# Texas Herpetological Society
# Fall 2016 Symposium

Saturday, November 19th
Tarleton State University
Stephenville, Texas
Lamar Johanson Science Building, RM 102

## Schedule of Events/Abstracts

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| 8:00–9:15 | Registration outside RM 102 (Refreshments) |
| Session 1 | Salamanders (Moderator: Jesse Meik) |
| 9:15 | **Opening Remarks**<br>Jesse M. Meik |
| 9:30 | **Reproductive Ecology of Federally Threatened Jollyville Plateau Salamanders (*Eurycea tonkawae*) in the Wild**<br>Zachary C. Adcock |
| 9:45 | **Captive Husbandry of Edwards Aquifer Species at the San Antonio Zoo**<br>Mason Lee |
| 10:00 | **Stream Habitat Recreation for the Barton Springs Salamander**<br>Donelle Robinson |
| 10:15 | **Urbanization is associated with changes in baseline and environmental corticosterone in a stream dwelling salamander**<br>Caitlin R. Gabor |
| 10:30 | **Time-series analysis of Barton Springs Salamander population counts**<br>Nathan F. Bendik |
| 10:45 | **Break** |
| Session 2 | Herpetological Surveys (Moderator: Dan Foley) |
| 11:00 | **A Herpetofaunal Survey of Two Sites in the Texas Cross Timbers Ecoregion, with an Evaluation of Survey Method Effectiveness**<br>Ed Barnes |
| 11:15 | **Assessment of Herpetofauna Responses from Habitat Disturbances in the Lost Pines Ecoregion**<br>Jasmine A. Herndandez |
| 11:30 | **Developing a Safer Method for Conducting Wildlife Mortality Road Surveys Utilizing Modern Video Recording Devices**<br>Payton Prather |
| 11:45–1:15 | **Lunch** |
| Session 3 | Amphibia Pt. 2 (Moderator: Toby Hibbitts) |

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| 1:15 | **Current assessment of *Batrachochytrium dendrobatidis* in *Hyla cinerea* and *Hyla versicolor* in North America**<br>Andrea Villamizar-Gomez |
| 1:30 | **Potential effects of climate change on the prevalence of optimal breeding conditions for the endangered Houston Toad (*Anaxyrus houstonensis*)**<br>Andrew R. MacLaren |
| 1:45 | **Round-up affects antipredator response of Gulf Coast toad tadpoles**<br>Erin Gorishek |
| 2:00 | **An Evaluation of Conventional PCR Assays in the Detection of Houston Toad (*Bufo houstonensis*) Environmental DNA (eDNA)**<br>William Keitt |
| 2:15–3:00 | **Poster Session/Afternoon Break** |
| Session 4 | Lizards and Turtles (Moderator: Wade Ryberg) |
| 3:00 | **Anole Blood: How Environment Influences Physiology**<br>Miguel A. Webber |
| 3:15 | **Neural Processing of Visual Information: An Analysis of Brain and Behavior in Green Anole Lizards**<br>Maria A. Jaramillo |
| 3:30 | **Evaluation of the Feasibility and Success of Translocating Wild-Caught Texas Horned Lizards (*Phrynosoma cornutum*) to Formerly Occupied Habitat in the Texas Cross Timbers**<br>Kelly J. Mitchell |
| 3:45 | **Assessing Movement Patterns in the Rio Grande Cooter (*Pseudemys gorzugi*) through Capture-Mark-Recapture, Telemetry and Genetic Frameworks**<br>Shashwat Sirsi |
| 4:00 | **THS: Society Business for 2017 and Beyond!**<br>Wade Ryberg |
| 4:15–4:45 | **KEYNOTE ADDRESS: 'Common' Turtles Need Attention Too!**<br>Carl J. Franklin |
| 5:00 | **THS Social at Legends Country Club (Lookout Bar and Grill)** |

**Attention Speakers and Moderators!** Please make sure your talk is loaded prior to your assigned session. If possible, please load talks during the early morning registration period, so that we can reserve the 15 minute interludes between sessions to accommodate any late-comers or last minute changes, etc.

**Session 1: Salamanders** (Moderator: Jesse Meik)

## Reproductive Ecology of Federally Threatened Jollyville Plateau Salamanders (*Eurycea tonkawae*) in the Wild

Zachary C. Adcock (zca3@txstate.edu) and Michael R.J. Forstner (mf@txstate.edu)
Department of Biology, Texas State University

The U.S. Fish and Wildlife Service (USFWS) listed Jollyville Plateau Salamanders (*Eurycea tonkawae*) as federally threatened in 2013 and established 32 Critical Habitat Units (CHUs) in Travis and Williamson Counties, Texas. Basic life history data (e.g., reproductive cycle, clutch size) are critical for informing such management and conservation policies. However, only two peer-reviewed publications mention the reproductive ecology of this taxon, and it was not the primary topic of either study. We conducted monthly to bi-monthly *E. tonkawae* surveys at six sites in four federal CHUs from 2013 to 2016. We recorded total length (TL), snout-vent length (SVL), and microhabitat for each captured salamander and non-invasively inspected its body cavity for oocytes. We captured a total of 815 *E. tonkawae*, of which, 45 were gravid females. The minimum size of a gravid female was 23.6 mm SVL, and gravid females contained between 1 – 21 visible oocytes. The percentage of gravid females across all sites peaked from November to February, and the percentage of juveniles and subadults peaked approximately two to three months later. Chi-square goodness of fit tests revealed that gravid females selected for leaf litter and woody debris microhabitats, and juveniles and subadults avoided cobble and selected for vegetation microhabitats.

## Captive Husbandry of Edwards Aquifer Species at the San Antonio Zoo

Mason Lee
Conservation Technician, Department of Conservation and Research, San Antonio Zoo

The rare, threatened, and endangered fauna of the Edwards Aquifer is vulnerable to catastrophic events such as prolonged droughts and chemical spills. As required by the Edwards Aquifer Habitat Conservation Plan (EAHCP), a salvage refugia program has been established to maintain captive populations in the case of such an event. The San Antonio Zoo (SAZ), SWCA Environmental Consultants (SWCA), and SeaWorld San Antonio (SWSA) are partnered together to collect the 11 listed Edwards Aquifer species and establish husbandry protocols.

SWCA sampled Comal Springs in New Braunfels for the Comal Springs Dryopid Beetle (CSDB, *Stygoparnus comalensis*), and other substitute species for 12 weeks using cotton cloth lures and

Hester-Dendy traps. SWCA, SAZ, and SWSA are also trapping for the Texas Blind Salamander (TBS, *Eurycea rathbuni*) using minnow traps deployed in three wells in San Marcos, Texas. SAZ currently houses TBS, Stygobromus sp., Lirceolus sp., and the Comal Springs Riffle Beetle, *Heterelmis comalensis.* Trapping efforts for CSDB have already concluded, and trapping for TBS will end on December 1, 2016. Research on captive husbandry of the collected species will continue in 2017.

## Stream Habitat Recreation for the Barton Springs Salamander

Donelle Robinson (Donelle.Robinson@austintexas.gov)
City of Austin

The Barton Springs Salamander, *Eurycea sosorum*, is an aquatic perennibranchiate species that inhabit the Edwards Aquifer springs known as the Barton Springs complex. It was listed as federally endangered primarily due to its small range, threats to water quality and quantity, and harm associated with the maintenance of Barton Springs Pool. The largest number of salamanders is found at Eliza Spring, although this spring was highly modified in the early 1900s. A concrete amphitheater was built around the spring pool, and the spring outflow was buried into a pipe, which destroyed the salamander stream habitat. The failing pipe can backup and create a pond-like environment in the amphitheater that impacts the remaining habitat. This pipe will be removed and the stream recreated, a process known as daylighting. The project incorporated salamander habitat requirements, including ideal water velocity and depth, substrate type, and native stream vegetation. The recreated stream will increase the amount of habitat available for the Barton Springs Salamander at Eliza Spring, allowing for more salamanders and their prey to live here and improving the resiliency of the species. The project will also improve the salamander habitat in the amphitheater by eliminating the pond-like conditions that sometimes occur.

## Urbanization is associated with changes in baseline and environmental corticosterone in a stream dwelling salamander

Caitlin R. Gabor[1], Nathan F Bendik[2], Diana Kim, Drew R Davis[1,3], Kristina Zabierek.
Texas State University[1]; City of Austin[2]; University of South Dakota[3]

Jollyville Plateau salamanders (*Eurycea tonkawae*) are aquatic salamanders endemic to two highly populated counties in central Texas. They inhabit streams in urban and non-urban catchments and have lower densities and have experienced population declines in heavily urbanized areas. While it is recognized that urbanization alters hydrology and decreases water quality no study has examined the physiological impact of urbanization on salamanders. Assessing stress levels in field-caught animals may provide important insights into population health. We collected water-borne hormones to measure corticosterone (CORT) release rates (baseline and stress responsiveness) in streams of urban and rural sites over three years. For two years we found that baseline CORT was higher in urbanized sites but not in the third year suggesting that urbanization is affecting physiological stress. We found mean stress responsiveness across all sites for two years suggesting that sites were not chronically stressed. We also measured background (i.e., environmental) levels of CORT in stream water. Environmental CORT was higher in urbanized streams, positively

correlated with percent impervious cover, and also positively correlated with baseline CORT. Further, to examine how CORT changes throughout the year, we explored changes in baseline CORT across three seasons and found that baseline CORT varies across seasons and is highest in summers. Because salamanders in urbanized sites are exposed to more environmental CORT and experience higher stress in most years, they may be more prone to experiencing chronic stress if or as conditions worsen.

## Time-series analysis of Barton Springs Salamander population counts

Nathan F. Bendik
City of Austin

Population monitoring is an important part of conservation because it provides the ability to detect population change and its drivers as well as identify potential problems. Long-term datasets (e.g., those spanning numerous generations of the focal taxon) help to determine baseline conditions necessary to evaluate change or assess responses to management actions. While it can be challenging to maintain a long-term monitoring effort, the resulting data may pose many of its own challenges. For example, refinements of sampling protocols over time cause data inconsistencies, missing data interferes with application of methods requiring equal sample intervals, and variation in detection can lead to bias and imprecision in parameters. Even with ideal data, animal abundances are influenced by endogenous and exogenous forces that should be accounted for. Species interact with themselves (e.g. density dependence) as well as others (competition, predation), while environmental drivers may have varying additive or interactive effects within communities or among different life stages. These complexities pose non-trivial challenges for meaningful statistical inference. My goal is to examine monthly count data from a 10 year period to understand what environmental or demographic factors influence shifts in Barton Springs salamander abundance. I will address some of the challenges faced thus far and discuss preliminary results from a set of multivariate auto-regressive state-space models.

### **Session 2: Herpetological Surveys** (Moderator: Dan Foley)

## A Herpetofaunal Survey of Two Sites in the Texas Cross Timbers Ecoregion, with an Evaluation of Survey Method Effectiveness

T. Edward Barnes, Department of Biological Sciences, Tarleton State University

As global reptile and amphibian populations decline, determining effective survey methods and applying them in the field is key to monitoring populations long-term. We examined herpetofaunal communities across two large sites in the western Cross Timbers ecoregion to compare amphibian and reptile assemblages, habitat associations, and determine relative abundances. In addition, we evaluated differences in observations made from various standardized detection methodologies, such as visual encounter surveys, cover board arrays, nocturnal road searches, hoop trapping, and audio surveys. In total, 41 species were documented, but with only a 63.4% overlap in species richness between sites despite similar topography and vegetation. Frogs dominated the actual

counts of individuals across taxa, whereas snakes showed the highest species richness. Visual detection methods seem to be the most effective way of detecting squamates, the turtles were detected more efficiently by hoop trapping, and frogs were detected most efficiently via nocturnal road surveys.

## Assessment of Herpetofauna Responses from Habitat Disturbances in the Lost Pines Ecoregion

Jasmine A. Hernandez, Shawn F. McCracken, and Michael R.J. Forstner
Texas State University, 601 University Drive, San Marcos, TX 78666, USA

The Lost Pines ecoregion of Bastrop Co, TX has undergone anthropogenic habitat changes that have altered the overall natural landscape. A catastrophic 2011 wildfire event eliminated much of the excessive fuel loads used as fire suppression. The impacts of that fire have led to efforts to apply mechanical thinning for removal of excessive understory brush as an effective fuel reduction technique preventing future catastrophic wildfires. This study seeks to evaluate the response of local herpetofauna to these habitat treatments: untreated control, mechanical thinning, and catastrophic wildfire in the Lost Pines Ecoregion. Board arrays and linear transects for coverboard and visual encounter surveys (VES) were applied in each treatment for herpetofauna detection. Over 200 reptile and amphibian individuals were observed under coverboards and along linear transects within the treatments. Statistical analyses resulted in no significant difference of herpetofauna detection within the three habitat treatments ($p > 0.05$); however, trends for untreated control and mechanical thinned treatments indicated higher detection and similar responses. With no overall significant effect, this suggests a possible implementation of this forestry technique on the Bastrop Co., landscape without short-term impacts to the herpetofauna. Additional investigation of these responses should be assessed for further application of this silvicultural practice as a tool for wildlife habitat management.

## Developing a Safer Method for Conducting Wildlife Mortality Road Surveys Utilizing Modern Video Recording Devices

Payton Prather, Shawn F. McCracken, and Michael R.J. Forstner
Texas State University, San Marcos, TX

Traditional wildlife mortality surveys are an optimal method for collecting the most data needed for monitoring projects. However, depending on the traffic usage of the roadway system it may not always be the safest. This presents a potential risk for the researcher, forcing them along high traffic, and potentially high speed roadways. Creating a system that would allow for the implementation of recording devices, such as GoPro cameras, could allow a researcher to collect the needed data without ever having to leave the safety of their vehicle. This study seeks to develop a survey methodology to examine wildlife mortalities along a high use roadway system utilizing GoPro cameras. Two GoPro Hero 3+ Black cameras were placed on a fabricated mount on the front of the researcher's vehicle, and a portion of Highway 290 in Bastrop County was surveyed. Each instance of a wildlife mortality was extracted from the collected recordings, and determined down to the lowest taxonomic unit. Preliminary results show a lack of resolution in images

extracted from the video data, resulting from the trade-off between frames per second and image quality. While this survey methodology provides numerous benefits, further research is required to evaluate the most optimal method to collect video recording data that still proves useful.

Lunch Break 11:45

**Session 3: Amphibians Pt. 2** (Moderator: Toby Hibbitts)

## Current assessment of *Batrachochytrium dendrobatidis* in *Hyla cinerea* and *Hyla versicolor* in North America

Andrea Villamizar-Gomez[1], Thanchira Suriyamongkol[2], Kaitlyn N. Forks[2], William E. Grant[2], Hsiao-Hsuan Wang[2], Michael R. J. Forstner[1], and Ivana Mali[3]
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This study sought to assess the prevalence of *Batrachochytrium dendrobatidis* (*Bd*) in *Hyla cinerea* and *Hyla versicolor* within a system of ponds in central Texas, and to provide a thorough literature review evaluating the spread of *Bd* in both species throughout the US. We used tissue samples collected from an ongoing amphibian assessment in Bastrop County, Texas. This study shows that *Hyla cinerea* regularly tested negative for *Bd* (n = 123) in Texas, which is consistent with previous studies done in Texas. In the same bodies of water, we detected *Bd* in *Hyla versicolor* despite a much smaller sample size (N = 27). Our literature review demonstrated that the prevalence of *Bd* in *Hyla cinerea* has been assessed in 7 states within their range with no positive samples detected up to date. Prevalence of *Bd* in *Hyla versicolor* has been assessed in 12 states within their range. *Bd* was detected in 3 of the 12 states that were sampled. Our study provides an updated assessment for the prevalence of *Bd* among *Hyla versicolor* but extends the results to include our own confirmation of zero prevalence in a sympatric frog, *Hyla cinerea*.

## Potential effects of climate change on the prevalence of optimal breeding conditions for the endangered Houston Toad (*Anaxyrus houstonensis*)

Andrew R. MacLaren, Shawn F. McCracken, and Michael R. J. Forstner
Department of Biology, Texas State University, San Marcos, Texas

Houston Toads seemingly select for a suite of optimal environmental conditions in which they choose to breed. Continued changes in the Earth's climate may reduce the number of occurrences of those precise conditions within a given breeding season. This study aims to investigate whether the number of spring nights with suitable breeding conditions has experienced a decrease throughout recent history.

Environmental conditions conducive to breeding were established based on several years of spring-annual surveys for male chorusing events correlated with measurements of ambient air temperature, relative humidity, wind speed, barometric pressure, moon illumination, and precipitation. Contrasting recent conditions to historical data enables us to compare the number of occurrences of these optimal conditions that are present in years past, when complementary breeding assessments were not feasible.

Preliminary findings indicate that in recent years the numbers of potential optimal occurrences are not linear. That is, chorusing activity is not steadily increasing or decreasing, but rather it varies in response to climatic conditions and demographic changes. Such information are applied to enable our understanding of whether the critically small populations of Houston Toads left on the landscape have declined precipitously as a consequence to a reduction in optimal climatic conditions.

## Round-up affects antipredator response of Gulf Coast toad tadpoles

Erin Gorishek, Zach Forsburg, and Caitlin Gabor
Texas State University, Department of Biology

Round-up affects antipredator response of Gulf Coast toad tadpoles Erin Gorishek, Zach Forsburg, Caitlin Gabor Texas State University, Department of Biology Herbicides function to kill weedy vegetation, however runoff from such chemicals can also affect non-target organisms, such as amphibians. Amphibians have been experiencing massive declines partially owing to exposure to pollutants. Due to the high permeability of anuran skin, tadpoles are susceptible to direct and possible indirect mortality when exposed to glyphosate, the active ingredient in the herbicide Round-up. We exposed Gulf coast toad, Incilius nebulifer, tadpoles (n = 20/treatment) to Round-up (0.736 mg/L) or clean water. First, we tested whether foraging behavior changed after 6 days of exposure to water or Round-up and found no significant difference in foraging attempts between treatments. To determine if the anti-predator behavior of tadpoles is reduced when exposed to sub-lethal concentrations of glydphosate, we examined anti-predator behavior in response to diet cues of the common predator Anax spp. larvae. Anuran tadpoles respond to predator cues by reducing activity, or freezing. Tadpoles exposed to glyphosate showed reduced activity in response to water cues and showed weaker antipredator response to predator chemical cues compared to tadpoles exposed to the water control. Our results indicate that the ability of tadpoles to respond to predator cues was inhibited by the chemical glyphosate but foraging behavior was not affected. The lack of strong antipredator response has conservation implications and suggests lower survival of tadpoles in agricultural areas or neighborhoods thus further contributing to amphibian declines.

## An Evaluation of Conventional PCR Assays in the Detection of Houston Toad (*Bufo houstonensis*) Environmental DNA (eDNA)

William Keitt, and Michael R. J. Forstner
Texas State University, 601 University Drive, San Marcos, TX

Environmental DNA (eDNA), is a rapidly growing molecular survey technique that is being increasingly implemented as a survey methodology for various aquatic and terrestrial taxa. Despite

increasing instances of its use, there have been few attempts at validating the efficacy of this method. This study examines detection rates of eDNA in the endangered Houston Toad (*Bufo houstonensis*) using conventional PCR assays. The Griffith League Ranch (GLR), a primary recovery site of the Houston Toad in Bastrop County, was sampled weekly from February to June of 2016. Nine perennial ponds on the GLR were surveyed and a total of 469 water samples were collected, with 106 representing known positive controls. Houston Toad presence was evaluated per sample based on successful DNA amplification of the sample. Preliminary PCR analyses show that 71% of the 106 known positive samples showed amplification of Houston Toad DNA, while only 4 of the total 363 pond samples, amplified Houston Toad eDNA. Overall, the preliminary results of the PCR assays suggest that conventional approaches may not be the most sensitive method for amplifying eDNA of ephemerally present, pond-breeding amphibians. Exploring other assay methods is essential to understand the utility of a popular yet inadequately validated survey technique.

## Poster session

## Session 4: Lizards and Turtles (Moderator: Wade Ryberg)

# Anole Blood: How Environment Influences Physiology

Miguel A. Webber, Brittney Ivanov, and Michele A. Johnson
Trinity University

Oxygen transport in the blood is critical for all animals, but cold temperatures and high altitudes represent significant challenges to oxygen uptake efficiency in any species. Animals can respond to these challenges by increasing their blood concentration of hemoglobin (the protein responsible for oxygen transport), the relative abundance of red blood cells, which carry oxygen (also called hematocrit), or the size of these cells. However, these effects have only been previously studied within single species. To determine how blood physiology across a group of species responds to compensate for this, we collected males from each of 13 species of anole lizards native to the Dominican Republic. These lizards are ideal for this study because they live across a wide range of habitats across varying altitudes and, as ectotherms, they are particularly sensitive to variation in climate. We measured the concentration of blood hemoglobin, hematocrit, and red blood cell area. We then collected environmental data for each species at the site of capture: elevation, mean temperature, annual precipitation, and net primary productivity (NPP, as a proxy for the rate of oxygen production). Using phylogenetically informed analyses, we determined that species adapt to lower temperatures and lower oxygen availability with increases in hemoglobin and hematocrit. Species occurring at high elevations also exhibited increased hematocrit. These results demonstrate clear evidence of hematological adaptations to hypoxic environments, and show how habitat specialization can provoke significant changes in physiology, even between closely related species.

## Neural Processing of Visual Information: An Analysis of Brain and Behavior in Green Anole Lizards

Maria A. Jaramillo (mjaramil@trinity.edu), Miguel A. Webber, Charles N. Stein, and Michele A. Johnson
Trinity University, San Antonio, Texas

Animals perform visual displays to communicate information about potential competitors, mates, predators, and prey. Behavioral responses to these complex displays have evolved as a result of the mechanisms by which visual information is processed in the brain. Here, we seek to understand how information processing differs among *Anolis carolinensis* (green anole lizards) exposed to social or non-social visual information by manipulating visual cues and measuring subsequent changes in neural activity within the visual and social nuclei of the brain. We conducted behavioral trials in which a male lizard was placed in a visually neutral arena, presented with visual information from a live anole or from carefully constructed video playback, and their behavioral responses were recorded. Each lizard (N = 40) was randomly assigned to one of four treatments – social control (two live males interacting with each other), non-social control (focal lizard shown video of a stationary perch), social condition (focal lizard shown video of a lizard displaying on a perch), or non-social condition (focal lizard shown video of a lizard displaying on a perch, but with the pixels scrambled to remove social context). Our behavioral results showed that lizards in the social treatments were more attentive to the visual information than lizards in the nonsocial treatments. Immediately after each trial, lizard brains were flash-frozen in isopentane. We are now using immunocytochemistry to measure neural activity in the visual and social brain regions by quantifying expression levels of the immediate early gene c-*fos*. From this study, we hope to gain a greater understanding of how lizards process visual and social information and the degree to which brain regions differentially respond to visual displays.

## Evaluation of the Feasibility and Success of Translocating Wild-Caught Texas Horned Lizards (*Phrynosoma cornutum*) to Formerly Occupied Habitat in the Texas Cross Timbers

Kelly J. Mitchell[1] (kelly.mitchell@go.tarleton.edu), Devin Erxleben[2], Nathan Rains[2], and Jesse M. Meik[1]
[1]Department of Biological Sciences, Tarleton State University, Stephenville, TX
[2]Texas Parks and Wildlife Department

Translocations of individuals from natural populations of wildlife species have become an important tool for wildlife managers. Although many attempts to re-establish populations have been made with mammals and birds, few of these efforts have included reptiles. We conducted a three-year study to evaluate the feasibility of reintroduction of Texas horned lizards (*Phrynosma cornutum*), a state threatened species in Texas that appears to be declining throughout its distribution. Lizards were translocated from natural populations in western Texas to Muse Wildlife Management Area in the Cross Timbers of central Texas, an ecoregion that has experienced apparent local extirpations of horned lizards. After soft enclosure releases, we tracked horned lizards daily to evaluate movements, spatial use, sources of mortality, and reproduction. Although

we observed reproduction each year, and body condition of lizards remained mostly stable, mortality from predation was particularly high, and may ultimately hinder success of the project.

## Assessing Movement Patterns in the Rio Grande Cooter (*Pseudemys gorzugi*) through Capture-Mark-Recapture, Telemetry and Genetic Frameworks

Shashwat Sirsi[1] (s_s477@txstate.edu), Andrew MacLaren[1], Daniel H. Foley III[2], and Michael R.J. Forstner[1]
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[2] Sul Ross State University - Rio Grande College, 205 Wildcat Drive, Del Rio, Texas 78840, USA

Rio Grande Cooters (*Pseudemys gorzugi*) are a narrowly distributed species, restricted to the Rio Grande River and its tributaries. Habitat loss via modification to flow rates of these river systems represent a core threat to these turtles. Understanding movement patterns in such modified landscapes is important to determining population connectivity and spatial scale of management approaches. I compare the utility of three commonly used methods, Capture-Mark-Recapture (CMR), telemetry and population genetics, in determining movement rates. An examination of recapture locations from multi-year (2011 and 2014-2016) CMR data showed that individuals were sedentary. Additionally, a *POPAN* formulation generated a population estimate of 1022 $\pm$ 247 individuals with a maximum probability of entry (*PENT*) at 41%. *PENT* values are suggestive of greater movement than suggested by recapture locations, which provided the impetus for a telemetry approach. VHF transmitters coupled with GPS-enabled data loggers have revealed novel movement data with straight line movements of up to ca. 27 km. Finally, genetic analyses reveal the population is homogenous throughout its range and suggest occasional long-range movements historically maintained range-wide population connectivity. Each of these methods determine varying levels of connectivity and demonstrate a need for caution in management implementations.

## THS: Society Business for 2017 and Beyond!

Wade Ryberg
Research Scientist, Institute of Renewable Natural Resources, Texas A&M University

Wade will discuss THS business for the upcoming year.

## KEYNOTE ADDRESS:

Our keynote address will be given by charismatic author and turtle enthusiast, Carl J. Franklin, who holds the position of Biological Curator and Collections Manager at the University of Texas at Arlington. Carl will engage us with an account of his ongoing studies on Texas turtles and provide inspiration and research opportunities to aspiring students seeking to think outside the 'box' when it comes to turtle research.

## ‘Common’ Turtles Need Attention Too!

Carl J. Franklin
Amphibian and Reptile Diversity Research Center, The University of Texas at Arlington

Currently there are more than 322 million people living in the United States and approximately 27.6 million of them reside in Texas. Economic development and population growth are powerful factors that challenge the diversity and very existence of our natural areas and wildlife. Documenting our chelonian fauna, especially those species considered 'common,' via surveys and museum contributions, is crucial not only for better understanding of Texas turtles but also provide the sustenance for legislation that may be enacted to protect natural areas and wildlife therein. Additionally, these activities can provide an excellent springboard for influencing public perception/policy while providing inspiration for the intrepid student or those afflicted with a similar biophilia to undertake further research endeavors.

### Poster Session (Abstracts)

## Resolving Questionable Museum Records of the Louisiana Pinesnake (*Pituophis ruthveni*)

Connor S. Adams[1] (conadams22scott@gmail.com), Wade A. Ryberg[1], Toby J. Hibbitts[2], D. Craig Rudolph[3], and Josh B. Pierce[3]
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[3]Southern Research Station, U.S. Forest Service, Nacogdoches, TX

The Louisiana Pinesnake (*Pituophis ruthveni*) is considered one of the rarest snakes in North America. This species is currently under review by the U.S. Fish & Wildlife Service (FWS) for threatened or endangered species listing. Specimens of *P. ruthveni* are not well represented in scientific collections, and many museum records are questionable or unverified. In past studies, these records have been used to create distribution and habitat models for this species. Some of these records have been resolved, but uncertain records still exist. The purpose of this study is to resolve questions surrounding unverified museum records of *P. ruthveni.* We measured 13 morphological characters of 28 museum specimens of *P. ruthveni*, and 15 museum specimens of *P. catenifer*. Multivariate statistics were used to distinguish among the two groups. Questionable records of *P. ruthveni* have been identified, and represent *P. catenifer*.

## Simulated Effects of Juvenile Survival on Adult Population Dynamics of the Houston Toad (*Bufo houstonensis*)

Rebecca Aden[1], Hsiao-Hsuan Wang[1], Ivana Mali[2], William E. Grant[1], Michael R.J. Forstner[3]

[1] Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77845
[2] Department of Biology, Eastern New Mexico University, Portales, NM 88130
[3] Department of Biology, Texas State University, San Marcos, TX 78666

Amphibian populations have been documented to be declining worldwide for the last three decades. Determining the risk of extinction is one of the major goals of amphibian conservation. Low juvenile survivorship is a common issue among amphibians and the effects of juvenile survivorship on Houston toad populations (*Bufo houstonensis*) have not been studied extensively. The sex ratio of reproductively mature individuals within a population is an important determinant of population dynamics, particularly for endemic species such as the Houston toad, a species native to east central Texas. The species demonstrates differences in the age at sexual maturity for males and females thus causing a large intrinsic sex-ratio disparity. The objective of our research was to determine how juvenile survivorship affects this disparity along with population growth rates. We conducted a thorough literature review to obtain the best basic demographic data available and developed a stage- and sex-structured population dynamics model for the Houston toad using STELLA®7.0.1. The model was then applied to simulate variations in mortality rates and the resulting sex ratio of reproductively mature individuals within the population as well as growth rates. Finally, we evaluated the performance of the model based on published literature. Our results showed that the sex ratio was influenced the most by changes in juvenile and adult female mortality rates. As the juvenile survivorship increased, the sex ratio disparity increased as well as the growth rates. As adult female survivorship increased, the sex ratio disparity decreased and growth rates rose. Thus, as long as juvenile survivorship increases, the Houston toad population may not be affected by sex ratio disparity if enough juvenile females survive to reproductive age.

## Green anoles, brown bodies: The influence of a loser effect on the dorsal coloration of lizards

Brittney M. Ivanov, Troy G. Murphy, Michele A. Johnson
Trinity University

For many animals, winning agonistic interactions with conspecifics is critical for obtaining necessary resources. Although competitive success may be dependent on differences in resource holding potential, previous social experience can also alter an individual's investment in future fights, giving rise to winner-loser effects. Male green anole lizards often engage in aggressive interactions mediated by visual displays, including dewlap extensions, push-ups, and changes in body color between green and brown. Here, we investigated whether dorsal coloration is altered due to competitive losses. We conducted a series of loser effect trials in which we tested if previous experience in losing makes a lizard more likely to exhibit a brown coloration and to lose subsequent encounters. Sixteen male lizards were "trained" to lose agonistic interactions by pairing them with a series of trainer males (assigned to maximize the differences in each pair in mass, snout-vent length, and head size) for one hour on each of three consecutive days. Following these trials, focal males competed with a size-matched, novel male to test for a loser effect. Eight of these trials yielded a clear loser in which 7 focal males lost and 1 focal male won, suggesting the presence of a loser effect. Individuals that were more often brown prior to the trials were more likely to lose in the training trials, supporting our previous findings that predominant body color

is predictive of the outcome of agonistic interactions. Also, the predominant body color of lizards that lost their fourth trial was more likely to become brown after this final interaction. These results indicate that competitive experiences affect both behavior and appearance of green anoles.

## Muscle Physiology and Social Behavior in Caribbean Anole Lizards: How Do Muscle Fiber Type and Size Interact?

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Animal movements and the muscles that produce those movements are tightly interrelated, as behavioral movements require muscular contractions, and in turn, the use of a muscle can influence the structural and biochemical traits of the muscle. For example, continuously active muscles generally have a higher percentage of fatigue-resistant fibers than muscles used periodically, and muscles used more frequently are often composed of larger fibers. Yet, these traits are rarely examined across species. Here, we test the hypothesis that the types of fibers that compose a muscle (fast or slow twitch; oxidative or glycolytic) and their size evolve in association with the frequency or duration of the contractions of that muscle, using three closely-related pairs of *Anolis*lizard species. The lizards in each pair share a suite of morphological and ecological specializations to a particular microhabitat, but differ dramatically in the frequency and duration for which the dewlap (a throat fan used in aggressive and courtship displays) is extended. We collected behavioral field data on dewlap use for each species, and then collected the ceratohyoid (CH), the muscle responsible for dewlap extensions, from each species to determine the composition and size of CH fibers. We found a negative correlation between dewlap frequency and duration, such that species either display the dewlap quickly and often, or rarely but for longer durations. We found that species that extend the dewlap rarely and slowly have a higher proportion of slow oxidative fibers, the type associated with endurance, in the CH. We are now determining whether CH fiber size interacts with their type to produce dewlap extension, to understand how behavior and the physiological traits that underlie it have coevolved.

## Is artificial light at night a stressor for Barton Springs salamander, *Eurycea sosorum*?

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Artificial light at night (ALAN) is defined as artificial light that alters the natural light dark patterns in ecosystems. ALAN can have a suite of effects on community structure and is a driver of evolutionary processes that influences a range of behavioral and physiological traits. Research on the effects of ALAN on amphibians is lacking and is important as ALAN could contribute to stress and declines of these populations, particularly in urban areas. We tested the hypothesis that exposure to constant light would induce a stress response in *Eurycea sosorum*. We exposed adult *E. sosorum* to either constant light or a natural light regimen for 14 days. We used water-borne hormones to measure corticosterone (CORT) release rates after two days of exposure and at the end of the experiment. We found a time by treatment interaction with individuals in the control

having higher CORT release rates than in constant light on day 2, on day 14 the CORT went down for the control treatment but didn't change for the ALAN treatment. These results could suggest that the salamanders were stressed by the process of relocating and while the control group was able to mount a stress response, the potential stress of constant exposure to light may have caused a disruption of the HPA axis in the ALAN treatment salamanders. Overall these data suggest that ALAN can affect CORT levels in *E. sosorum,* but further investigation is needed to fully understand how ALAN may interact with additional stressors.

## Resource allocation in *Anolis* sperm and testis morphology

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Sexual selection acts on an organism's ability to successfully obtain mates, either through intersexual selection, generally via female choice of males, or intrasexual selection, where males compete against each other for access to females. Male competition for mates can occur both before and after copulation, but the relationship between these two types of competition is unclear. Stronger pre-copulatory male competition generally leads to greater sexual size dimorphism (SSD), with males growing to larger body sizes than females, while the strength of post-copulatory selection is often associated with testis and sperm morphology. To better understand the dynamics between these pressures when they are *both* present within the same individuals, we examine 30 species of *Anolis* lizards from Puerto Rico, Bahamas, the Dominican Republic, and the United States. Using cryosectioned testis tissues, we will measure the cross-sectional areas of the testis, the seminiferous tubules, and the lumina of the tubules. We will also measure the ratio of spermatogenic to somatic cells within the testis. We will then determine relationships between these measures of testis architecture, relative testis size, and SSD. In addition, we will also examine relationships between these traits and the head and midpiece morphology of mature sperm across species. We predict that species exhibit trade-offs between pre- and postcopulatory selection, such that species that invest more in male growth (i.e., greater SSD) will have fewer resources to allocate to sperm and testis development. This study will help us understand how sexual selection influences the evolution of reproductive morphologies in lizards.

## Differential Population Structure and Body Condition of *Pseudemys gorzugi* between New Mexico and Texas Populations

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Western River Cooter, *Pseudemys gorzugi*, is one of the least studied species of freshwater turtles in North America, and very little is known about their biology. In the US, species occurs in New Mexico and Texas, with range restricted to the Pecos and lower Rio Grande Basin. Western River Cooter is listed as a state threatened species in New Mexico and near threatened by the

International Union for Conservation of Nature (IUCN). Given their conservation status, it is important to monitor populations of Western River Cooter across their range. In this study, we compared population demographics and body condition indices between two distinct regions of *P. gorzugi* distribution: Black River in New Mexico and Devils River in Texas. Our analyses show that there are fundamental differences in demographic parameters between New Mexico and Texas populations. While Texas population consists of larger turtles and adults only, New Mexico population contains turtles of all age classes (i.e., hatchlings, juveniles, and adults). Furthermore, turtles in Texas show significantly higher body condition indices. To further understand these differences, future research should focus on studying resource availability, food habits, and nesting ecology of Western River Cooters.

## A Mechanism of Social Behavior: Neuromuscular Junction Size in Anole Lizard Muscles

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Signals are relayed from an animal's nervous system to its muscles via neurotransmitters, chemicals that are released from a motoneuron, travel across the neuromuscular junction (NMJ), and interact with receptors in the muscle fibers. NMJs are a critical component of muscular contraction, and thus animal behavior. But, does NMJ size vary in association with the behavioral use of a muscle? Here, we test the hypothesis that species that use a muscle frequently evolved larger NMJs in that muscle. We studied 10 *Anolis* lizard species and their use of two muscles: the ceratohyoid (CH), which controls the movement of the dewlap, a throat fan used in courtship and aggressive displays; and the retractor penis magnus (RPM), the muscle that controls movement of the hemipenes during copulation. We collected field observational data for each species to determine the frequency of dewlap display and copulation. Then, we dissected the CH and RPM muscles from each species and stained them for acetylcholinesterase, an enzyme that breaks down the neurotransmitter acetylcholine and is only found in the NMJ, to measure the cross-sectional area and major and minor axes of the NMJs. Larger measurements indicate a broader area of connection between the motoneuron and muscle fiber. Our results show high variation in NMJ size in both the CH and RPM muscles among species, and this variation is not associated with lizard body size or the size of the structures these muscles control. The variation in the RPM muscle, however, is positively associated with the frequency of copulation, and NMJs in the CH (a muscle used every few minutes) are much larger than NMJs in the RPM (a muscle used every few days). This study is among the first of its kind to use a comparative approach to analyze NMJ size across species.

# Using Distance Sampling Method to Estimate Population Size of Western River Cooter (*Pseudemys gorzugi*) within the Black River Drainage in New Mexico

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Western River Cooter (*Pseudemys gorzugi*) is one of the least studied freshwater turtle species in North America. Historically, species occurred along the Pecos-lower Rio Grande basin from New Mexico through Texas, USA, and in Tamaulipas, Mexico. However, the habitat of this species is decreasing due to degradation and pollution, which can also lead to the population declines. Currently, Western River Cooter is listed as near threatened by the IUCN red list and as threatened in the state of New Mexico. The objective of this study was to estimate the abundance of Western River Cooter within the Black River drainage, New Mexico using the data obtained from line transect distance sampling surveys. Data were collected from a single 1500m stretch of the river. We ran five transect lines in June and one transect line in August 2016. During each survey, we kayaked along the transect line and counted the number of turtles observed basking on the logs or in dense vegetation structures. The density of Western River Cooter was calculated using DISTANCE software and resulted in 0.0013022 clusters/sq. meter. We are certainly aware that our survey area and period were limited, and that this method is not readily used for freshwater turtles. However, it provided a useful start to understand the species. Moreover, our methods could incorporate new data as it becomes available to improve the accuracy of population abundance estimation and used as a comparison to other survey methods.

END PROGRAM