Wildlife Resources Division, Fisheries Management Section, Region 1, Gainesville, GA

[3] – U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University, Stillwater, OK

[4] – Presenter contact: Andrew.t.taylor@okstate.edu / 706-766-5923

Dams and impoundments are known to alter natural aquatic ecosystems and negatively affect many aquatic species. Similarly, the effects of reservoirs and reservoir-dwelling fishes on native fluvial species that reside in upstream tributaries of reservoirs may have management and conservation implications. The Shoal Bass (*M. cataractae*) and Chattahoochee Bass (*M. chattahoochae*) are fluvial specialists and popular sport fish endemic to the Apalachicola-Chattahoochee-Flint Basin of the southeastern U.S. Both species are of conservation concern because of habitat alteration and negative effects of introgressive hybridization and interspecific competition from non-native congeners. Many non-native black bass species occur in reservoirs, creating a source of non-native species to migrate upstream into tributaries and interact with native species, although the degree to which this occurs is not well known. Thus, we sought to identify trends in how the community of native and non-native black basses (*Micropterus* spp.) changed with increasing distance from a downstream reservoir. Our study was conducted in the Chattahoochee and Chestatee rivers upstream of Lake Lanier in northern Georgia where a popular sport fishery for native Largemouth Bass (*M. salmoides*) and introduced Alabama Bass (*M. henshalli*) exists. In spring 2013, we sampled for black bass with boat electrofishing at four stations each in the Chattahoochee and Chestatee rivers beginning at the river-reservoir interface and progressed upstream into riverine habitats. We captured 127 individuals of four species, the majority of which were Alabama Bass and Shoal Bass. In both rivers, non-native Alabama Bass dominated the stations closest to the reservoir and declined in relative abundance upstream with a concomitant increase in Shoal Bass. However, non-native Alabama Bass still comprised 20-25% of the community at uppermost sites. Our results suggest that Alabama Bass can migrate upstream from their source populations in reservoirs, although the effects of their occurrence are still unknown. Future efforts that explore how differences in habitat (e.g., discharge, water temperature, and water level) affect black bass species composition would be beneficial.

Atlantic Sturgeon Recruitment in the Savannah River, Georgia

Derek L. Bahr
Warnell School of Forestry and Natural Resources
University of Georgia, Athens, GA 30602
Email: dbahr286@uga.edu

Douglas L. Peterson
Warnell School of Forestry and Natural Resources
University of Georgia, Athens, GA 30602
Email: dpeterson@warnell.uga.edu

The Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus* was once abundant along the Atlantic Coast of North America from the St. Johns River, Canada to the St. John River, Florida. Severe overfishing, coupled with habitat losses during the 1900s, resulted in major population declines that eventually led to the species' listing under the US Endangered Species Act in 2012. Despite the endangered status of Atlantic sturgeon, quantified recruitment data are largely lacking for most systems, particularly among populations within the South Atlantic Distinct Population Segment (DPS). The objective of this study was to quantify annual recruitment of Atlantic sturgeon in the Savannah River, Georgia by estimating annual abundance of age-1 river-resident juveniles. During the summer of 2013, we used anchored gill nets and trammel nets to sample juvenile Atlantic sturgeon throughout the Savannah River estuary. Ages of captured juveniles were determined by using a simple length-frequency histogram. Abundance of each age class was then estimated by using the Huggins closed-capture model in Program MARK. In 2013, abundance estimates for age-1, age-2, and age-3+ Atlantic sturgeon were 527, 464, and 720, respectively. The results from the first year of our study suggest that the Savannah population is likely the 2nd largest within the South Atlantic DPS; however, additional recruitment estimates are needed in subsequent years to better understand the current status and trend of the population.

Fecundity of Alabama Shad (*Alosa alabamae*) from the Apalachicola and Flint Rivers

Hannah Grice, Lauren Patterson, Celeste Giangiacomo, Maggie McCarter, Morgan Bowen and William Davin, Department of Biology, Berry College, Mount Berry, Georgia

This study examines the fecundity of the Alabama shad (*Alosa alabamae*). Fifty females, averaging in weight at around 703 grams were captured from the Apalachicola and Flint rivers and processed for this study. The ovaries were weighed and measured. One-gram samples were cut from the center of each ovary, for a total of 100 samples. The number of ova present in each one-gram sample was counted, and the total number of ova per fish was calculated. The results show that the average weight per ovary is 31.67 grams (63.3 grams/fish), and the average number of ova per gram is 1,354± 238 ova. The average fecundity was calculated at 42,881 ova per ovary, making the total mean fecundity per fish at nearly 86,000. The fecundity was plotted against the gonadal somatic index, total body weight and total ovary weight for each fish, all of which demonstrate a positive linear relationship. However, the fecundity and total ovary weight demonstrate the strongest correlation.

Evaluation of Sampling Methods for Monitoring the Sicklefin Redhorse *Moxostoma sp.* in Georgia

David J. Atwood; Department of Biology, Young Harris College, Young Harris, Georgia 30582; krmiller@yhc.edu

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

The sicklefin redhorse (SFR) *Moxostoma sp.* is a rare, potadromous, candidate species of Catostomid fish that migrates upstream to Brasstown Creek in Towns County, Georgia in late spring to spawn. To establish consistent monitoring of this fish in Georgia, we evaluated various sampling strategies (streamside visual surveys, underwater observation, and seining) at six 100-m representative sites from April to June 2013. Streamside surveys were conducted using binoculars; underwater observation occurred with two snorkelers moving systematically upstream and then floating downstream; seining was implemented by pulling a seine net quickly downstream. Additionally, an approximately 8-km section of Brasstown Creek was canoed to observe SFR abundance and occupancy. Throughout the study, 37 SFR were captured with the majority (59%) observed through visual surveys. SFR capture in seines ranged in total length from 43 to 55 cm and consisted of only males. The first and last SFR capture occurred on 24 April and 23 May 2013, respectively. Predicted capture probabilities are low (<20%), but streamside visual surveys were most likely (~15%) to detect SFR. We also report a potential upstream record for this fish and presence in a small, headwater tributary. Thus, future research on SFR should be expanded to tributaries and stream headwaters and should focus on specific protocol development for visual survey methods.

Habitat Preferences and Population Characteristics of a State-Endangered Crayfish in the Upper Hiwassee River

Brittany Henry; Department of Biology, Young Harris College, Young Harris, Georgia 30582; krmiller@yhc.edu

Sidney Weaver; Department of Biology, Young Harris College, Young Harris, Georgia 30582; krmiller@yhc.edu

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

Crayfishes are keystone species in headwater aquatic ecosystems that process organic material, increase nutrient availability and engineer benthic stream habitat. This study defined habitat preferences of a state-endangered, data-deficient crayfish, *Cambarus parrishi* in the upper Hiwassee River watershed in northeast Georgia. Crayfish were collected at 12 sites over a two year period, and habitat parameters including substrate size, depth, water velocity, and stream roughness were measured at a microhabitat scale. Correlation analysis identified habitat variables associated with presence which that were incorporated into logistic regression models. *C. parrishi* (n=108) were less abundant at lower elevation sites and prefer a wide range of water velocities, cobble and boulder substrates and shallow depths. In particular, young-of-year *C. parrishi* were found mostly in shallow side pools near undercut banks. Population characteristics such as age-structure, growth rate, and mortality were also defined by measuring captured crayfish. At least four definable age classes are present that show a moderate growth rate with males being larger than females. As listing status for *C. parrishi* is considered, habitat, population, and distributional data from this study will be useful in the evaluation process. Future surveys will expand to higher elevation streams where increased occupancy and abundance was observed.

Impacts of Local Watershed Development to a Biodiverse Mountain Headwater Stream Fish Community

Alex Spiegel; Department of Biology, Young Harris College, Young Harris, Georgia 30582; krmiller@yhc.edu

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

Southeastern native freshwater fishes are highly imperiled, mostly due to habitat loss associated with watershed development. Fish extinctions result from cumulative effects of local extinctions and barriers to recolonization. The objective was to determine if a fish community was impacted by watershed activities by measuring fish biodiversity at multiple sites along Corn Creek, a small stream in north Georgia that flows through an expanding college campus. Fishes were collected at 6 sites located upstream and throughout Young Harris College's campus using seines from September to November 2013. Environmental variables such as stream habitat type, riparian zone width, and substrate type were recorded for each site and paired with fish abundance data for analysis in the BiodiversityR package in R. Diversity was assessed by several metrics such as Shannon's diversity index, Renyi diversity profiles and rank-abundance curves. Ecological distance between sites was compared by hierarchical clustering methods and tested against significant ($P<0.05$) environmental variables. A downstream decrease in diversity was observed on campus with available riffle and run habitats likely contributing to fish community change. Ecological distance in fish communities increased proceeding downstream, demonstrating that local watershed development can alter fish communities by homogenizing stream habitats.

Distribution of Black Bass in Tributary Streams of the Middle Chattahoochee River, Georgia and Alabama

Chase T Katechis; School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University, Auburn, Alabama 36849; katecc1@auburn.edu

Steven M. Sammons; School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University, Auburn, Alabama 36849; sammosm@auburn.edu

The middle Chattahoochee River has been designated as an area of focus for the conservation of Shoal Bass *Micropterus cataractae* by the National Fish and Wildlife Foundation (NFWF). The Shoal Bass is a fluvial specialist, yet many of remaining populations of Shoal Bass are affected by the non-native generalist Spotted Bass *Micropterus punctulatus* through competition, predation, and introgression. Other threats include: a loss of habitat from impoundments, urbanization, and poor land use practices causing erosion, sedimentation, channelization, and altered hydrology. Presence/Absence sampling was conducted on selected tributaries from Atlanta, GA downstream to the headwaters of Walter F. George Reservoir using a canoe-mounted DC Electrofishing unit with a backpack-type electrode pole. Effort consisted of 15 minute transects along selected reaches of tributaries and GPS locations were recorded at the start and end of each transect. Electrofishing was conducted on 13 middle Chattahoochee River tributaries in Alabama and Georgia with a total of 153 transects and an average of 8 transects per reach. Mesohabitat percentages of runs, pools, and shoals were estimated for each transect and fin clips were taken for future genetics work. Unidentified hybrids were found on 3 different tributaries with several other apparent hybrids between Shoal Bass and Spotted Bass collected. Shoal Bass were only abundant in Flat Shoals Creek and Mulberry Creek in Georgia and Spotted Bass were gathered in all sampled tributaries.

Identification of Critical Habitat and Spawning Migrations of Atlantic Sturgeon *Acipenser oxyrinchus oxyrinchus* in the Altamaha River System, Georgia

Evan C. Ingram & Douglas L. Peterson

Warnell School of Forestry and Natural Resources, The University of Georgia, 180 East Green Street, Athens, GA 30602-2152, USA

The Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*, Aciperseridae) has declined throughout its range as a result of various anthropogenic factors and the species is now protected under the United States Endangered Species Act. Information on spawning migrations and spawning habitat is essential for effective recovery plans for Atlantic sturgeon. The objectives of our study were to document and describe (1) seasonal distribution and movements and (2) spawning migrations. We used a stationary array of acoustic receivers to monitor the movements of 45 adult Atlantic sturgeon in the Altamaha River system, Georgia, from April 2011 through December 2013. Telemetry data revealed that adult Atlantic sturgeon appeared to stage in the oligohaline habitats of the lower Estuary during the spring and early summer. In fall, the fish migrated at least 208 km upriver to potential spawning habitats in Ocmulgee and Oconee Rivers, returning back to the ocean during the following winter. Similar studies of Atlantic sturgeon in northern river systems showed that spawning typically occurs in late spring and early summer. Our findings on the Altamaha River illustrate the clinal variation in the life history of Atlantic sturgeon and highlight the need to manage the species as distinct population segments with regionally specific recovery goals.

Macroinvertebrate Community Responses to Annual Flow Variation from River Regulation: an 11-Year Study

Courtney R. Holt, Don Pfitzer, Chris Scalley, Broughton A. Caldwell, and Darold P. Batzer

Dept. of Entomology, University of Georgia, Athens, GA 30606

The majority of the world's large river systems are affected by dams. The influences of unnatural regimes induced by flow management are wide-ranging from both biotic and abiotic standpoints. However, many of these effects are not evident over short (1-2 year) time periods (e.g. impacts of annual flow variation). This study examines the long-term effects of annual flow variation on the macroinvertebrate community in the tailwater section of the Chattahoochee River below Buford Dam, a major recreational fishery. Quarterly macroinvertebrate samples were taken from 2001-2011 using Surber and Hester-Dendy plate samplers at six locations spread across 65 river Km below the dam. Data were analyzed via ANOSIM to determine differences in community composition between high-flow (mean discharge = 58.27 m^3/s) and low-flow (mean discharge = 26.53 m^3/s) years. Taxa that contributed most to community differences were determined via SIMPER analyses and subsequent t-tests. Several insect taxa (e.g. *Cheumatopsyche* and *Ceratopsyche* caddisfly larvae, *Maccaffertium* mayfly larvae, and *Taeniopteryx* stonefly larvae) were more prevalent under the high-flow regime. Non-insect macroinvertebrates (e.g. *Crangonyx* amphipods, Tricladida flatworms, and *Caecidotea* isopods) were more abundant under low-flow conditions. In terms of taxon richness, no significant effects of flow regime were detected. The results of this study provide insight into the health of the fishery and ecological health of the river overall.

A Mixed Modeling Approach to Quantify Blackside Dace Abundance in the Cumberland River System

Cassandra R. Jansch (presenting author)
Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, 30602, USA

e: cjansch@uga.edu
p: 631-365-3747

Brian J. Irwin
U.S. Geological Survey, Georgia Cooperative Fish and Wildlife Research Unit,
Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, 30602, USA

e: irwin@uga.edu
p: 706-542-0790

Quantifying the population dynamics of rare and elusive species is challenging for both methodological and statistical reasons. For such species, monitoring surveys often produce data sets dominated by zero counts (i.e., survey effort is expended but the target organism is not observed). However, zero-inflated data sets may also contain some observations of high abundance. Applying traditional statistical approaches to zero-inflated data typically requires direct data manipulation (e.g., making zero observations positive), and violations of statistical assumptions can still occur. Alternatively, we can apply distributional assumptions more appropriate for count data, such as the negative binomial distribution. Overall, modeling abundance data is often done in order to relate observations to predictor variables of interest. Here, we apply a negative binomial mixed model to quantify the spatiotemporal variability of a federally threatened freshwater cyprinid, blackside dace (*Chrosomus cumberlandensis*), and to relate abundance observations to measures of water conductivity. We hypothesize that increased water conductivity will be negatively associated with the abundance of blackside dace. Further, we expect that mixed models can provide advantages for modeling observations of fish abundance and that these modeling approaches can be informative to managers who rely on monitoring programs to support decisions.

Analysis of the Spawning Behavior and Microhabitat Of the Tallapoosa Darter, (*Etheostoma tallapoosae*) (Perciformes: Percidae)

Joshua Hubbell

University of West Georgia, College of Science and Mathematics, Carrollton, GA

The Tallapoosa darter is an endemic fish species to the Tallapoosa River basin and is a member of the subgenus *Ulocentra*, a group of darters collaboratively linked by a singular synapomorphy, the attachment of adhesive eggs by females during reproduction. Very little is known about the microhabitat of percids within this subgenus, or how these species use such microhabitat in relation to their breeding behavior. I surveyed four streams and examined substrate use by females for egg-attachment, microhabitat use and microhabitat availability, and how this habitat use correlated with the fishes' reproductive behavior within the upper Tallapoosa River basin in Carroll and Haralson Counties in the state of Georgia. Tallapoosa darters primarily occupied run habitats (transitional areas between riffle and pools) composed primarily of gravel (2-16 mm) and pebble (17-64 mm) substrate. Females primarily utilized coarse (17-32 mm) and very coarse gravel (33-64 mm) for egg attachment. Previous studies identified many species throughout *Ulocentra* primarily utilizing cobble for egg attachment but these findings were not consistent with the data procured by this study. Tallapoosa darters are habitat specialists; sedimentation in streams may threaten population persistence within the Tallapoosa River basin.

Historical Analysis of Commercially and Recreationally Important Nekton in Relation to Habitat Loss in Barataria Bay, Louisiana, USA

Authors:

Kristy Lewis; Department of Oceanography and Coastal Sciences, Louisiana State University, Baton Rouge, Louisiana 70803; klewi41@tigers.lsu.edu

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

For almost 40 years scientists have hypothesized that Louisiana fisheries could be at the nexus of collapse due to an extraordinary loss of marsh habitat that is considered to play an important role in fisheries recruitment and growth. While Louisiana has been losing marsh at an alarming rate, fisheries production does not seem to have been noticeably impacted. This study applied a suite of statistical applications to historical fisheries data to determine if the severe loss of marsh in Louisiana has impacted fish and shrimp production within Barataria Bay. Louisiana is second only to Alaska in the amount of fish landed per year, emphasizing the socio-economic implications a fisheries collapse could have on the people and industries in this region. Previous research on this topic focused on the relationship of marsh loss and fish production at small spatial scales, thereby limiting the interpretability of ecological interactions at larger scales. Results of this study indicated that long term patterns of fish and shrimp abundance in relation to marsh habitat at small spatial scales does not appear to translate to larger estuary-wide scales. Earlier studies found that marsh edge habitat is a critical factor in the abundance of some fish and shrimp species, but this relationship does not appear to be as significant as was once thought.

Food Habits of Blue Catfish (*Ictalurus furcatus*) Introduced into Lake Oconee, Georgia

Geoffrey Mitchell and Cecil Jennings

Georgia Cooperative Fish and Wildlife Research Unit, Warnell School of Forestry and Natural Resources, University of Georgia

Blue Catfish (*Ictalurus furcatus*) are an important commercial and recreational species and are used widely for predator-control purposes within the United States; as a result, it has been introduced widely throughout the country. Because of its widespread introduction, there is a potential for this species to have negative effects on native aquatic communities. Blue Catfish are native to the Coosa river drainage in northwest Georgia, but recently have been discovered outside of this range. Blue Catfish were first discovered in Lake Oconee in 1997. In Lake Oconee, their abundance and growth rates have increased dramatically, but their food habits are unknown. Therefore, food habits of Blue Catfish were determined by examining the stomachs of 808 specimens from Lake Oconee's upper and lower regions during all seasons beginning in summer 2012. Stomach contents were analyzed using the Index of Relative Importance, which was calculated by determining the frequency of occurrence, percent composition by weight, and percent composition by number of each prey item. The dominant prey item during the summer was Asian Clams (*Corbicula fluminea;*98%). Dominant prey items for the fall season shifted to a more diverse array of prey items including Asian Clams (46%), Mayflies (Ephemeroptera;23%), Flies (Diptera;16%), and Threadfin Shad (*Dorsoma petenense*;15%). Winter dominant prey items shifted to Mayflies (45%), Threadfin Shad (35%), and Asian Clams (16%). Mayflies (84%) dominated the spring prey diet. The upper region fish relied heavily on Asian Clams (48%) and lower region fish relied on Mayflies (36%). The results show that the diet of introduced Blue Catfish in Lake Oconee, Georgia, is omnivorous. More importantly, the results also show that they are not preying intensely on native bi-valves and fish species. They actually feed intensively on the invasive Asian Clam during the summer and fall seasons. This finding is important because it demonstrated that introduced Blue Catfish are helping to control another non-native invasive species. However, the competitive interaction between Blue Catfish and other native species is unknown. For example, Blue Catfish may be out-competing other species such as the White Catfish (*Ictalurus catus*) and the Channel Catfish (*Ictalurus punctatus*), whose populations have plummeted with the introduction of Blue Catfish. Future research focusing on the competitive interactions between Blue Catfish and White Catfish and Channel Catfish will be helpful in understanding the trophic dynamics among these native and introduced ictalurids.

Modeling Culvert Passability Using Landscape Variables

Evan Collins, Duncan Elkins, Nate Nibbelink, Will Duncan

Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, 30602, USA

Engineered structures including dams and roads provide an invaluable benefit to society. However, these structures also have a negative impact on the landscape and ecosystems where they are situated. Like dams, road crossings have the potential to fragment stream habitat and obstruct fish movement. However, because these structures are less prominent than dams on the landscape, they are often inadequately surveyed or overlooked during studies on hydrologic connectivity, so their number and effects on habitat connectivity are uncertain. Given this uncertainty, region-wide surveys are clearly desirable. Field surveys, however, are often cost prohibitive. In lieu of large scale, region wide surveys, we used a geographic information system (GIS) and logistic regression approaches to help determine if environmental variables influenced culvert passability. Surveys were conducted on various streams in three watersheds, the Chipola, Etowah, and Nolichucky River systems, during summer, fall, and winter 2013. We used logistic regression to model passability of culverts with landscape variables at two spatial scales. Impassable barriers were found to correlate with factors such as topographic variation and adjacent land use practices. Differences in important landscape variables were hypothesized due to the distinct geomorphologies of the three basins. Future research will expand from logistic regression to use random forest classification trees to predict culvert passability. This information could be useful to managers for identifying regions with an increased risk of habitat fragmentation from road crossings and targeting those areas for focused surveys and remediation.

Assessing the Economic Impact of Tournament Black Bass Angling on Lake Guntersville, Alabama

Patrick Snellings, Terry Hanson, and Steven M. Sammons

School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University, 203 Swingle Hall, Auburn University, AL 36849

PLS0007@auburn.edu

Lake Guntersville, Alabama boasts one of the most popular Largemouth Bass *Micropterus salmoides* fisheries in the United States and as such competitive bass fishermen constitute a large proportion of effort on the lake. Black Bass *Micropterus* spp. tournaments bring in additional revenue into local communities surrounding the reservoirs they occur on. This study looks to quantify the economic impact of these competitive events over the course of one year from February 2013 through January 2014 on Lake Guntersville. All tournaments occurring on Lake Guntersville were identified if possible and stratified random sampling by tournament type determined which tournaments were surveyed. Three trips per month were made to Lake Guntersville except during summer (July- August) and winter (December- January) months, when only two trips were made. At the completion of a tournament, anglers were directly contacted at access points and were given a survey packet to complete and return via postage paid envelope. 76 tournaments were sampled during the study and 1672 surveys were distributed. Preliminary findings show that mean trip expenditures ranged from $134 for wildcat tournaments to $872 for professional tournaments and an average trip expenditure of $481 across all tournament anglers surveyed. Tournament anglers on Lake Guntersville were also likely to fish multiple tournaments on the lake, averaging 6 tournaments on Lake Guntersville annually. Further analysis will be conducted on these data to evaluate the direct economic impact to the local economy and determine the proportion of these expenditures which go into the local taxes. The socio-economics of tournament anglers will also be quantified and described to better understand how efforts can be made to improve angling experiences and increase local expenditures.

Sources and Effects of Estrogens in the Upper Conasauga River

Whitney Jacobs[1*], Peter Lasier[2], Sayed Hassan[3] and Robert Bringolf[1]

[1]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA

[2]USGS, Patuxent Wildlife Research Center, Athens, GA

[3]College of Agricultural and Environmental Sciences, University of Georgia, Athens, GA

Populations of rare and endangered fish have been declining in the upper Conasauga River (UCR). Concurrently, agricultural activities have increased in the watershed, and in a preliminary contaminant survey we measured high concentrations of estrogens in sediments throughout the UCR watershed. The goals of this study were to determine the effects of estrogens on fish in the UCR and identify UCR tributaries with the highest estrogen input. Specific objectives were to: 1) determine the presence and bioavailability of estrogens in UCR tributaries by assessing vitellogenin (Vtg) induction in caged male fish, 2) assess the estrogenic potency of UCR sediments by measuring Vtg induction in sediment-exposed male fish, 3) determine sediment toxicity to larval fish, 4) determine incidence of intersex in a survey of multiple species of fish in the UCR, and 5) determine if exposure to estrogens altered the sexual development of male Western Mosquitofish (*Gambusia affinis*) in the UCR. Study sites included five UCR tributaries with similar land use characteristics. Results from this study showed estrogens are present in UCR water, with estrogenic equivalencies (EEq) ranging from 1.57 ng E2/L (± 0.8, standard deviation) in Spring Creek to 16.36 ng/L (± 8.2) in Mill Creek. Estrogen concentrations were higher in sediment samples from the creeks, with EEq ranging from 72.6 µg E2/kg in Sugar Creek to 164.7 µg E2/kg in Mill Creek. However, male fish produced higher concentrations of Vtg when exposed to UCR water than when exposed to UCR sediments, suggesting estrogens in the water column were more bioavailable than those in the sediment. Sediment toxicity tests revealed significant growth differences in larval Fathead Minnows (*Pimephales promelas*; $p = 0.0022$) and Tricolor Shiners (*Cyprinella trichroistia*; $p = 0.0016$) exposed to Mill Creek and Sugar Creek sediments compared to controls. Of the 174 male fish (27 species) collected for the intersex survey, 13 (7.5%) were intersex. Sugar Creek had the highest rate of intersex at 13.6% (3 of 22 males). Gonopodia of Western Mosquitofish collected from a farm drainage ditch were significantly ($p = <0.0001$) shorter compared to Western Mosquitofish from the lower Conasauga River. Results indicate environmentally relevant estrogenic compounds are present in UCR surface water and sediment, and these compounds may be linked to declines in fish populations. Additionally, this approach has facilitated identification of tributaries with the highest estrogen loads, where best management practices should be targeted for greatest impact.

Evaluation of Growth and Costs with Use of Higher Protein Fish Food Diets on Bluegill (*Lepomis macrochirus*).

Folsom, Caroline, and Grimes, Greg

Aquatic Environmental Services, Inc., Ball Ground, GA.

A study was designed to evaluate the effects of four dry pellet food diets containing various protein/fat levels on the growth efficiency versus cost of food for bluegill (*Lempomis macrochirus*). Average weight was calculated per phase to measure growth rates. Fish were held in 33ft^3 plastic mesh cages to isolate feeding; there were eight cages in total, two per food type. Over the five month period, Purina Aquamax 500 had the best feed conversion ratio at 1.86:1 followed by Cargill Aquafeed 40-10 at 2:1 and Cargill Aquafeed 45-12 at 2.18:1. Purina Game Fish Chow with a lower protein content of 32% (similar to many diets sold at local feed stores) had a 3.27:1 feed conversion. Cost analysis showed the Cargill 40-10 slightly beat out Aquamax. Purina Game Fish Chow while being much cheaper per pound, cost much more overall when you factor in the conversion rates. This data demonstrates that protein, crude fat content, and food palatability provides evidence for greater weight gain. When analyzing cost, it does pay to use a better quality feed for supplementing feeding bluegill.

The Quest for the Holy Grail: Trophy Bass Production in Small Ponds

Steven M. Sammons and Michael J. Maceina

School of Fisheries, Aquaculture, and Aquatic Sciences
Auburn University
(334) 844-4159

sammosm@auburn.edu

Abstract: Production of trophy-sized (> 8lbs) largemouth bass has become the primary interest of many pond owners, many of whom are willing to spend a lot of money to create and maintain such fisheries. The primary problem in most traditional largemouth bass ponds is over-reproduction of bass, leading to high population densities, limited food supplies, and poor growth of bass. In 2003, we initiated research at Auburn University that focused on limiting populations of largemouth bass and increasing forage supplies. For our initial strategy, bluegill and bass were stocked at a 15:1 ratio in an attempt to flood the system with forage. Bass were removed from these systems beginning in the fall of the second year at a rate of 25 lbs/ac to reduce bass populations. This strategy produced good fishing for largemouth bass, but forage densities were unable to be maintained for more than 4-5 years, thus, the old 10:1 bluegill to bass stocking ratio should be increased to approximately 35:1. Also, bass harvest needs to begin when the fish are as small as possible, preferably around 10", because their prey demand at this size is very high. The second strategy involved stocking all female largemouth bass into ponds to eliminate bass reproduction completely. Since these fish were hand-sexed, they were stocked at larger sizes (10-12") and at lower densities (20-35/ac) than fingerling fish. Following results from the first strategy, forage stocking was heavy, at least a 35:1 ratio to the bass. The ability to completely control bass reproduction allowed forage densities to remain high, leading to fast growth rates and fat bass that reached 5-6 lbs in less than 3 years. The primary problem with this strategy was ensuring all the stocked bass were in fact females, and keeping "foreign" males from entering the pond system. However, this appears to be a viable management alternative for pond owners desiring to create a trophy bass fishery in their pond with minimal annual maintenance.

Lake Lanier Striped Bass Research and Monitoring Efforts

Patrick O'Rouke and Christopher Looney

Georgia Wildlife Resources Division

In response to decreased gill net catch rates and angler complaints, Georgia WRD increased monitoring efforts for the striped bass population at Lake Lanier. As we found very little relationship between stocking rate and gill net CPUE, we added multiple methods of assessment targeting different life stages of striped bass. For immediate survival at stocking, we used plankton nets to assess larval fish abundance and held a subset of fingerling striped bass in cages to assess post-stocking mortality. Gill nets targeted mostly age-0 and age-1 striped bass, though there was doubt whether sample sizes have been sufficient to accurately assess their abundance. We used electrofishing to collect age-2+ striped bass in the spring and read scales from each fish to verify their ages. Finally, we partnered with angler groups to provide supplemental data relating to angler catches. All of these data sources allowed us to compare apparent year-class strength among different sampling methods. Due to these efforts, we now have a better understanding of the Lanier striped bass population and a closer relationship with stakeholders. As a result, we can ultimately refine our methods to use staff time as efficiently as possible in managing the Lake Lanier striped bass fishery.

Climate Change and a Disturbance Mediated Stream Fish Assemblage in the Southeastern United States.

Gary Grossman

Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA.

Both theoretical and empirical data indicate that Global Climate Change (GCC) will likely produce increased variability in precipitation and flow in the Southeast. Previous research has shown that biodiversity in some southern Appalachian streams is positively correlated with flow variability and that this variability overwhelms the effects of interspecific interactions. I explore how species richness is maintained in the Coweeta Creek drainage and how these mechanisms may be affected by increased environmental variability caused by GCC. Because flow variability is positively correlated with species richness in this stream it is possible that increased flow variability will affect species richness. Long-term population data within Coweeta Drainage assemblages suggests that strong density-dependence is present in populations of the dominant species and that this likely facilitates high species richness (i.e., intraspecific competition is stronger than interspecific competition) in a disturbance-driven assemblage. Nonetheless, greater variability in flows may shift population control from density-dependent processes capable of producing compensatory population responses to non-compensatory density-independent processes with subsequent negative effects on population persistence and species richness.

Validation of Daily Ring Deposition in the Otoliths of Age-0 Alligator Gar

Peter C. Sakaris, Southern Polytechnic State University, Department of Biology and Chemistry, Marietta, GA 30060; E-mail: psakaris@spsu.edu

David Buckmeier and Nate Smith, Texas Parks and Wildlife Department, Heart of the Hills Fisheries Science Center, Mountain Home, TX 78058

We developed and validated techniques for estimating the daily age of young-of-the-year alligator gar, *Atractosteus spatula*. These techniques allow fish ecologists to estimate hatch dates and early growth rates and to investigate other aspects of the early life histories of fishes. In addition, these tools allow us to assess how environmental factors may influence hatching success, the transition from endogenous to exogenous feeding, and early growth. Known-age alligator gar larvae were initially grown in aquaria and then transferred to an outdoor artificial stream. Fish were sampled from 3 to 118 d post-hatch. Sagittal otoliths were extracted from each fish, and each otolith was embedded in a clear epoxy resin. Otoliths were sectioned, along a transverse plane, using a Buehler® high-precision sectioning saw and mounted with thermoplastic cement to microscope slides. Each otolith section was sanded with 600-grit sandpaper to reveal daily rings and then polished with ultra-fine, 1500-grit sandpaper. Otoliths were read three times each in random order without reference to known ages, and no two counts of an otolith were made consecutively. The mean of the three counts for each otolith was used for analyses. We estimated the daily ages of 50 alligator gar (21 - 118 days old, 43 - 458 mm total length). Estimated age and known age were closely related ($r^2 = 0.95$, $P<0.01$, regression slope = 0.965), indicating that daily ring deposition occurred in the otoliths of alligator gar. Daily increment counts were reasonably accurate through 62 d post-hatch, although some variation in assigned ages was detected for all age groups. Daily increments around the core (up to ≈ 15 d post-hatch) were difficult to read, but later increments were more discernable and deposited in a more regular pattern. We expect that a refined technique will enhance the readability of inner rings (i.e., by hand-sectioning resin-embedded otoliths). A highly significant relationship was also detected between fish length and otolith radius ($r^2 = 0.95$, $P<0.01$), indicating that otoliths likely grow proportionally with fish size. We encourage researchers to utilize our aging technique to estimate hatch dates, the timing and frequency of hatching, and early growth rates of alligator gar in wild populations. This early life-history information will be valuable in enhancing the management and conservation of gar populations.

Ready to Start Mapping Lakes and Reservoirs?
An Introduction to the Capabilities and Requirements of Various Sonar Systems

Robert A. Bahn and Susan B. Wilde

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

Lake and reservoir managers have been challenged by the introduction of non-native aquatic plants and subsequent ecological consequences. When a system becomes inundated with non-native and/or invasive submerged aquatic vegetation (SAV), managers are often faced with tough and costly management decisions. The ability to effectively quantify the amount of nuisance SAV in a reservoir would be a valuable tool for managers to aid in the establishment and execution of management plans. The identification of bottom substrate and the creation of bathymetric maps are also capabilities that would prove very useful to managers and a wide variety of other user groups. Commercial and consumer-grade side and down-scan sonar are low-cost emerging technologies that may be able to provide useful data sets to managers and other users. Several different geo-referenced mapping platforms have been introduced in recent years, ranging from consumer-grade "fish finder" sonar units to a calibrated commercial-grade package. In this presentation, our objective is to provide comparison information about three available mapping platforms (Contour Innovations' CI BioBase, USACE's SAVEWS Jr., and BioSonic's MX Aquatic Habitat Echosounder) to potential new users and discuss the capabilities of each along with their financial, logistical, and computing requirements.

Evaluating Reservoir Fish Assemblages: How Much Sampling is Enough?

Don Dennerline and Cecil Jennings

U.S. Geological Survey, Georgia Cooperative Fish and Wildlife Research Unit, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA

We analyzed community metrics derived from approximately 20 years (1986 to 2008) of monthly gillnet sampling conducted in Richard B. Russell and J. Strom Thurmond reservoirs to assess spatial and temporal variability in the metrics. Over the entire sampling period, we collected 45 species from each reservoir and the number of species captured was relatively constant across stations and ranged from 36 to 38 for Thurmond reservoir (4 stations) and 33-37 for Russell reservoir (5 stations). The average number of species collected in a calendar sampling year was also relatively constant among stations and ranged from 20 to 25 for Thurmond and 19 to 21 for Russell. Though numbers of species were similar, there were identifiable temporal (across months and years) and spatial (across stations) patterns in catch with respect to the number of fish and the individual species collected. Using the patterns in catch, we generated temporal subsets of the data (combinations of various months) and subsequently evaluated the similarity in inferences between the subsets and the full data set with respect to the species accumulation curves, species composition, and species rankings. Within years, subsets of specific monthly samples typically greatly under-represented the assemblage derived from the complete annual sampling regime; however, community metrics derived from subsets of the data pooled across many years were very similar to those derived from the full dataset for the same time period. For example, in Thurmond reservoir, pooling the data from May to June (25% of the overall effort) resulted in a similar assemblage as the full data set with nine of the top 10 species being the same and having very similar rankings. The subset captured fewer species (28 of 38), as expected by sampling theory, but eight of the 10 species not sampled in the subset consisted of only 14 individuals, and six of the species were captured only once in 3,289 gillnets. Our findings suggest there may be an opportunity for future monitoring programs that are interested in assessing changes in fish assemblages to spend less time on "routine monitoring" of the assemblage and more time on sampling to address specific issues or questions. For example, decreasing community monitoring efforts to 3-6 months could make time and resources available to conduct age and growth or mark/recapture studies on key species of interest and gain a better understanding of factors driving changes in community structure.

West Point Lake Fishing Survey

Brent Hess

Georgia Department of Natural Resources

Angler surveys provide resources managers with valuable information on the use of fishery resources such as angler's fishing habits and how satisfied they are with the fishery. In July of 2013, the Fisheries Management Section of the Georgia Department of Natural Resources (GADNR) conducted an angler survey in the West Point Lake area. Local angler information was obtained from the fishing license database. Licensed anglers were emailed a link that directed them to the *SurveyMonkey* website. They were asked a series of five questions pertaining to the fishing in West Point Lake this past spring. The survey questions included how frequent they fished West Point Lake and what types of fish they had fished for. Also, they were asked if they fished for striped bass (STB) and/or hybrid striped bass (WXS) and how would they rate their fishing. Finally, they were asked how important the STB/WXS stocking program was to them. A total of 6,283 emails were sent to local anglers in the West Point Lake area. Ten percent (657) participated in the survey. Most anglers (52%) indicated they fished on 1 to 10 spring trips. They primarily fished for *Bass* followed by *Crappie*, *STB/WXS*, *Catfish*, *Bream*, and *Other*. However, most anglers fished for more than just one of these groups of fish (2.5 per angler). Fifty-two percent of the anglers had fished for STB/WXS. They rated their STB/WXS fishing as *Excellent* (5%), *Good* (32%), *Fair* (45%), and *Poor* (18%) for this spring. Anglers said that the GADNR STB/WXS stocking program was *Very Important* (59%) to them followed by *Somewhat Important* (22%) and finally *Not Important* (19%). In summary, all but 18% of those surveyed had fished West Point Lake this spring. They fished for a diverse range of fish with *Bass* fishing being the most popular. Just over half of the anglers had fished for STB/WXS this spring and only 18% rated their fishing as *Poor*. Most surveyed anglers (81%) indicated that the GADNR STB/WXS stocking program was *Important* to them.

Distribution of Non-Native Crayfishes in Georgia

Christopher E. Skelton

Department of Biological and Environmental Sciences, Georgia College & State University, Milledgeville, Georgia

chris.skelton@gcsu.edu

In *The Crayfishes of Georgia*, Hobbs presented accounts for 66 species and subspecies native to the state. Two of these native species, *Faxonella clypeata* (Ditch Fencing Crayfish) and *Procambarus acutus* (White River Crawfish), were mentioned as being introduced into Georgia river systems outside of their native ranges; only one species, *Cambarellus shufeldtii* (Cajun Dwarf Crayfish), was possibly introduced into Georgia from another state. Since this volume was published in 1981, four species not native to Georgia have been found in the state. *Procambarus clarkii* (Red Swamp Crawfish) is now known from about 10 localities in the Chattahoochee, Etowah, Flint, Oconee, Ocmulgee, and Tennessee river systems; this species has been present in Georgia for at least 15 years. *Orconectes palmeri creolanus* (Creole Painted Crayfish) was first collected in the Flint River system in 1999 and is now commonly found within the lower 130 km of the Flint mainstem. *Procambarus hayi* (Straightedge Crayfish) was discovered in the spring of 2010 in tributaries to the Oconee River and *O. juvenilis* (Kentucky River Crayfish) was discovered in Lake Sinclair (Oconee River system) in December 2010. The distribution and ecology of *O. p. creolanus* have been studied and it appears that the species is displacing *Procambarus spiculifer* (White Tubercled Crayfish) in portions of the Flint River. The remaining three species are reproducing and appear to have robust populations where they occur, but the extent of their respective distributions and any effects they are having on native species remain poorly understood.

Lessons Learned: Management of a Unique Trophy Largemouth Bass Fishery in Georgia

Timothy F. Bonvechio

Georgia Department of Natural Resources, Wildlife Resources Division
P.O. Box 2089, Waycross, Georgia 31502-2089, USA

The low density stocking of female-only largemouth bass Micropterus salmoides in combination with a catch-and-release regulation at Ocmulgee Public Fishing Area (PFA) met the objective of providing a unique trophy bass fishing destination. To describe the growth, size structure and mortality of the population, data from angling and electrofishing was compared. Both gears yielded similar numbers of trophy bass (> 3.6 kg) in the population. Of the total bass collected with both gears, 34.4 % exceeded the 3.6 kg mark and 8.8 % exceeded the 4.5 kg mark. Size-selective biases were apparent. Both gears consistently caught large individuals > 457 mm (TL), but only electrofishing collected a broader size range of bass including fish as small as 237 mm TL. The Kolmogorov-Smirnov two sample test indicated that the size structure of bass captured with the two types of gear differed significantly when all sizes of fish being captured were examined. For bass > 457 mm TL, angling and electrofishing size structure data did not differ significantly with the Kolmogorov-Smirnov two sample test. For electrofishing, the total annual mortality (A) estimate was 15%, and growth was described with the von Bertalanffy growth curve as TL = 564.2. (1-e -0.471[age + 0.409]). Due to a lack of age-classes collected with angling, growth curves and mortality estimates were not obtained. Biologist' should be cautious when using one gear to evaluate trophy largemouth bass populations given that size selective biases do exist with angling and electrofishing that can influence growth, mortality and length-frequency assessments. Volunteer angler data can be a viable method for supplementing electrofishing, especially where trophy sized bass can be difficult to collect. The recipe of female only largemouth bass does cater to a subgroup of specialized and motivated anglers, and as result of high angler satisfaction, angler recruitment and fishing license sales have the potential to increase due to a unique system such as Ocmulgee PFA.

Georgia's Marine Sportfish Carcass Recovery Project

Ryan Harrell

ryan.harrell@dnr.state.ga.us
Georgia Department of Natural Resources, Coastal Resources Division, One Conservation Way, Brunswick, GA 31520

In the fall of 1997, the Georgia Department of Natural Resources' Coastal Resources Division initiated the Marine Sportfish Carcass Recovery Project. This project takes advantage of the normally discarded fish carcasses collected by recreational anglers, which become a source of much needed data on Georgia's popular marine sportfish. Recreational anglers are encouraged to donate species including: spotted seatrout, red drum, southern kingfish (whiting), black drum, tripletail, flounder, sheepshead, weakfish, and red snapper. Chest freezers are placed near cleaning stations located at many coastal Georgia marinas. Anglers place their filleted carcass into a bag with a data card containing the anglers name, contact info, date, and location where fish were caught. Anglers who participate are rewarded with incentives such as T-shirts and hats. Donated carcasses are identified to species, measured, sexed, and the otoliths removed. Data collected from the project are made available for use in stock assessments, allow biologists to create length at age keys for frequently captured species, and most importantly, allows anglers to have direct involvement in the stewardship of coastal Georgia's fishery resources. Angler participation has been successful with more than 165 anglers donating annually. To date, more than 52,000 carcass donations have been processed by DNR staff with spotted seatrout, red drum, and southern kingfish representing 91% of all fish donations.

Shoal Basses, a Clade of Cryptic Identity

Bud Freeman, Georgia Museum of Natural History and Odum School of Ecology, University of Georgia; Andrew Taylor, Oklahoma State University; Ken Oswald, Northern Kentucky University; Mary Freeman, US Geological Survey, Patuxent Wildlife Research Center; Joe Quattro, University of South Carolina; Jean Leitner, South Carolina Department of Natural Resources, Hayley Glassic, University of Georgia.

Abstract: Shoal basses are a cryptic clade composed of Micropterus spp. restricted to the Apalachicola River system and three southeastern 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), the Chattahoochee Bass, Micropterus chattahoochae Baker, Johnston and Blanton (endemic to the Chattahoochee River), and two undescribed forms from the Altamaha River and Savannah River drainages. Members of the shoal bass clade can be distinguished from all other species of Micropterus basses 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 Hubbs and Bailey, 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 seven species, each of which is endemic to a single southeastern drainage. Recognizing and documenting the actual diversity of Micropterus species provides important information for managers who may wish to avoid stocking or translocations that could compromise genetic integrity of native bass populations. Introductions of non-native basses, including Spotted Bass (M. punctulatus), Alabama Spotted Bass (M. henshalli) and Smallmouth Bass (M. dolomieu) currently threaten integrity of native shoal bass species in rivers of the Chattahoochee, Altamaha and Savannah systems.

Posters

Satilla River Flathead Catfish Removal

Timothy F. Bonvechio & Jason S. Mitchell
Georgia Department of Natural Resources, Wildlife Resources Division
P.O. Box 2089, Waycross, GA 3152-2089

Conservation Status Assessment Mapping: A Consistent Method for Rapidly Assessing the Conservation Status of Large Numbers of Aquatic Species

Catherine Reuter, Brett Albanese, Deb Weiler, Chris Canalos and Greg Krakow

Using Angler Catch Data to Assess an Introduced Spotted Bass Fishery in a Georgia Highland Reservoir

Joe Thompson (Young Harris College) and Johnathan Davis (Young Harris College)