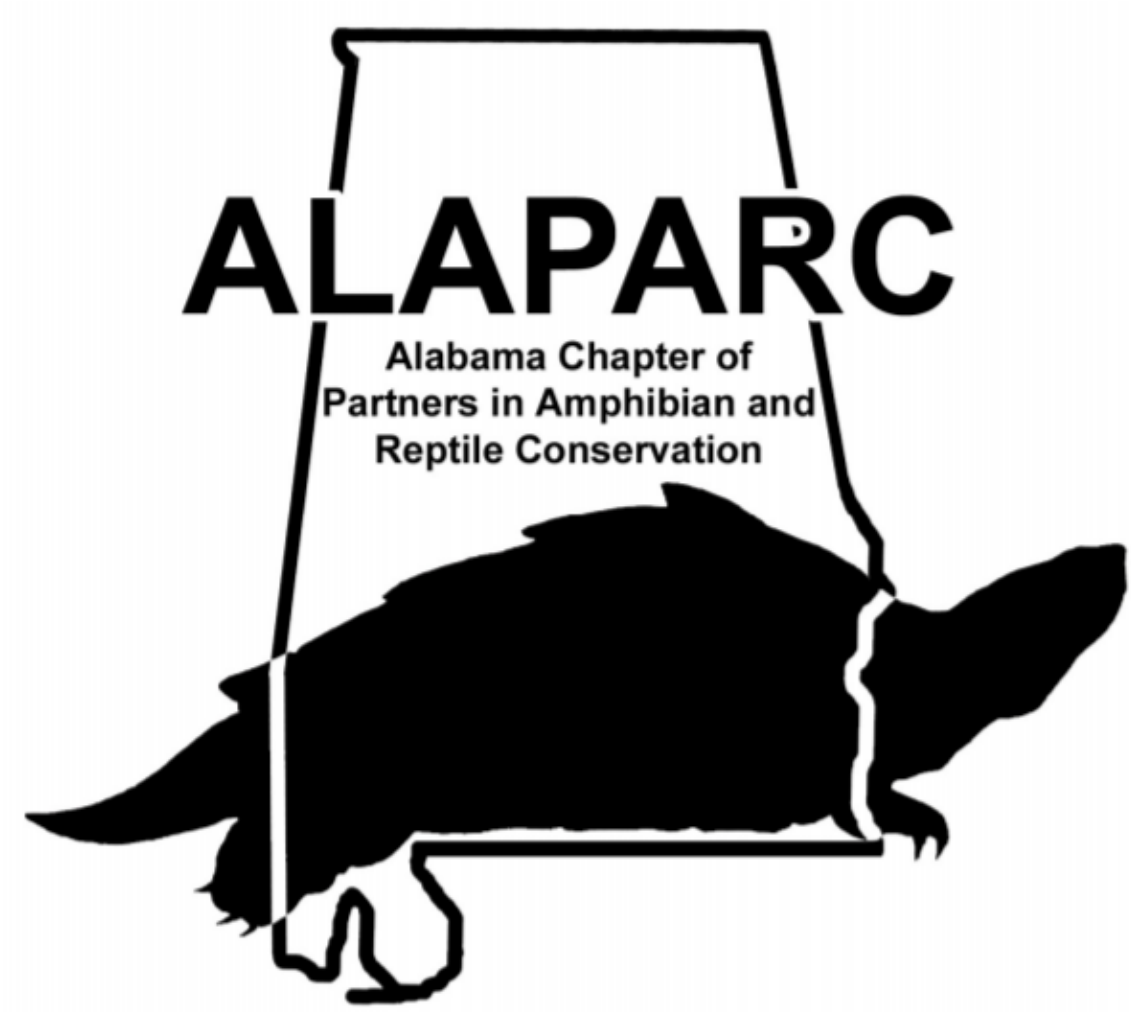
“10 Years of Promoting Herp Conservation in Alabama”



10th Annual Meeting

November 1st- 3rd 2019
Camp McDowell, Nauvoo, AL

PARC
PARTNERS IN
AMPHIBIAN AND REPTILE CONSERVATION

About Our Meeting

Welcome to the tenth annual meeting of the Alabama Chapter of Partners in Amphibian and Reptile Conservation (ALAPARC) at Camp McDowell in Nauvoo, Alabama. Camp maps are provided at the back of this program. All talks will occur in Phifer Hall and all meals will be served in Stough Lodge. The poster session and socials will also occur at Phifer Hall.

Camp McDowell

Accommodations

Upon arrival, check in at the Phifer Hall where we will have your room assignments and keys. Dorms and rooms will be in the Bethany Village portion of camp. Please leave the doors unlocked when you leave Camp McDowell. Use the camp map (provided at the back of this program) to locate the different buildings. **If sleeping in the dorms, you must provide your own bed linens or sleeping bag, pillow, towels, and toiletries.**

Meals

All meals will be served in the Stough Lodge. Try to make it to Stough in a timely manner at the assigned mealtimes.

Sustainability

Please consider bringing your own coffee mugs and beer steins to our meeting so that use of disposable cups will be minimized. Containers for recycling aluminum cans are located throughout camp.

Website

For more information about Camp McDowell, visit: www.campmcdowell.com

SCHEDULE

Friday November 1st

Time	Event
3:00	Check-in (Phifer Hall)
5:00	Introductions (Phifer Hall)
5:00-5:45	Keynote Address: Reflections on 10 Years of ALAPARC. **Jimmy Stiles**
5:45-6:15	An Update on Conservation Initiatives, Policies, and Growth of Southeast Partners in Amphibian and Reptile Conservation (SEPARC). **Andrew W. Cantrell**
6:30	Dinner (Stough Lodge)
7:30	Poster Session/Social (Phifer Hall)

Saturday November 2nd

Time	Event
8:00	Breakfast
9:00-9:15	*The individual fitness consequences of wildlife reintroductions: A meta-analysis.* **Iwo Gross**
9:15-9:30	*Xenobiotic estradiol-17ß and the microbial gut communities of hatchling American Alligators (Alligator mississippiensis)*. **Kaitlyn M. Murphy**
9:30-9:45	*An eDNA approach to surveying Necturus species in central and northern alabama waterways.* **Katelyn T. McDaniels**
9:45-10:00	*Persistence and spatial ecology of Gopherus polyphemus throughout federally protected and unprotected lands in southwest Alabama*. **Robin B. Lloyd Jr**.
10:00-10:15	*Effects of population density and timing of hatching on phenotypic selection in an invasive lizard.* **Daniel A. Warner**
10:15-10:30	Break
10:30-10:45	*Exploring Multilevel Habitat Selection by Flattened Musk Turtles (Sternotherus depressus): Informing Future Conservation Efforts for Alabama's Most Imperiled Turtle Species.* **A. Joseph Jenkins**

10:45-11:00	*A Morphological Perspective for Identifying Hybrid Hylids in Northeastern Alabama.* **Andrew S. Collins**
11:00-11:15	*An update on the Urban Turtle Project: two years of documenting aquatic turtles in the Birmingham metropolitan area.* **Andrew T. Coleman**
11:15-11:30	*Ambystoma maculatum egg mass ecology: thoughts on a model system I.* **George R. Cline**
11:30-11:45	*Ambystoma maculatum egg mass ecology: thoughts on a model system II.* **George R. Cline**
12:00	Lunch
1:15-3:45	Field Outing at Camp McDowell (Stough Lodge) **A. Joseph Jenkins**
4:00-4:15	*Apalachicola National Forest (ANF) Gopher Tortoise Restoration, Relocation, and Research Project Update*. **Chance Gwaltney**
4:15-4:30	*Effects of early-life thermal stress on phenotypic traits and heat tolerance in Anolis sagrei*. **Amélie Fargevieille**
4:30-4:45	*The phenology of the symbiotic association between Ambystoma maculatum and Oophila amblystomatis using molecular techniques*. **Griffin M. McDaniels**
4:45-5:00	*Ecomorphological variation in shell shape of stripe-necked musk turtles (Sternotherus peltifer).* **Matthew Welc**
6:00	Dinner
7:15-7:30	ALAPARC Housekeeping: Next Year's Meeting and Selecting the Next Co-Chair. **TJ Haltigan** and **Taylor Cook**
7:30	Poster Viewing/Social
9:00	Silent Auction Benefitting ALAPARC Ends

Sunday November 3rd

Time	**Event**
8:00	Breakfast
9:30	Check-Out/Field Outings to Bankhead National Forest

Abstracts

Oral Presentations

Iwo P. Gross (ipg0004@auburn.edu) & **Matthew E. Wolak**, Auburn University. *The individual fitness consequences of wildlife reintroductions: A meta-analysis.*

Captive-rearing programs aimed at supplementing threatened or extirpated animal populations are ubiquitous in conservation biology and are widely considered beneficial preservation measures. However, population model projections and long-term monitoring efforts suggest reintroduction programs can be ineffective and might ultimately reduce the long-term viability of supplemented populations. One primary criticism of such programs is the investment in, and release of, captive-reared individuals with depressed fitness values relative to their wild counterparts. Here, we assessed these concerns directly in a meta-analytical framework by compiling the relevant literature and quantifying trends in differential fitness estimates among released and resident animal cohorts. An ongoing Web of Science literature search of 8,083 articles has yielded 293 effect size estimates from 83 unique studies, including representative taxa from invertebrate, fish, and tetrapod clades. We targeted studies that made direct *in situ* comparisons of conspecific wild and reintroduced animal cohorts according to various behavioral, morphological, genetic, and reproductive correlates of relative fitness. Our data indicate a significant negative effect of captive-rearing across many fitness correlates and taxa. Our trends were weaker when evaluating early survivorship, which suggests that captive-rearing might improve recruitment of younger cohorts but impart some behavioral or other deficiencies that might affect lifetime fitness. Our study provides a quantitative synthesis of the captive-rearing literature and identifies the primary weaknesses in current animal reintroduction programs. Although not formally quantified, we noted that successful reintroduction programs often utilized a multi-pronged approach (e.g., soft-release, enriched enclosures, invasive predator eradication, state/federal protections) to complement releases. It remains to be seen whether the adverse effects of captive-rearing can have trans-generational impacts on fitness. Future efforts should invest in extensive post-release monitoring and should include released vs. wild comparisons as part of their success criteria.

Kaitlyn M. Murphy (kmm0155@auburn.edu), **Madison M. Watkins, John W. Finger, Meghan D. Kelley, Ruth M. Elsey, Daniel A. Warner, Mary T. Mendonça,** Auburn University. *Xenobiotic estradiol-17β and the microbial gut communities of hatchling American Alligators (Alligator mississippiensis).*

Environmental estrogens pose serious concerns for ecosystem and population health and, specifically, steroidal estrogens have been shown to influence gut homeostasis; however, these associations are understudied, particularly in wildlife populations. To determine the influence of

environmental estrogens (i.e. xenoestrogens) on the diversity and abundance of gut microbiota, twenty-three hatchling American alligators (*Alligator mississippiensis*) were randomly allocated across 3 control, low, and high treatment groups. For ten weeks, individuals were fed 1 mL/kg of peanut oil as a control, 0.5 μg/kg estradiol-17ß as a low group, or 1 μg/kg estradiol-17ß as a high group. We predicted that (1) xenoestrogen exposure would increase microbial diversity and abundance within the digestive tract and that (2) the effect of xenoestrogens on the gut microbial community would be dose-dependent. Microbial samples were collected following the study and were elucidated using 16S rRNA gene-sequencing. Findings from this study may suggest the influence of steroidal estrogen contamination on wildlife populations at the internal microbial level.

Katelyn T. McDaniels (kthenderson@jsu.edu), **Christopher A. Murdock**, and **George R. Cline**, Jacksonville State University. *An eDNA approach to surveying Necturus species in central and northern alabama waterways.*

Distribution maps for *Necturus* species have not been updated in Alabama for approximately 43 years. *Necturus alabamensis* has been watched closely due to its protected status but the other species in the state have not been studied as closely. By developing a genus specific primer that will detect both *N. beyeri* and *N. maculosus*, the waterways of Central and Northern Alabama can be surveyed for *Necturus spp.* using environmental DNA techniques. Nineteen different waterways were sampled, chosen from waterways that have historically held *Necturus spp.* along with new waterways with suitable habitat. The sampling was done during their breeding seasons between November and March in 2017 and 2018. Real-time PCR was used to detect presence or absence of *Necturus spp.* at each site. Results revealed eighteen new sites for *Necturus spp.* and that a historical site may no longer support these organisms.

Robin B. Lloyd Jr. (rl1724@jagmail.southalabama.edu), **David H. Nelson**, **Steven R. Schultze** and **Adam D. Chupp**, University of South Alabama. *Persistence and spatial ecology of Gopherus polyphemus throughout federally protected and unprotected lands in southwest Alabama*.

The gopher tortoise (*Gopherus polyphemus*) is an ecosystem engineer and a promoter of biodiversity in the xeric pine forests of the southeastern Coastal Plain. In the last century, there has been an 80% decline of gopher tortoise populations throughout the southeastern United States. In southwest Alabama, the gopher tortoise is federally listed as threatened west of the Mobile-Baldwin County line (since 1987), but has remained unlisted east of this line and is protected only by state agencies. Thus, the border of Mobile and Baldwin counties represents a transition between federally protected (Mobile County) and unprotected (Baldwin County) gopher tortoise habitat. From 1991-92 (initial surveys), 164 locations of suitable gopher tortoise habitat were identified and surveyed across Mobile and Baldwin counties. In 2018, 146 of the

initial sites were surveyed again. Although our recent surveys found a 21-25% increase in active burrows in both counties our results show a substantial overall decline in total burrow abundance compared to the initial surveys in 1991-92 [Baldwin: 122 (initial), 108 (2018), Mobile: 390 (initial), 300 (2018)]. In addition, gopher tortoise burrows persist at 58.5% of initial sites in Mobile County and only 31.2% of initial sites in Baldwin County. The simultaneous increase in active burrows and declines in total burrow abundance seems to indicate that tortoise populations are being concentrated in remnant areas of suitable habitat. Going forward, we are using ArcGIS and the information gathered from these surveys to identify all remaining suitable habitat in southwest Alabama.

Daniel A. Warner (daw0036@auburn.edu) and **Timothy S. Mitchell**. Auburn University. *Effects of population density and timing of hatching on phenotypic selection in an invasive lizard.*

Intra-specific competition is strongly influenced by population density and can have profound effects on individuals and populations. For example, variation in population density can influence phenotypic variation via numerous mechanisms (e.g. natural selection, phenotypic plasticity). Prior research in our lab and at our field site indicates that adult lizard density strongly influences hatchling survival and modifies behaviors. In addition, the timing of hatching strongly influences offspring survival, possibly due to seasonal shifts in competitive interactions. To address these issues, we conducted a large-scale field experiment where we spatially manipulated adult population densities and leveraged naturally occurring temporal changes in hatchling density to evaluate the effects of conspecific densities on early life phenotypes and survival in brown anoles (*Anolis sagrei*). We released marked hatchling lizards onto small islands where we experimentally manipulated the population densities such that there were either high or low densities of adult anoles. We released these hatchlings early in the season when hatchling densities are naturally low, and later in the season when hatchling densities are naturally high. We sampled the populations at the end of the breeding season (prior to winter) and again the following spring, and repeated the study in the subsequent year. Preliminary results suggest that early-hatched individuals had greater survival than those that hatched late in the season, but adult density had no effect on hatchling survival. These data also allow us to investigate the importance of the timing of hatching, and patterns of growth and selection under differing population densities.

A. Joseph Jenkins (ajj0012@auburn.edu), **James C. Godwin**, **David A. Steen**, and **Daniel A. Warner**. Auburn University. *Exploring Multilevel Habitat Selection by Flattened Musk Turtles (Sternotherus depressus): Informing Future Conservation Efforts for Alabama's Most Imperiled Turtle Species.*

The Flattened Musk Turtle (*Sternotherus depressus*) is a small kinosternid turtle endemic to the portion of the Black Warrior River Basin (BWR) above the Fall Line in Alabama. Listed as threatened under the Endangered Species Act and critically endangered by the International Union for the Conservation of Nature, *S. depressus* populations have experienced range-wide declines attributed to sedimentation and chemical pollution from mining, agriculture, and development. In this study, we utilize trapping, visual encounter, and radio telemetry surveys in conjunction with side-scan sonar and point-transect habitat surveys to explore 2nd (population level), 3rd (individual level), and 4th order (microhabitat level) habitat selection by *S. depressus* in the relatively unimpacted populations of Bankhead National Forest. Our results will be utilized to inform and focus upcoming conservation efforts for the species in the BWR.

Andrew S. Collins (ascollins@jsu.edu), Jacksonville State University. *A Morphological Perspective for Identifying Hybrid Hylids in Northeastern Alabama.*

Over the past 40 years, records from Auburn University showed that hybridization can occur between sympatric anuran populations of *Hyla gratiosa* and *Hyla cinerea*. It is possible that these hybrids have a reduced fitness level compared to the parent species. For this study, I surveyed several ponds allopatric and sympatric for both species in the Northeastern Alabama region. I wanted to test whether hybridization is occurring in a region of the state where *H. cinerea* has recently invaded and what factors might be influencing it. I used morphological and acoustic methods to gather and analyze data in order to identify individuals as well as the characteristics that might be influencing their behavior. Morphological characters that have been proven effective in similar studies as well as newer characters that have yet to be implemented for this type of project have been used. Museum specimens were included to provide an adequate sample size for the morphological analysis.

Andrew T. Coleman (urbanturtleproject@gmail.com), Talladega College. *An update on the Urban Turtle Project: two years of documenting aquatic turtles in the Birmingham metropolitan area.*

The aim of the Urban Turtle Project is to collect long-term data on the demography, ecology, and conservation of freshwater turtle species that inhabit the rivers and tributaries of the Birmingham metropolitan area. Started in Spring 2018, regular trapping and surveying have been conducted at sites in the Cahaba River and its tributary of Pinchgut Creek. In addition to these efforts, larger weekend-long surveys have been completed in the Shades Creek (Cahaba River watershed) as well as Valley Creek and Turkey Creek (Black Warrior River watershed) with the assistance of citizen scientists. To date, almost 200 turtles have been captured and marked (if deemed of appropriate size). The total catch includes nine species: *Apalone spinifera spinifera*,

Chelydra serpentina, *Graptemys pulchra*, *Graptemys geographica*, *Macrochelys temminckii*, *Pseudemys concinna*, *Sternotherus minor peltifer*, *Sternotherus odoratus*, and *Trachemys scripta*. Project data have extended the range of *Macrochelys temminckii* in the Cahaba River and provided important insight into the ecology and demography of *Graptemys pulchra*.

George R. Cline (gcline@jsu.edu), **Griffin McDaniels**, **Katelyn McDaniels**, and **James R. Rayburn**, Jacksonville State University. *Ambystoma maculatum egg mass ecology: thoughts on a model system I.*

The Spotted salamander, *Ambystoma maculatum,* is a medium-sized, late-winter breeding mole salamander. While many articles have been published on this species, much requires further study. Spot egg masses consist of 80-250 individual eggs, each surrounded by extra-vitelline membranes, which are further surrounded by a clear, gelatinous mass. Orr (1888) described a globular unicellular algae from within egg masses that gave them an overall green color which appears about 1-2 weeks after being laid. The algae was named *Oophila amblystomatis*, but recent taxonomic work suggests that it may be a previously described *Chlorella* sp. Gilbert (1942) argued that alga invaded the egg mass from the surrounding pond (horizontal transmission). Recent work by Kerney et al. (2011) revealed that algae enter the embryonic tissue proper, thus raising the possibility that algae may be passed from one generation to the next during reproduction (vertical transmission). Using eDNA techniques, G. McDaniels (2017) revealed algae present in Harrison Stage 1 and 2 eggs, but he could not rule out either mode of transmission. We need more information from at least two areas. First, we need to know more about the chemistry of the gelatinous coat. Once hydrated, the pore size of the material is very small. Dextran Blue dye (avg. molec. size 2 $x10^6$) could not pass through the mass once hydrated (Pinder and Friet 1994), excluding the entrance of an alga. But we do not know pore size prior to hydration. Second, we need details of the anatomy of the reproductive system of *A. maculatum*. We need to determine how and where the extra-vitelline membranes are formed, and where the gelatinous coat is produced and released.

George R. Cline (gcline@jsu.edu), **Griffin McDaniels**, **Katelyn McDaniels**, and **James R. Rayburn**, Jacksonville State University. *Ambystoma maculatum egg mass ecology: thoughts on a model system II.*

The Spotted salamander, *Ambystoma maculatum,* is a medium-sized, late-winter breeding mole salamander. While many articles have been published on this species, much requires further study. Spot egg masses consist of 80-250 individual eggs, each surrounded by extra-vitelline membranes, which are further surrounded by a clear, gelatinous mass. They range in color from clear, to opaque, to green. Clear and opaque forms are genetically coded (Ruth et al. 1993).

Opaque egg masses result from the presence of a water insoluble protein (1-3µ, 15,400 kD) in the jelly mass. Clear egg masses result from production of a water soluble protein (14,400 kD). Ruth et al. (1993) speculated on the function of the egg mass morphs. The are several possible anti-predator functions possible. Jellies could be foul tasting which would reduce predation rates. Molecular components could also bind with smaller, desirable molecules making it less likely to be absorbed. Opaque egg masses could camouflage egg masses by hiding embryos or by hiding embryo movement. Tumlison and Serviss (2013) noted that gilled larval *Ambystoma talpoideum* began feeding on *A. maculatum* eggs once the embryos began moving in the eggs. So it's possible that opaque egg masses might be selected for in high density predator environments. Hanson (2015) reported stable egg morph ratios among 6 ponds in Calhoun County, but she could not correlate those data with environmental variables. Could the frequency of opaque egg masses reflect predation rates in different breeding ponds? Additional research is needed to understand the role of specific predators. Since spots lay their eggs in late winter, eggs are exposed to cold water temperatures. Many of the identified predators of spot eggs and larvae are insects (i.e. caddisfly nymphs, dragonfly nymphs). Pilot studies in the lab showed that dragonfly nymphs could consume 10 *Xenopus* tadpoles in 24 hrs at 5°C. Additional studies comparing predation rates of clear and opaque egg masses are recommended. Studies of anti-predator behavior of larval spots to various predators (fish, newts, larval marbled salamanders, dragonfly nymphs) would be further recommended.

Austin D. Carroll and **Chance Gwaltney** (cgwaltney@wiregrasseco.com), Wiregrass Ecological Associates. *Apalachicola National Forest (ANF) Gopher Tortoise Restoration, Relocation, and Research Project Update.*

Gopher tortoise (Gopherus polyphemus) populations have been declining in recent decades due in large part to an increase in urbanization, habitat conversion, and habitat fragmentation. In Florida, the gopher tortoise is a state threatened species, and the Florida Fish and Wildlife Conservation Commission (FWC) requires the protection of all gopher tortoises and their burrows. Landowners and developers with gopher tortoises on their property and located within 25 feet of development activities can have them relocated to an FWC-approved long-term recipient site (conservation bank). The gopher tortoise research recipient site—Apalachicola National Forest (ANF) Research and Restoration Area—is the result of a Memorandum of Understanding (MOU) between the U.S. Forest Service (USFS), Wiregrass Ecological Associates (WEA), and FWC. It contains more than 900 contiguous acres of the tortoise's preferred upland pine sandhills habitat that will be managed into perpetuity to maintain habitat conditions by USFS. A formal research study aimed at evaluating the site fidelity response of relocated tortoises to habitat conditions created by common silviculture practices (thinning, burning, and/or herbicide) is coupled with the restoration objectives. Using radio transmitters on over 10% of all relocated gopher tortoises, site fidelity of tortoises (post enclosure removal) is

monitored and evaluated with site conditions and vegetative response. Approximately 2,000 adult and juvenile gopher tortoises have been relocated under this project through 2019.

Amélie Fargevieille1(akf0020@auburn.edu) , **Alex R. Gunderson**[2] , **Taylor O. Cook**[1] , **Allison G. Dees**[1] , **Olivia G. Schweikart**[1] , **Daniel A. Warner**[1] 1 Department of Biological Sciences, Auburn University, Auburn, AL 36849, USA 2 Department of Ecology and Evolutionary Biology, Tulane University, New Orleans, LA 70118, USA . *Effects of early-life thermal stress on phenotypic traits and heat tolerance in Anolis sagrei*

Climate change increases the frequency of extreme temperature peaks, which in turn, can affect many aspects of wildlife, from species distribution to individual physiology and/or behavior. It can also increase mortality, especially for individuals at early-life stages. For species with no parental care behavior, the egg stage can be particularly vulnerable to thermal peaks. Indeed, different studies of early-life development in brown anoles (Anolis sagrei) have shown high egg mortality and developmental complications in relation to thermal stress. However, those studies focused on early stages of life and data collection typically stopped at the hatchling stage. If embryo development is affected by heat stress, we predict that these effects will also carry into later stages and at different levels. Our experiment focused on how early-life thermal stress affected growth rate, phenotypic traits and heat tolerance at adulthood. We incubated 199 eggs under three different treatments varying in mean and maximal daily temperature. We then raised the 117 hatchlings in common garden conditions and recorded their growth rate every 20 days. Finally, when individuals reached sexual maturity we recorded information on snout-vent length, mass, dewlap size and coloration. Lastly, we quantified their heat tolerance to determine if early-life thermal stress has lasting phenotypic consequences into adult stages.

Griffin M. McDaniels (gmcdaniels@jsu.edu), **George R. Cline, Christopher A. Murdock, James R. Rayburn,** Jacksonville State University. *The phenology of the symbiotic association between Ambystoma maculatum and Oophila amblystomatis using molecular techniques*.

In the waters of the stochastic micro-ecosystem of the wetland vernal pool, a unicellular alga is found within the cells and tissues of developing Spotted Salamanders (*Ambystoma maculatum*). This symbiosis appears to be mutualistic with involved parties trading nitrogen, oxygen, and carbon dioxide; but the broader ecology the interaction has yet to be thoroughly explored. This study seeks to examine the spatial and temporal distributions of the endosymbiotic algae among developmental stages of embryo, between egg-masses, and within and between several vernal wetlands in Northeast Alabama. After verifying the efficacy of published genetic primers for the algae and developing real-time PCR primers, a systematic detection protocol was established using environmental DNA (eDNA) techniques. Here, we provide evidence that the transfer of the

algae is environmental and occurs rapidly after deposition of the eggs into the pond. Algae presence was also detected in the waters of the pool at the date of filling, before salamanders arrived to breed. This gives insight to the natural histories of both the salamanders and algae and hopefully will influence continuing studies on this system in the future.

Matthew Welc (welcmatt@auburn.edu) and **Matthew E. Wolak**, Department of Biological Sciences, Auburn University. *Ecomorphological variation in shell shape of stripe-necked musk turtles (Sternotherus peltifer).*

With six species of musk turtles currently recognized, the genus *Sternotherus* makes up a significant component of Alabama's remarkable turtle diversity. There is substantial variation in morphology within the genus, with each species represented by an area along a continuous axis of shell shape, varying from highly flattened to highly domed. This divergence in body shapes is presumably a consequence of local adaptation, with species from swift streams with ample bedrock evolving to be flatter (e.g., *S. depressus*) than species from slower, sandy or muddy streams (e.g., *S. carinatus*). However, as much is currently unknown about the ecology and evolution of the genus, the true adaptive significance of shell shape variation remains an unanswered question. One species, the stripe-necked musk turtle, *S. peltifer*, occupies a wide variety of stream habitats in Alabama. A large amount of intraspecific variability in morphology, including a notable flattened phenotype reminiscent of *S. depressus*, has been noted in *S. peltifer* from the Cahaba River of central Alabama. This variation appears to be associated with location relative to the Fall Line, a geological boundary that demarcates a rapid change in river bottom from bedrock to sand. Similar clines in shell shape have been demonstrated for several species of Emydid turtles, but whether this convergent shell phenotype has come about in *S. peltifer* through a similar adaptive process remains to be determined. We trapped *S. peltifer* throughout the Cahaba River drainage in the Spring and Summer of 2019 to obtain shell morphology measures. We conducted a PCA on these standard turtle shell biometrics to assess whether relative shell height varies among all measured individuals. Multiple regression was used to assess the relationships between relative shell height, sex, and location relative to the Fall Line. We discuss future research directions and possible implications for conservation. This study will contribute to a growing body of knowledge regarding the ecology and evolution of bottom-walking turtles.

Poster Presentations

Dawn Canterbury(dcanterbury@stu.jsu.edu) , **Sandra Elliott**, **Griffin McDaniels**, and **Katelyn McDaniels**, *Preliminary Study of Culturable Bacteria from the Mouths of Individuals from the Family Natricinae in Northern Alabama.*

Many species of water snakes in the family Natricinae can be found in the waterways of Northern Alabama. Two common genera of water snake include *Nerodia spp*. and *Regina sp.*, each seem to express different behavioral responses to being handled. *Nerodia spp.* tend to be foul-tempered, are quick to bite, commonly musk, and express other defensive mechanisms. *Regina sp.* tend to be subdued, are more accepting of being handled, with little to no reports of bites or other aggressive defensive mechanisms. Anecdotally, water snakes are said to have "dirty" mouths that will cause a major infection to anyone bitten by them. This thought is derived from the thought that the waterways they inhabit are full of harmful bacteria. However, in practice we have seen that only minor skin irritation is a result of being bitten by a *Nerodia spp.* Irritation can be explained by the properties of the proteins commonly found in water snake saliva; itchiness diminishes within a short time period after bite. Bacteria load was used to attempt to quantify how "dirty" the mouth of a water snake can be. For a preliminary study, mouth swabs were taken from an individual *Nerodia sp.* and an individual Regina sp. The samples were cultured on Agar plates at two different incubation temperatures, 35°C and 25°C. At the higher temperature a single type of colony was seen on both plates, but the plate from the *Nerodia sp.* had more colony growth. At the lower temperature a single colony type was seen on the plate from the *Nerodia sp.* with more growth than at the higher temperature. The plate from the *Regina sp.* showed multiple colony types at the lower temperature and more colony growth. Future study will include Gram staining to identify different colonies and taking samples from more individuals.

Eric A. Cline, (ecline@stu.jsu.edu), and **George Cline**, Jacksonville State University. *An eDNA survey of the wood frog, Lithobates sylvaticus, in Northern Alabama*.

Wood frogs (*Lithobates sylvaticus*), are True Frogs of the family Ranidae. Their geographic range extends from above the Arctic Circle to as far south as northern Alabama, including Calhoun, Clay, and Talladega Counties (Mount 1975). Little is known of wood frog biology in Alabama. Wood frogs breed in vernal pools in late winter, then disperse widely from the ponds during the rest of the year. Short breeding seasons and wide dispersal make wood frogs difficult to catch and survey. Additionally, wood frogs are at the southern limit to their distribution in Alabama. Wood frogs lose their ability to right themselves when inverted at roughly 92°F (Bratstrom 1963). If climate change continues to cause increased temperatures, then wood frogs may become extinct in Alabama. In order to establish baseline data on the distribution of wood frogs in Alabama, we propose to use eDNA techniques to survey potential wood frog habitat.

Taylor Cook (toc0001@tigermail.auburn.edu), **Amelie Fargevieille**, and **Daniel A. Warner,** Auburn University. *Dorsal pattern polymorphism in female Brown Anoles: testing the "male-mimicry hypothesis."*

To understand the evolution of polymorphisms in females, many scientists have been interested in the "male mimicry hypothesis". The evolutionary explanation for male mimicry by females often involves a reduction in sexual harassment, at the cost of higher testosterone levels and lower reproductive success in "male-like" females. Three primary dorsal patterns have been described in female brown anoles (*Anolis sagrei*), but some populations also include a "male-like" pattern. A recent study on female polymorphism in *A. sagrei* proposed that the presence of the male-like dorsal pattern could be maintained as a consequence of relaxed sexual harassment. We tested this hypothesis using two sets of analyses. First, we aimed to determine if female dorsal pattern was truly similar to male dorsal pattern using two different methods: 1) unbiased human vision with no or low previous knowledge of the existing classification, and 2) computer classification of dorsal patterns. Second, we then related the female dorsal patterns to body condition, dewlap size and coloration to support or discount the idea of "male-like" females being viewed as males in the wild. We also related female dorsal patterns to egg production as a metric of reproductive success. In accord with the "male-mimicry hypothesis" we predict male-like females to have larger and more vibrant dewlaps and lower fecundity than the other female morphs.

Jacob Garmon (jgarmon@stu.jsu.edu) ,**Griffin McDaniels**, and **Katelyn Henderson**, Jacksonville State University. *Species distribution of Desmognathus conanti and D. monticola along a branching stream system*

Desmognathus conanti and *D. monticola* are both common stream salamanders more locally known as dusky salamanders. While both species rely heavily on streams for habitat, protection, and reproduction they did not seem to overlap much within this study site. We hypothesized this is due to the stream having vastly differing habitats in such short spans (heavy tree cover, mixed hardwood, valley, mixed pine, and flood plain). Salamanders were caught at each of three study sites within the stream system, weighed, measured, photographed, and released. Data collection proved that *D. monticola* favored the mixed hardwood site with abundant canopy, while *D. conanti* did well in areas with less canopy cover and the flood plain.

Sahara Gonzalez (sgonzalez4@stu.jsu.edu**)** and **Michael E. Burns,** Jackson State University. *A Paleohistological Investigation of Caudal Vertebral Fusion in Mosasaurids (Reptilia: Squamata).*

Mosasaurs were squamates that filled a marine apex predator niche during the Late Cretaceous period. A survey of mosasaur fossils collected in Alabama over the years has identified at least a thousand specimens. Among marine reptiles, mosasaurs appear to exhibit an unusually high instance of caudal vertebral fusion. Little research has investigated the etiology of this fusion. In

this study, we test three hypotheses to explain the cause of this fusion; normal development, pathology, or healed injury.

Three specimens exhibiting caudal fusion, collected from the Mooreville Chalk formation, were used for paleohistological analysis. Before sectioning, specimens were mold and cast to preserve morphological data, and stabilized by resin impregnation. The sections were then prepared petrographically on frosted Plexiglass slides. Our analysis indicates no in vivo fusion in two of the specimens, whereas, one does display fusion of vertebrae.

The unfused specimens show trabecular bone in the medullary regions of the vertebrae; however, towards the cortex, in particular, the anterior and posterior margins, the bone tissue becomes denser. This histology is typical for vertebrae. In the fused specimen, the trabecular bone density is constant throughout, with no indication an intervertebral disk, calcified cartilage, or woven bone. Because the trabecular bone density is constant and no evidence of woven bone (indicative of injury or a pathology) can be observed, evidence supports the hypothesis that this fusion is indicative of normal bone development. However, it is important to note that, if this fusion were due to pathology or breakage, remodeling could have erased such a record. Therefore, although the histological evidence indicates a developmental process normal for these taxa, the alternatives cannot be completely ruled out without further study.

Olivia G. Schweikart (ogs0003@tigermail.auburn.edu) , **Amélie Fargevieille**, and **Daniel A. Warner**, Department of Biological Sciences, Auburn University. *Effects of thermal stress during incubation on post-hatching development in Anolis sagrei.*

Increases in temperature extremes due to global change can threaten species in many ways. Early life stages, such as embryos in species with no parental care, are particularly vulnerable to extreme spikes in temperature. Indeed, at high temperature peaks during incubation, thermal stress can have immediate effects on embryo development but can also affect morphology and fitness in later stages. In the brown anole (*Anolis sagrei*), lab studies have found that thermal stress induced at the embryo stage leads to developmental complications and increased mortality during incubation. However, data collection typically stops when individuals hatch, and thus, we still lack knowledge about how early-stage thermal stress affects post-hatching development and fitness. To answer that question, we incubated brown anole eggs in three different temperature treatments, varying in mean and maximal temperatures. The temperature patterns were set to mimic natural environments, allowing for a temperature spike around mid-day. We compared tail length, snout-vent length, and mass among individuals to determine if different thermal peaks influenced variation in hatchling morphology, by measuring individuals the day they hatched. Hatchlings were then raised in common garden conditions and measured again at 40 days into the study to better track the effect of thermal stress on post-hatching survival and growth rate. We predicted that individuals that experienced high thermal peak during each day of incubation

would be relatively small, with a low survival probability after hatching. We also expected reduced growth rate for individuals that experienced relatively high thermal stress.

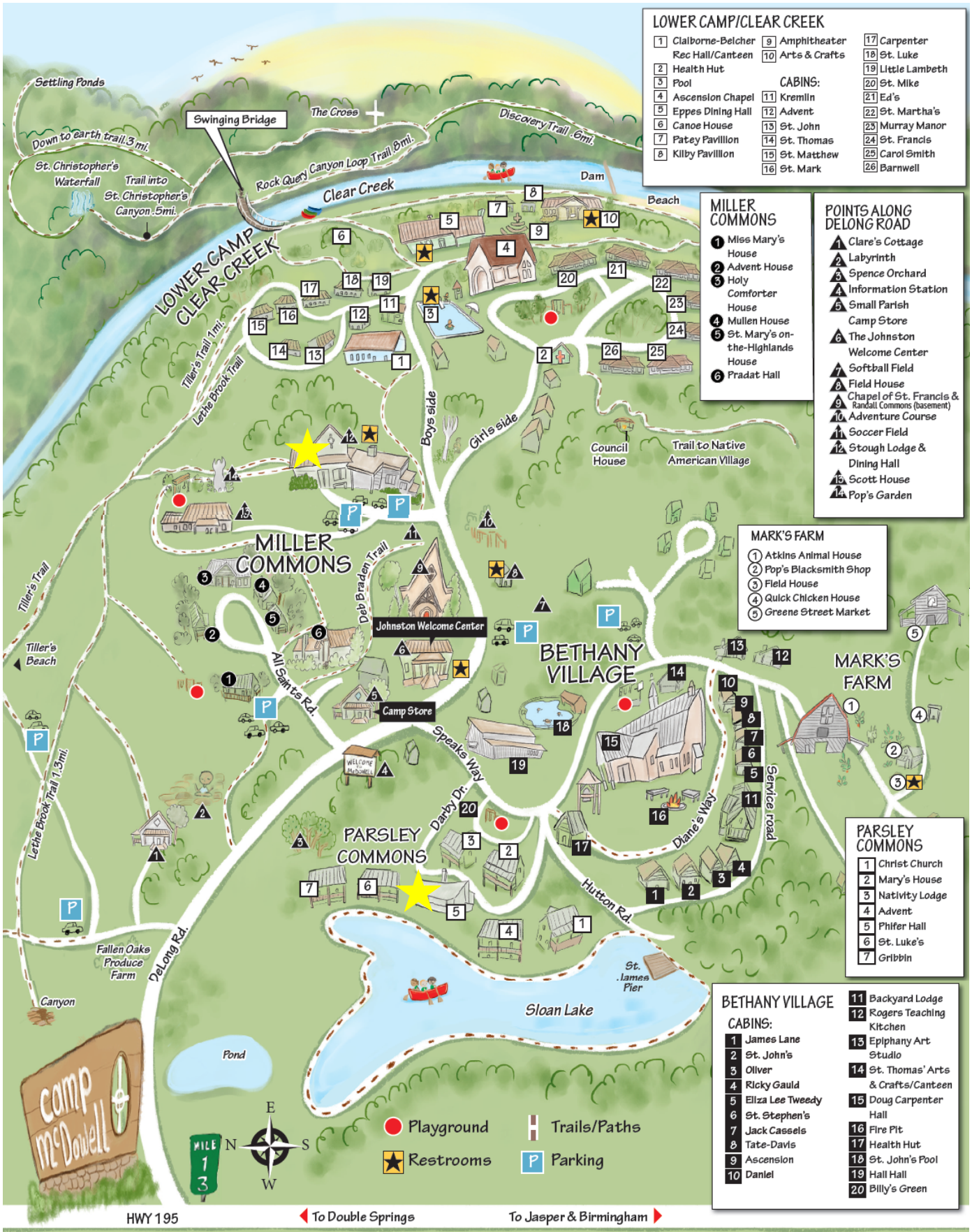
Cindy Scruggs (cds0044@auburn.edu), Jocelyn Miracle (jem0092@aubur.edu), Kerry Cobb, Daniel Warner, Auburn University. *The influence of water availability on maternal and egg hydration in the brown anole.*

Water availability influences many aspects of an organism's biology and can have direct consequences on components of fitness. In reptiles, the hydric conditions of nests are important for proper embryonic development. Relatively moist conditions facilitate embryonic development and have positive effects on offspring phenotypes and survival. In contrast, eggs can quickly desiccate if they experience negative water balance. Thus, the quantity of water that is maternally allocated to eggs and the hydric conditions of the surrounding incubation substrate can have important effects on offspring. In this study, we quantified the effects of maternal water availability on egg production, egg size and egg hydration by manipulating watering regimes to reproductive females of the brown anole lizard (*Anolis sagrei*). Preliminary results indicate that low water availability reduces egg production but has no effect on egg size or hydration. Subsequently, we examined the effect of maternal watering regime on patterns of water uptake by eggs when incubated under relatively dry vs moist substrates. Water uptake by eggs was strongly influenced by the moisture conditions during incubation, but preliminary analyses suggest that maternal hydration has little to no effect. Subsequent analyses will examine the interaction between maternal hydration and incubation moisture conditions on egg survival and offspring phenotypes.

About Our Chapter

Alabama PARC is co-chaired by TJ Haltigan and Taylor Cook and is a chapter within Southeast PARC (SEPARC), co-chaired by Becca Cozad and Vanessa Terrell. For more information about SEPARC visit www.separc.org. ALAPARC's website is www.alaparc.org. National PARC's website is www.parcplace.org.

Camp McDowell Map



*Not to scale Map by Michelle Hazelwood Hyde www.michellehazelwood.com

Camp McDowell is a ministry of the Episcopal churches in the Diocese of Alabama