2021 Annual Meeting

Alabama Chapter of the American

Fisheries Society

Kick Back Ranch

Hope Hull, Alabama

September 23-24, 2021

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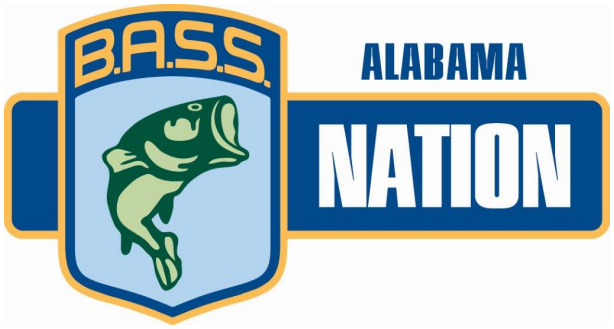

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Program Schedule

- **All oral presentations and business meeting to be held in the Dining Hall.**
- **Poster presentations, social, and banquet to be held in the Dining Hall or Social Deck weather permitting.**

Thursday, September 23

10:30 AM – 4:00 PM	Meeting Registration & Load Talks
10:30 AM – 5:00 PM	Poster Setup
12:00 PM – 12:20 PM	Opening Remarks
12:20 PM – 2:00 PM	Student Presentations – Session A
2:00 PM – 2:10 PM	Break
2:10 PM – 4:50 PM	Student Presentations – Session B
4:30 PM – 5:00 PM	Break
5:00 PM – 6:30 PM	Poster Presentations & Social
6:30 PM – 8:30 PM	Dinner & Awards

Friday. September 24

8:00 AM – 9:00 AM	Breakfast/Meeting Registration
9:00 AM – 10:10 AM	Business Meeting
10:10 AM – 10:20 AM	Break
10:20 AM – 11:40 AM	Presentations – Session C
11:40 AM – 12:00 PM	Adjourn

SDAFS UPDATE:

Jason Olive, Vice President, Southern Division of AFS

Jason Olive is the Assistant Chief of Fisheries Management for the Arkansas Game and Fish Commission. He is currently serving as President-Elect of the Southern Division of AFS as well as the Secretary/Treasurer of the AFS Fisheries Administration Section. Jason is a native of Florence, AL, and received BS and MS degrees in fisheries management from Mississippi State University. He has worked as a fisheries biologist for both the AR Game and Fish Commission as well as the MS Department of Wildlife, Fisheries, and Parks; and has served as an administrator for the past 6 years. Jason has served as an officer at the sub-unit, chapter, division, and section levels of AFS, and currently chairs the AFWA Subcommittee on Water.

Presentation Schedule

Thursday, September 23

SESSION A (STUDENTS)
Moderator: Cal Johnson, ADEM

12:20 pm An Analysis of Fecundity Age and Length Relationship for Black Crappie (*Pomoxis nigromaculatus*) at Lake Purdy, Birmingham, Alabama. Kathryn Jones et al.

12:40 pm An Analysis of Fecundity Density for Black Crappie (Pomoxis nigromaculatus) at Lake Purdy, Birmingham, Alabama. Jacqueline Hintz et al.

1:00 pm Avian Predation on Low-Salinity Shrimp Aquaculture. Caleb A. Amacker et al.

1:20 pm Evaluating the thermal tolerance of aquatic invertebrates using aerobic scope. Kaelyn J. Fogelman et al.

1:40 pm Swimming performance and metabolism of four fish species under the flow and temperature regimes of a regulated river. Ehlana Stell et al.

2:00 – 2:10 pm **Break**

SESSION B (STUDENTS)
Moderator: Kyle Bolton, ADCNR

2:10 pm A comparison of unionid feeding ecology between lentic and lotic systems Kaelyn J. Fogelman et al.

2:30 pm Fish kill loss valuation and angler effort estimation on three mid-size Alabama rivers. Phil Carson et al.

2:50 pm Temperature effects on larval development of Florida (Micropterus salmoides floridanus) and Northern (Micropterus salmoides salmoides) largemouth bass: Implications for intensive indoor aquaculture and fisheries management. Gavin L. Aguilar et al.

Thursday, September 23 continued

3:10 pm Multispecies fish passage and movements in the Alabama River Henry Hershey et al.

3:30 pm Distribution, Relative Abundance, and Habitat Associations of Warrior Bass *Micropterus warriorensis* in the Black Warrior Watershed, Alabama Amber N. Young et al.

3:50 pm Effects of ecologically relevant levels of glochidia infestation on metabolic rate and hypoxia tolerance of Bluegill *Lepomis macrochirus* and Largemouth Bass *Micropterus salmoides*. Lindsay M. Horne et al.

4:10 pm Evaluating the effects of three Alabama River dams on fish movements using otolith microchemistry. Christopher Rotar et al.

4:30 pm Can otolith microchemistry be used to quantify fish movement downstream of a hydropeaking dam? Elijah Lamb et al.

5:00 – 6:30 pm **Poster Presentation**

Fishes of the Cypress Creek System, Tennessee River Drainage: Historical Records, Recent Fish Fauna, and Index of Biotic Integrity Assessment. Jeffery M. Ray et al.

Use of a kaolinic clay in diets of Pacific white shrimp *Litopenaeus vannamei* cultured in low salinity water. Sunni Dahl et al.

Evaluating Zooplankton in Traditional and Split-pond Systems for Raising Golden Shiners, *Notemigonus crysoleucas.* Anita Kelly and Sindhu Kaimal.

Coinfective bacterial pathogens in channel catfish (Ictalurus punctatus) production. Allison Wise et al.

Friday, September 24

8:00 – 9:00 am Breakfast & Meeting Registration

SESSION C

Moderator: Colin Dinkin, Kleinschmidt

9:00 – 10:10 am Business Meeting

10:20 am Weight loss, survival, and fatty acid composition in over-wintered juvenile Coppernose Bluegill (*Lepomis macrochirus purpurescens*) cultured in outdoor tanks using different feeding regimens. Luke A. Roy et al.

10:40 am Growth parameters in northern largemouth bass *Micropterus salmoides salmoides* raised near their upper thermal tolerance for 28 days. Anita M. Kelly et al.

11:00 am Evaluation of mechanical removal rates for rehabilitating over-crowded largemouth bass *Micropterus salmoides* populations in Alabama small impoundments. Taylor Beaman et al.

11:20 am Intensive pond-based production systems: Are they a good fit for sportfish and baitfish species? Luke A. Roy et al.

11:40-12:00 **Network & Adjourn**

Abstracts

Oral Presentations (Student Sessions)

Kathryn Jones (Student), Kjones22@samford.edu, 205-726-2944

An Analysis of Fecundity Age and Length Relationship for Black Crappie (*Pomoxis nigromaculatus*) at Lake Purdy, Birmingham, Alabama.

Kathryn Jones, Jacqueline Hintz, Kaitlynn Wade, and Anthony Overton
Samford University- Department of Biological and Environmental Sciences, Birmingham Alabama 35229

Black Crappie (*Pomoxis nigromaculatus*) are a popular recreational fish species that is sought after by a multitude of anglers every year. However, their popularity has led to several populations in water bodies becoming overfished or stunted in growth. As recreational fishing regulations are implemented to help improve the overall number and health of their populations, it is important to regularly evaluate the demographics of these populations. Therefore, this project analyzed 78 Black Crappie from Lake Purdy, Alabama during the spring of 2020 in order to measure their overall health in fecundity, gonadosomatic index (GSI), and age and length relationships. It is observed in several studies that the fecundity and GSI would increase throughout the spawning season in females, which was supported with the GSI analysis in Black Crappie. The average value with standard deviation for January was 6.34 ± 1.83, February was 5.96 ± 2.53, and March was 7.17 ± 2.78. The scales of the fish were used to age 31 fish, and the ages ranged from 1 to 5 years old. There was a positive correlation between fish length and fish age as the fish increased in length with age. Males were larger than females by 8.37mm to 13.17mm up to age-3, and females age-3 and older were 1.36mm to 25mm longer in length.

Virtual Presentation

Bio: I am currently a junior Marine Science Major at Samford University. My research focuses on age and growth of Black Crappie under the direction of Dr. Overton.

Jacqueline Hintz (Student), jhintz@samford.edu 205-726-2944

An Analysis of Fecundity Density for Black Crappie (Pomoxis nigromaculatus) at Lake Purdy, Birmingham, Alabama.

Jacqueline Hintz, Kaitlynn Wade, and Anthony Overton, Samford University-Department of Biological and Environmental Sciences, Birmingham Alabama 35229

Lake Purdy, located in Birmingham, Alabama, preserves the population of Black Crappie, *Pomoxis nigromaculatus*. Estimating individual reproductive potential is key to understanding the reproductive biology of fishes. We compared gravimetric methods and digital image analysis to calculate fecundity estimates in Black Crappie. The image analysis approach represents a highly time-efficient procedure compared to the traditional gravimetric techniques. We analyzed 20 Black Crappie oocytes and distinguished the oocyte density approximating between the gravimetric and image systems. Processing time, including the manual preparation of the sample for analysis and the data processing afterward for the gravimetric method, was approximately two hours per sample, whereas; image analysis processing time was roughly one hour. There was a significant relationship between the gravimetric and image oocyte density estimates (*Y=0.89x+103.5; r2=0.91).* The imaging system oocyte density estimates were routinely lower than the gravimetric method. This is possible because of the oocyte's diameter. Our samples were collected from fish early in the pre-spawn season whose oocytes were smaller and lesser developed. We hypothesize that more significant, more developed oocytes would provide more of an accurate oocyte density estimates and easier processing methods. Accurate and more precise measurement of oocyte density is vital in assessing the maturity and spawning of fishes.

Virtual Presentation

Bio: I am currently a junior Marine Science Major at Samford University. My research focuses on fecundity of Black Crappie under the direction of Dr. Overton.

Caleb Amacker (Student), caa0043@auburn.edu, 601-408-5570

Avian Predation on Low-Salinity Shrimp Aquaculture.

Caleb A. Amacker[1], Mark D. Smith[2], Brian S. Dorr[3], Luke A. Roy[4]

[1]Auburn University, School of Forestry and Wildlife Sciences, Auburn, AL 36849
[2]Auburn University, School of Forestry and Wildlife Sciences, Auburn, AL 36849
[3]USDA, Wildlife Services, National Wildlife Research Center, Starkville, MS 39762
[4]Auburn University, School of Fisheries, Aquaculture, and Aquatics, Auburn, AL 36849

Pacific white shrimp (*Litopenaeus vannamei*) is the most commonly produced shrimp in the world and prominent in the United States' seafood industry. Aquaculture producers in the United States raise >2,000 metric tons of shrimp each year using various low-salinity water (LSW) sources. Although many bird species frequent aquaculture facilities and are known or suspected of consuming shrimp, no studies have examined the impact these birds may have on final yield. Therefore, our objectives were to 1) assess the distribution and relative abundance of predatory birds on commercial shrimp farms in Alabama and Florida, 2) quantify the diet of these birds, 3) and estimate the total amount of shrimp consumed annually. During May-October 2020, we conducted biweekly surveys to estimate the diversity and relative abundance of birds and then conducted collections of individuals observed actively foraging around shrimp production ponds at farms in Alabama and Florida. Collected birds were injected immediately with cold (<10° C) phosphate buffered saline to halt digestion and placed on ice. Necropsies were then performed to determine each bird's diet. A total of 58 birds (7 species) were collected with most (n=34) being collected closer to the harvesting months of September and October. Of these 34 birds, 21 (61.8%) had consumed shrimp with Pied-billed Grebes (*Podilymbus podiceps*), Great Egrets (*Ardea alba*), and Double-crested Cormorants (*Phalacrocorax auritus*) consuming the most shrimp. Pied-billed Grebes consumed an average 1.67g dry weight shrimp/bird, Great Egrets consumed 1.85g, Double-crested Cormorants consumed 5.34g, Great Blue Herons consumed 1.32g, and Little Blue Herons consumed 0.47g. We found that only select avian predators consume shrimp and do so closer to harvest when shrimp are mature and pond waters are lowered suggesting that management actions to mitigate losses may be targeted to a few species and may be most effective immediately before shrimp are harvested.

Bio: I grew up in Gumpond, MS. I Graduated in 2019 (B.S. in Wildlife, Fisheries, and Aquaculture) from Mississippi State University. Currently, I attend Auburn University (M.S. in wildlife) while researching the effects of avian predation on low-salinity shrimp aquaculture in Alabama and Florida under Dr. Smith.

Kaelyn J. Fogelman, (Ph.D. Candidate), kjf0021@auburn.edu, 334-332-8396

Evaluating the thermal tolerance of aquatic invertebrates using aerobic scope.

Kaelyn J. Fogelman[1], Aya S. Hussain[1,2], Kayla Boyd[1], Patrick Jordan[1], Hisham A. Abdelrahman[1,3], Luke A. Roy[1] and James Stoeckel[1].

[1]Auburn University, Auburn, AL, USA; [2]Suez University, Suez, Egypt; [3]Cairo University, Giza, Egypt

Understanding the physiological mechanisms behind thermal tolerance is of increasing importance in the face of ongoing climate change. Aerobic scope may be an important driver underlying thermal tolerance and geographic range of aquatic ectotherms. Aerobic scope represents the excess capacity of an organism to deliver oxygen in support of activity, growth, and reproduction. It can be calculated as the difference between resting metabolic rate (RMR: metabolism required for basic maintenance) and maximum metabolic rate (MMR: maximum metabolic rate an organism is capable of). Aerobic scope exhibits a unimodal relationship with temperature. In theory, the temperature at which aerobic scope equals zero represents the critical thermal maximum (CTM) of an organism where it is no longer physically capable of meeting its energetic needs. We are currently comparing aerobic scope and CTM among various sessile and mobile taxa including unionid mussels (*Pygonadon grandis* and *Lampsilis straminea*), crayfish (*Cambarus latimanus and Procambarus clarkii*) and saltwater shrimp (*Litopenaeus vannamei*). We hypothesize that sessile taxa will exhibit greater aerobic scope at high temperatures than mobile taxa, and this will be reflected by a higher thermal tolerance. To test the concept of aerobic scope, we exposed shrimp, crayfish, and mussels to increasing temperature (1-2°C/hr) from 25 - 50°C. At each temperature, RMR was estimated via respirometry and MMR was estimated via the electron transport system (ETS) assay. Aerobic scope was calculated as RMR-MMR. CTM was estimated as the temperature at which shrimp and crayfish could be flipped over and were unable to right themselves for at least 30 seconds and mussels had an extended foot, gaping shell, retracted mantle tissue and siphons and were unresponsive to touch. Data is currently being analyzed to estimate aerobic scope of mussels, crayfish, and shrimp to determine whether aerobic scope is an important, physiological driver of thermal tolerance among taxa.

Bio: I am from central Pennsylvania and received a dual B.S. in Biology and Ecology in 2016 from Susquehanna University. I am co-advised by Dr. Jim Stoeckel (Auburn University) and Dr. Brian Helms (Troy University) and my dissertation is on feeding ecology and stressors to unionid mussels, but I also have an interest in exploring the ecophysiology of aquatic invertebrates

Ehlana Stell, (Ph.D. Candidate), egs0046@auburn.edu, 662-416-2930

Swimming performance and metabolism of four fish species under the flow and temperature regimes of a regulated river.

Ehlana Stell, Dennis R. DeVries, and Russell A. Wright
School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University, Auburn, Alabama 36830

Hydropeaking dams are an integral part of our nation's infrastructure. While these systems provide significant services (e.g., electricity, recreation), there are potential negative impacts of creating a reservoir and regulating downstream flow. Downstream of hydropeaking dams, fishes contend with rapidly changing water temperature and flow often daily. We measured critical swimming speed, active metabolic rate, and swimming behavior of Channel Catfish *Ictalurus punctatus,* Redbreast Sunfish *Lepomis auratus,* Tallapoosa Bass *Micropterus tallapoosae* and Alabama Bass *M. henshalli* from the Tallapoosa River, Alabama, captured above and below a hydropeaking dam. In controlled trials, fish were subjected to incrementally increasing water velocities in a swimming respirometer to measure metabolic rate at increasing speeds up to fatigue. Water velocity and/or temperature change trials were conducted using observed critical swimming speeds and in river summer temperature fluctuations. Swimming behavior was quantified using video analyses to determine swimming mode, tail beat frequency, and tail beat amplitude. We hypothesized that capture location (regulated versus unregulated sites) would significantly affect fish swimming performance and metabolic rate. Also, we hypothesized rapidly cooling water would decrease metabolic rate despite increasing activity. Tail beat frequency increased with increasing speeds while tail beat amplitude remained unchanged. Maximum metabolic rate occurred within ± 1 standard deviation of critical swimming speed. Changes in fish metabolic rate in response to increased water velocity in rapidly cooling water were similar to that occurring when rapidly cooling water was introduced without increased water velocity, suggesting acute temperature change is more important to determining metabolic rate than is swimming speed.

Bio: I grew up in Booneville, MS. Graduated in 2015 with a B.S. in Biology from the University of Mississippi and then completed my Master's at the same university in 2018. I joined Auburn's SFAAS in 2018 and plan to complete my doctoral dissertation by 2023. My work focuses on the effects of dams on swimming behavior, respiration, and movement of fishes in our larger rivers under Dennis DeVries and Rusty Wright.

Kaelyn J. Fogelman, (Ph.D. Candidate), kjf0021@auburn.edu, 334-332-8396

A comparison of unionid feeding ecology between lentic and lotic systems.

Kaelyn J. Fogelman[1], James Stoeckel[1], Hisham A. Abdelrahman[1,2], and Brian Helms[3].

[1]Auburn University, Auburn, AL, USA; [2]Cairo University, Giza, Egypt; [3]Troy University, Troy, AL, USA.

Understanding the feeding ecology of unionids is necessary to fully comprehend their role in ecosystem processes, causes of decline and to aid in propagation and relocation programs. Unionids are generally regarded as filterers feeding on planktonic algae. There also is evidence suggesting mussels can utilize benthic food resources in addition to suspended material, although the relative contributions of different dietary constituents may vary depending on habitat. Using a stable isotope approach, we quantified feeding relationships of five mussel species from lotic systems (*Cyclonaias petrina*, *C. necki, C. pustulosa*, *Lampsilis bergmanni* and *L. bracteata*) and three mussel species from a lentic system (*Fusconia escambia, Utterbackiana hartfieldorum*, and *Elliptio pullata)* to determine the relative dietary contribution of fine particulate organic matter (FPOM) associated with benthic sediments, suspended particulate organic matter (SPOM), and detrital coarse particulate organic matter (CPOM). We collected tissue samples of mussels and environmental samples of putative food resources from four lotic systems in Texas and a lentic system in Alabama. Stable carbon isotope ratios ($\delta^{13}C$) and stable nitrogen isotope ratios ($\delta^{15}N$) values suggested lotic mussel species were feeding similarly, as all lotic species derived the majority of assimilated carbon from CPOM and SPOM, but not FPOM. Preliminary analyses of lentic systems suggests that species associated with lentic conditions were primarily utilizing CPOM and FPOM, but not SPOM as food resources. SPOM was never the dominant carbon source across species and habitats, and surprisingly, appeared to be even less important in lentic, as compared to lotic systems. This suggests that mussels from both lentic and lotic systems, across a wide geographical area, are capable of exploiting multiple carbon sources but their primary carbon sources appear to be coming from benthic rather than planktonic sources.

Bio**:** I am from central Pennsylvania and received a dual B.S. in Biology and Ecology in 2016 from Susquehanna University. I am co-advised by Dr. Jim Stoeckel (Auburn University), and Dr. Brian Helms (Troy University) and my dissertation is on feeding ecology and stressors to unionid mussels, but I also have an interest in exploring the ecophysiology of aquatic invertebrates

Phil Carson (Student), prc0013@auburn.edu, 803-496-4339

Fish kill loss valuation and angler effort estimation on three mid-size Alabama rivers.

Phil Carson, Terry Hanson, and Steve Sammons

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

Following a public water fish kill, ADCNR-WFF seeks financial restitution (replacement costs) for economic damages relative to the kill. Currently, this consists of staff costs and costs of actual or estimated fish mortalities. However, according to AFS fish kill investigation and valuation guidelines, user loss and biological interim loss values are also allowable inclusions in loss valuations.
In order for WFF to integrate these losses into their fish kill valuations, data on angler use and effort, associated angling expenditures, and contingent behavior following a fish kill is necessary. While this information is available for Alabama reservoirs, it is lacking on rivers in the state. Therefore, an angler survey on 3 mid-size rivers is underway gathering data on these loss metrics. Alongside this, trail cameras are being employed to monitor angler use and effort. In an effort to assess the viability of trail cameras in this manner, comparative studies will be performed with other estimates of angler use and effort (i.e., bus-route survey and completed trip info).

Bio: I grew up in South Carolina and graduated with a biology degree from College of Charleston in 2011. I'm currently working on estimating angler effort and user loss values on the Cahaba, Locust Fork, and Coosa Rivers with Drs. Terry Hanson and Steve Sammons.

Gavin Aguilar (Student), gla0012@auburn.edu, 612-719-0383

Temperature effects on larval development of Florida (Micropterus salmoides floridanus) and Northern (Micropterus salmoides salmoides) largemouth bass: Implications for intensive indoor aquaculture and fisheries management.

Gavin L. Aguilar1, Josh Sakmar2, Allen Nicholls2, Timothy J. Bruce1, Anita M. Kelly1, Luke Roy1, Moises Antonio Bernal de Leon3, Ian A.E. Butts1

1Auburn University, School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn, AL 36849

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Largemouth bass (LMB), Micropterus salmoides is the most popular sportfish in the US, with a rapidly expanding food fish market in North America. Farmers traditionally raise LMB in earthen ponds. However, there are reports of high mortality at the larval stage. Circumventing these pond stages to complete indoor culture would streamline production and minimize risks. Therefore, our objectives were to (i) identify optimal thermal regime for rearing LMB in an indoor recirculation aquaculture system (RAS); (ii) assess the performance of Florida vs. Northern LMB for RAS culture; and (iii) elucidate thermally induced phenotypic changes and inter-linked expression of targeted genes involved in early development. Florida and Northern LMB were reared at 21oC, 24oC, and 27oC using RAS. Fish were randomly sampled at 2 to 28 days post-hatch (DPH) for total length (TL), body area (BA), myotome height (MH), eye diameter (ED), jaw length (JL), yolk area (YA), and oil droplet area (ODA). In addition, yolk utilization efficiency (YUE) and yolk utilization rate (YUR) were calculated. The weight of fingerlings was determined at 29 DPH along with survival and expression of targeted genes. There was a significant temperature effect for all morphometric traits, where both sub-species increased in size over the temperature gradient, with the largest traits (TL, BA, MH, JL, ED) detected at 27oC. Northern LMB larvae were typically larger with respect to morphometric traits. The 27oC treatment demonstrated the highest final weight for larvae, where 21oC had the highest survival rate. Gene expression results are ongoing. These results have three major implications: 1) suggests that 27oC improves growth performance during early ontogeny, and 2) provides supporting evidence that Northern LMB is genetically selected for faster growth when reared in an indoor RAS, and 3) informs fisheries managers on growth dynamics to assist with the conservation of natural bass populations.

Bio: I grew up in Eden Prairie, MN and graduated in May 2016 with a B.S. in Fisheries, Wildlife, and Conservation Biology from the University of Minnesota- Twin Cities. Following graduation, I spent a season in Alaska and multiple seasons working for t Minnesota DNR and Idaho Fish and Game.

Henry Hershey (PhD Candidate), hjh0027@auburn.edu

Multispecies fish passage and movements in the Alabama River.

Henry Hershey, Dennis DeVries, Rusty Wright, Dustin McKee, Daniel Thomas, Colin Laubach
Auburn University, School of Fisheries, Aquaculture and Aquatic Sciences. Auburn, AL 36830

Understanding the effects of dams on multiple fish species is essential for planning successful remediation or mitigation strategies. In 2017, we began tagging and tracking Smallmouth Buffalo *Ictiobus bubalus*, and Paddlefish *Polyodon spathula* in the Alabama River with the goal of quantifying their movements up to and past low-use lock-and-dam structures. More recently we have also tagged Southeastern Blue Sucker *Cycleptus elongatus*, Freshwater Drum *Aplodinotus grunniens*, and even one Bighead Carp (BHC) *Hyophthalmichthys nobilis*. To date we have tagged a total of 473 fish, with an estimated 300-350 with active tags that are still at large. With acoustic receivers stationed from the confluence with the Tombigbee River (RKM 0) upstream to Jones Bluff Lock and Dam (RKM 380), we have recorded over 50 million fish detections, and have monitored fish movements approaching and past both Claiborne Lock and Dam and Millers Ferry Lock and Dam for almost five years. Although these fish have been tagged in an effort to answer different questions concerning their locations and movements (e.g., effects of translocation, tailrace residence time, passage via navigational locks), their long-lived tag batteries have allowed us to continue to monitor them after projects concluded, generating a more complete and valuable database. We have observed over 150 upstream and downstream passages at Claiborne Lock and Dam by all species except for BHC. Most fish that passed CLD proceeded up to MFLD, and then migrated back downstream over CLD. We have only observed ## passages at MFLD. Only 3 passages were confirmed to have occurred via the navigation locks at either dam. In general, upstream movement was linked to winter/spring flow increases, and many individuals out-migrated for the summer. We believe that this information will be of use to managers hoping to restore fish migrations in the Mobile Basin

Bio: I was raised in New Jersey, graduated from Case Western Reserve University in 2016 with a degree in Biology. Finished my masters at Auburn in 2019, and remained in the lab to pursue a PhD on the same project, tagging and tracking everything that swims in Alabama.

Amber Young (Student), azy0019@auburn.edu, 706-280-3680

Distribution, Relative Abundance, and Habitat Associations of Warrior Bass *Micropterus warriorensis* in the Black Warrior Watershed, Alabama.

Amber N. Young[1] and Steven Sammons[1]

[1]Auburn University, School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn, AL 36849

The Southeastern United States possesses the richest diversity of freshwater fishes on the North American continent. Black bass *Micropterus spp.* follow this diversity trend. In fact, nine of the 14 described species and subspecies of black bass are endemic to the Southeastern United States. Some species of black bass in the Southeastern United States (e.g., Warrior Bass *Micropterus warriorensis*) were elevated to species status in 2013 and little is known about their distribution, life-history, and status. Therefore, resource managers need a better understanding of Warrior Bass distribution and habitat use before management actions can be implemented. The goal of this study was to estimate the distribution of Warrior Bass and to evaluate the influence of various factors on their presence. Warrior Bass distribution was assessed by conducting electrofishing (backpack and canoe) surveys at 65 stream sites from May – August 2020 and from May – July 2021. During electrofishing surveys, all black bass were captured and identified to species. Habitat surveys were then conducted within the same section of stream as the electrofishing survey to characterize the habitat of each stream reach. Warrior Bass were detected in 26% of the stream sites sampled. In total, 1,104 black bass were collected during sampling, of which 411 were Warrior Bass. Preliminary results show distribution of Warrior Bass is limited within the Black Warrior Watershed with many of the pure populations residing within Bankhead National Forest. Warrior Bass are associated with streams containing large quantities of fine rocky substrate and/or boulder bedrock. Moderately stable to stable banks with less than 30% erosion are also associated with Warrior Bass presence. Final results of this study will allow resource managers to identify areas within the watershed that should be prioritized for Warrior Bass conservation and management.

Bio: I grew up in Dalton, Georgia. I received my B.S. in Biology from Dalton State College in 2016. Following graduation, I worked for a variety of natural resource agencies in Alaska, Arizona, and Idaho. My thesis work is on the distribution of Warrior Bass in the Black Warrior Watershed and I am working under Dr. Steven Sammons and Terry Hanson.

Lindsay Horne (Post Doc), lhorne@auburn.edu, (334) 844-4058

Effects of ecologically relevant levels of glochidia infestation on metabolic rate and hypoxia tolerance of Bluegill *Lepomis macrochirus* and Largemouth Bass *Micropterus salmoides*.

Lindsay M. Horne, Dennis R. DeVries, James A. Stoeckel

School of Fisheries, Aquaculture & Aquatic Sciences, Auburn University, Alabama 36849

Gill parasites can negatively affect hosts via alterations in behavior or adverse effects to host physiology. Most unionid mussel larvae (glochidia) are obligate parasites requiring fish hosts, but the literature concerning how these parasites affect their hosts has been contradictory, dependent on parasite load and infestation method (natural vs. field). Here, we quantify the effects of natural levels of glochidia infestation on resting metabolic rate and hypoxia tolerance of juveniles of two sport fishes (bluegill *Lepomis macrochirus* and largemouth bass *Micropterus salmoides*) using glochidia of the southern fatmucket mussel *Lampsilis straminea*. We compared oxygen uptake (respiration rate), hypoxia tolerance (DO_{crit}), and regulation ability (regulation index RI) between infested and uninfested fish over 11 weeks after host inoculation. Hosts were successfully infested with glochidia at levels that were similar to those seen in wild, naturally-infested individuals. We found no significant effects of glochidia infestation on metabolic rate, $DO_{crit,}$ or RI of infested versus control fish for either species over the course of the 11-week experiment. Based on these results, along with a comparison of additional data from the published literature, normal field-based levels of glochidia infestation on fish gills may not necessarily cause host respiratory stress, as would be expected relative to long-term fitness of both host and parasite, given that glochidia survival and dispersal depends on host survival.

Bio: Originally from Athens, AL. Graduate Spring 2021 (PhD Fisheries, Aquaculture, and Aquatic Sciences) from Auburn University.

Christopher Rotar (Student), clr0063@auburn.edu, 334-844-4058

Evaluating the effects of three Alabama River dams on fish movements using otolith microchemistry.

Christopher Rotar, Dennis DeVries, and Russell Wright, Auburn University School of Fisheries, Aquaculture, and Aquatic Sciences

Dams impede fish movement and can isolate riverine populations into defined areas. The Alabama River is divided into four major sections by three lock-and-dam structures. Otolith microchemistry techniques were used to quantify movements among these river sections by three diverse fish species (Freshwater Drum, White Crappie, and Blue Catfish). Water sample trace-element ratios (Mg:Ca, Mn:Ca, Sr:Ca, Ba:Ca) from throughout the study area varied spatially but were temporally consistent. Broad patterns in water chemistry were reflected in element:calcium ratios in otolith cores (reflecting early life), edges (reflecting time of capture), and whole-transects (across their entire life). Correlations between otolith-edge and season-specific water Sr:Ca ratios from the areas of fish collections were generally significant across all species, while the associations between otolith-edges and water were mostly nonsignificant for Mg:Ca, Mn:Ca, and Ba:Ca ratios. Discriminant function analyses (DFAs) were used to determine if multivariate element signatures in otolith-edges could classify fish back to the river sections from which they were collected, with accuracies of 49% (Freshwater Drum), 69% (White Crappie), and 72% (Blue Catfish). DFAs using otolith whole-transect and core regions were generally less accurate in classifying fish back to their river section of capture versus edge measures. However, classification accuracies from these otolith regions remained relatively high. Evidence that these species move past dams appears limited based on whole-otolith transects. Variation in otolith traceelement signatures may be the result of fish using habitats adjacent to the main river channel.

Bio: I grew up in Missoula Montana, and graduated with a bachelor’s degree from Gonzaga University in 2014. I began my master’s degree at Auburn in 2019 under the direction of Dr. Dennis Devries and Dr. Russell Wright, and my thesis focuses on the use of otolith microchemistry and population genetics to assess the movements of several fish species in the Alabama River relative to three large lock-and-dam structures.

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Can otolith microchemistry be used to quantify fish movement downstream of a hydropeaking dam?

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Dams alter many aspects of riverine environments. In particular, hydropeaking dams can dramatically affect downstream fish habitats. Identifying natal origins of fishes downstream of a dam, as well as movement of fishes among areas are important to understanding how dams impact habits critical to population sustainability. Our objectives were to use hard part microchemistry to identify natal origins and to quantify movement patterns of fishes downstream of R.L. Harris Dam on the Tallapoosa River, AL. We used LA-ICPMS to quantify the elemental compositions (Sr, Ba, Mn, Mg, Ca) of Channel Catfish, Redbreast Sunfish, Alabama Bass, and Tallapoosa Bass otoliths collected during April 2019 through January 2021. Fish and water samples were collected at three sites on a gradient downstream of Harris Dam and one unregulated upstream site. Element composition in water was compared to signatures recently incorporated into fish otolith edges. Elemental signatures in water and otoliths varied across sites with the largest difference occurring between the upstream control site and the three downstream locations driven primarily by Sr:Ca ratios. Using linear discriminant analysis, otoliths were correctly assigned to capture region with overall accuracy of 39.5-82.7% depending on otolith segment (core, edge, or whole otolith) and fish species. Otolith ablation transects suggested three predominant movement patterns: 1) individuals spent their entire life at the capture location, 2) individuals recruited to the capture location from a different river section, and 3) individuals moved away from, then returned to the capture location. Variation in classification accuracy among otolith segments indicated potential ontogenetic shifts in site fidelity, although interpretation was limited by homogeneity among downstream site element signatures.

Bio: Eli grew up in Hillsborough, NC and was fascinated by the natural world from an early age. He graduates from Clemson University in 2019 with a B.S. in Wildlife and Fisheries Biology and is currently working toward a master's degree at Auburn University. His thesis work focuses on the downstream effects of hydropeaking river regulation on fishes, and he is co-advised by Dennis DeVries and Russell Wright.

Poster Presentations

Dr. Jeffery M. Ray, jmray1@una.edu, (256) 765-4933

Fishes of the Cypress Creek System, Tennessee River Drainage: Historical Records, Recent Fish Fauna, and Index of Biotic Integrity Assessment

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Cypress Creek is a northern tributary to the Tennessee River (Pickwick Lake) in Lauderdale County, Alabama, and Wayne County, Tennessee, with a drainage area of 214 square miles. Although repeatedly sampled for fishes such as Slackwater Darter, *Etheostoma boschungi*, Tuscumbia Darter, *E. tuscumbia*, and Flame Chub, *Hemitremia flammea*, over the past several decades, the last comprehensive fish survey of the watershed was conducted in 1971, and changes in the fish fauna and community composition may have occurred. Historical data (1845- 2019) containing 5,105 records was compiled for 109 species reported at least once from the Cypress Creek system. Samples from 2009-19 (primarily in 2015-16) at 83 localities were collected by seining, backpack electrofishing, and a limited number of boat electrofishing efforts. Community composition was analyzed for 39 collections using the Index of Biotic Integrity. One hundred thirty-one collections yielded 2,453 records containing a total of 80 species, with a mean of 21 species per collection, including several species of interest. Multiple species (e.g., Pirate Perch, *Aphredoderus sayanus*) that were rare in historical collections were proportionally documented more frequently in this study when sampling appropriate habitats in select tributaries. The current fish fauna of Cypress Creek includes 99 species, which represents high species diversity for this relatively moderate-sized stream, when compared to rivers and streams frequently referenced for their fish diversity. Index of Biotic Integrity scores varied among tributaries, suggesting differing anthropogenic impacts on fish community composition across the watershed. Future development within the watershed should be closely monitored to ensure the aquatic biodiversity of this stream is not compromised.

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Evaluating Zooplankton in Traditional and Split-pond Systems for Raising Golden Shiners, *Notemigonus crysoleucas.*

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Split-pond systems (SPS) have been successfully used to raise catfish *Ictalurus* spp. and are now being considered for other food fish and baitfish. Before implementing changes to the traditional production systems, their suitability to raise species other than catfish must be tested. This research explores the feasibility of using SPS to raise a baitfish species, the Golden Shiner *Notemigonus crysoleucas*. In SPS used to raise Golden Shiner, the waste unit might become a refuge for plankton rather than being used to augment water quality. To examine this hypothesis, a 6-week study was conducted in late spring to compare zooplankton populations in experimental traditional earthen ponds (TEP) and SPS stocked with Golden Shiner. To examine this hypothesis, a six-week study was conducted in six traditional earthen ponds (TEP) and six SPS (each 0.04 ha) stocked with adult golden shiners at 450 kg of fish/ha. Fish were fed a commercial feed at 3% body weight daily in three ponds (FED) of each pond type while in the remaining ponds fish had access to natural foods only (UNF). Zooplankton samples were collected daily for five consecutive days from three locations in each TEP and from three locations each within the fish culture unit (FCU) and WTU of SPS. Net yield and survival were not significantly different among the treatment groups. Survival was severely impacted by depredation from birds and herpetofauna. Fish in SPS-UNF ponds had lower condition factors, relative weight, whole-body fats, and gonadosomatic index compared to the other treatment groups. Zooplankton numbers were significantly higher in the TEP (both FED and UNF) when compared to other treatment groups. There was not enough evidence that the WTU being devoid of fish may serve as a refuge for larger zooplankton.

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Use of a kaolinic clay in diets of Pacific white shrimp *Litopenaeus vannamei* cultured in low salinity water.

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Kaolinic clays have been used in a variety of industries, including cosmetics, medicine, papermaking, and diets for animals. Although kaolinic clays have antimicrobial properties there is limited information on the benefits of these clays in the diet of aquatic species. The use of clay minerals in shrimp has demonstrated increased retention time in the gut and improved growth and feed efficiency. A 6-week tank study (clear water) and a 6-week on farm study (green water) were conducted to determine if Akuapro®, a kaolinic clay, added to the diets would increase growth, feed conversion, and immunological parameters in the Pacific white shrimp *Litopenaeus vannamei*. Shrimp in the clear water study were fed diets containing kaolin clay at 0, 1, 2, 3 or 4% of the diet. In the green water study, shrimp were fed diets containing 0, 2, 3, or 4%. Pacific white shrimp fed the 3% kaolin diet in the clear water study had significantly higher weight and weight gain compared to other treatments. However, survival of the shrimp fed 3% kaolin diet was lower than the other treatments. The advantages of kaolin clay in the diets were not observed in the green water study likely due to the availability of other food sources.

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Coinfective bacterial pathogens in channel catfish (Ictalurus punctatus) production

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Catfish farming is the largest sector of the U.S. aquaculture industry and produced $379 million dollars worth of sales in 2019. Due to the economic importance of the catfish industry within the United States, maintaining and improving catfish health is a primary concern for producers. Bacterial pathogens have caused a great economic impact to this industry. Edwardsiella ictaluri, Aeromonas hydrophila, and Flavobacterium columnare are the most predominant bacterial pathogens causing mortality in production facilities. The occurrence of bacterial co-infections may often go unreported or misdiagnosed, resulting in a lack of proper mitigation for the coinfective effectors. Bacterial coinfections increase the severity of the constituent pathogens along with grossly increasing mortality, thus creating economic losses. To assess and characterize the effects of bacterial coinfections, three pathogen challenge trials will be conducted to compare in vivo virulence along with fish immune responses resulting from exposure to single and coinfective bacteria. The pathogens investigated during this project will include mixed combinations of F. columnare, virulent Aeromonas hydrophila (vAh), and E. ictaluri. Cumulative percent mortality will be recorded to compare mortality between groups. Clinical signs will be characterized and the inherent bacterial load associated with each pathogen singularly and during mixed infections will be evaluated. Innate and adaptive immune responses of fish will be measured with a plasma lysozyme assay, RT- qPCR (to investigate cytokine activity), and an enzyme-linked immunosorbent assay (ELISA) to assess antibody titers following exposure. The evaluation of catfish immune responses will better elucidate how the pathogens impact channel catfish and assist in the development of potential treatments or preventative measures. The synthesis of these results will aid both fish health diagnosticians and channel catfish producers in better controlling bacterial coinfections.

Bio: I was raised in Greenville, MS and recently graduated from Texas Lutheran University (2021) with a degree in Molecular Biology. I joined Dr. Bruce's lab at Auburn University June 2021, and my thesis work pertains to investigating coinfections associated with bacterial pathogens in channel catfish.

Oral Presentations (Professional Session)

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Weight loss, survival, and fatty acid composition in over-wintered juvenile Coppernose Bluegill (*Lepomis macrochirus purpurescens*) cultured in outdoor tanks using different feeding regimens

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Commercial producers raising centrarchids in Arkansas routinely report winter mortality. Juvenile centrarchids are susceptible to harsh winter conditions. Coppernose Bluegill (*Lepomis macrochirus purpurescens*) is a popular sportfish for recreational fishing and there are no recommended best management practices for winter feeding of this species. We conducted an outdoor trial to investigate the effect of different feeding regimens on the performance of Coppernose Bluegill in the winter of 2014/2015. We used four feeding regimens that included feeding twice per week (2x/week), once per week (1x/week), twice per month (2x/month), or once per month (1x/month). Twenty-five Coppernose Bluegill (initial weight 2.59 ± 0.19 g) were stocked per tank (16 tanks, four replicates). Temperatures ranged from 0–16ºC during the trial. After 95 d, there were no differences ($P > 0.05$) in the final weight or weight loss. Fish fed 2x/week or 1x/week had higher survival ($P < 0.05$) than those fed 2x/month or 1x/month. Fatty acid profiles of initial fish were distinctly different from post-winter-fed bluegill, although winter feeding frequency did not appear to influence fatty acid profiles in Coppernose Bluegill. Levels of saturates were higher in initial fish than in post-winter fish. Monosaturates 16:1 and 18:1n-9 were higher in initial fish than in post-winter fish. Initial fish contained lower levels of 18:2n–6, 20:4, and 22:6n–3 than post-winter fish. Total polyunsaturated fatty acids (PUFA), n-3 and n-6 levels were also lower in initial fish than post-winter fish. In contrast, the ratio of n-6/n-3 fatty acids did not differ significantly among initial and post-winter-fed fish. Data indicate that overwintering and infrequently fed Coppernose Bluegill preferentially conserve PUFA, and feeding once or twice per week may be a beneficial strategy for sportfish producers to increase survival of Coppernose Bluegill during the winter in temperate regions of the U.S.

Bio: I am originally from Michigan but grew up in Uruguay, South America. I received a Ph.D. in Fisheries & Aquaculture from Auburn University, a M.S. in Soil and Water Science from University of California, Riverside, and a B.S. in Environmental Science from Samford University.

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Growth parameters in northern largemouth bass *Micropterus salmoides salmoides* raised near their upper thermal tolerance for 28 days.

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Largemouth bass (LMB) are a popular sportfish in the US. Within the last decade, several producers have begun to raise these fish for food. Most of the food fish sized LMB come from Arkansas. Producers noticed during the summer that food consumption and growth decreased in LMB. This study assessed growth, feed conversion efficiency, and fatty acid composition of three size classes of northern largemouth bass *Micropterus salmoides salmoides* (80 g, 105 g, and 137 g) subjected to a 35 °C water temperature for 28 days. A completely randomized design was conducted, with ten fish per tank and treatments triplicated. The trial was conducted in 180-L tanks in a recirculating system. Fish were fed a commercial diet formulated for largemouth bass consisting of 48% protein and 18% lipid at approximately 0800 and 1500 hrs daily. The experimental period lasted for 28 days. Water temperature was a significant contributor to the feeding and growth results observed in this study. While the 137 g group did experience some growth, the observed growth was not biologically significant during this study. The percent body weight consumed by all treatment groups was less than 0.21% day $^{-1}$. Feed conversion was best for the 137 g group at 4.0 ± 0.44 compared to 5.5 ± 2.57 and 5.8 ± 2.77 for the 80 g and 105 g groups, respectively. Fatty acid profiles of the groups remained similar except eicosapentaenoic acid, which was lower in the 80 g fish. This study was the first to examine the growth of northern largemouth bass at temperatures exceeding 32 °C and suggest extended periods of exposure to 35 °C or higher water temperatures resulted in thermal stress and the inability of these fish to grow at the rates necessary to make them profitable for commercial producers.

Bio: I received my PhD in Zoology from Southern Illinois University and my BS from the University of Iowa. I managed two commercial fish production farms before returning to academia. I am an Extension Professor at Auburn University specializing in fish health and production.

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Evaluation of mechanical removal rates for rehabilitating over-crowded largemouth bass *Micropterus salmoides* populations in Alabama small impoundments.

Taylor Beaman and Matt Catalano
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Largemouth bass *Micropterus salmoides* populations in small impoundments exhibit poor growth and body condition under high population densities typically found in unmanaged ponds. The effectiveness of largemouth bass harvest at reducing these conditions and restoring overcrowded populations back to desirable population size structures is unclear. We evaluated mechanical removal rates for rehabilitating over-crowded largemouth bass population in Alabama small impoundments. Via boat electrofishing, we removed 0-83% of largemouth bass populations under 356 mm over two years at eleven Auburn University Fisheries Research Unit ponds and evaluated changes in largemouth bass condition, size structure, growth and recruitment. Significant positive relationships were identified for $loge$ differences in largemouth bass PSD-Q, PSD-P, mean relative weights of 254-356 mm largemouth bass, and CPUE of >356 mm largemouth bass as a function of proportion biomass removed from 2019-2021. However, the magnitude of these associations was small and driven primarily by reductions at unharvested control ponds rather than strong responses at treatment ponds. No significant relationships were identified for $loge$ differences in growth or recruitment as a function of proportion biomass removed from 2019-2021. The removal effort necessary to achieve a mechanical removal rate of 0.5 (50% reduction) ranged from 4-9 complete shoreline circuits as largemouth bass catchability declined with removal effort. Despite significant relationships for some variables, two years of mechanical removals via boat electrofishing did not appear to substantially alter largemouth bass populations in these small impoundments. Rather the removal process maintained the current state of largemouth bass growth, condition, and population size structure in treated ponds compared to control ponds. Given the substantial amount of time, effort, and funding required to conduct intensive largemouth bass removals, my results offer clarity on the practicality and value of mechanical removals via boat electrofishing as a management tool for overcrowded largemouth bass ponds.

Bio: I grew up in Minnesota, studied fisheries at University of Wisconsin-Stevens Point, have had the opportunity to conduct fisheries work throughout much of Wisconsin, Minnesota, Utah, and Alabama, and just finished up my master's thesis researching overcrowded bass ponds under the advisement of Matt Catalano.

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Intensive pond-based production systems: Are they a good fit for sportfish and baitfish species?

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To remain competitive with lower-cost imports and rising production costs, the U.S. commercial catfish industry has increased efficiency while maintaining sustainable culture practices and acceptable risk using various intensive pond-based production systems. Over the last 15 years, several alternative production systems have been tested and implemented on commercial catfish farms in the U.S. These production systems were evaluated for the culture of Channel Catfish (*Ictalurus punctatus*) and some have been widely adopted for hybrid catfish (*Ictalurus punctatus* ♀ x *Ictalurus furcatus* ♂). Production technologies evaluated by the commercial catfish industry include intensively aerated ponds, split-pond systems, and in-pond raceway systems. Utilizing intensive pond-based technologies, farmers have increased production and reduced food conversion ratios relative to traditional earthen pond production systems. In addition, the advances in intensive pond-based production systems by U.S. catfish farmers, particularly split-pond systems and intensively aerated ponds, have led to the testing and implementation of these alternative technologies in other sectors of the aquaculture industry. Recently, there has been interest by state and federal hatcheries in this production technology, mainly due to advantages related to higher production on a smaller footprint and better protection from bird depredation. In addition to catfish, intensive pond-based production systems have been evaluated for the culture of baitfish species, Largemouth Bass (*Micropterus salmoides salmoides)*, Yellow Perch (*Perca flavescens*), and other species of interest to game and fish agencies.

Bio: I am originally from Michigan but grew up in Uruguay, South America. I received a Ph.D. in Fisheries & Aquaculture from Auburn University, a M.S. in Soil and Water Science from the University of California, Riverside, and a B.S. in Environmental Science from Samford University.

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