

## Dissertation Proposal Defense

Small nuclear RNAs originated from tRNAs function as a positive regulator in plant immunity

Dinesh S. Pujara

Major Advisor: Dr. Hong-Gu Kang

Committee Members:

Dr. Nihal Dharmasiri, Dr. Sunethra Dharmasiri

Dr. Sibum Sung (The University of Texas at Austin) & Dr. Joe Louis (University of Nebraska-Lincoln)

Thursday, December 3, 2020, 2:00 PM, Zoom Link: <https://txstate.zoom.us/j/98278791431>

Meeting ID: 982-7879-1431

Plants, sessile organisms lacking immunity-specialized cells, rely on the innate immunity of each cell. When effective, the immune responses in plants involve rapid and massive transcriptional reprogramming through altering chromatin topology in the nucleus. This nuclear change is often regulated by epigenetic components such as DNA/histone modifications, chromatin remodelers, non-coding RNAs. My high-throughput resistance analysis identified DCL1 and AGO2 as a positive regulator in R gene-mediated resistance in Arabidopsis. DCL1 is involved in the biogenesis of small non-coding small RNA (sRNAs), and AGO2 binds to sRNAs as their effector protein. Deep sequencing of sRNAs in the Arabidopsis nucleus was also performed at 1 hr post-infection (hpi) with *Pseudomonas syringae* carrying AvrPpt2. Note that most of the defense genes are known to be induced at 6 hpi with the same pathogen, justifying an early time point. This sequencing dataset identified several sRNAs in the nucleus that rely on DCL1 for biogenesis, bind to AGO2 in response to pathogen infection, and precede the induction of conventional defense genes. Interestingly, these sRNAs were originated from tRNAs, termed as tRNA-derived fragments (tRFs), and their infiltration to plants alone induced a defense gene in an AGO2-dependent fashion. Furthermore, treatment of these tRFs was sufficient to immunize Arabidopsis against virulent *P. syringae*. From these observations, I hypothesized that these tRFs serve as i) a positive regulatory molecule for plant immunity, ii) a guide for AGO2 proteins to modify chromatin for transcriptional reprogramming, and iii) a mobile signal to immunize plants systemically. Detailed experimental plans for characterizing this novel class of sRNAs will be discussed.

Bio: Dinesh was born in the far-western part of Nepal. He completed his B.S. in Biotechnology (Purbanchal University, Kathmandu) in 2011 and M.S. in Biotechnology (Bangalore University, India) in 2016. He has always been interested in plant molecular biology and immunology. Apart from academics, he is passionate about sports, especially Cricket and Tennis.

## Dissertation Proposal

### Community Ecology Dynamics of Mammalian Wildlife at South Texas Road Crossing Structures

Michelle E. Adcock

Major Advisor: Dr. M. Clay Green, Department of Biology, Texas State University

#### Committee Members:

Dr. Thomas R. Simpson, Emeritus Associate Professor, Department of Biology, Texas State University

Dr. Ivan Castro-Arellano, Department of Biology, Texas State University

Dr. J. Andrew Royle, USGS Patuxent Wildlife Research Center

Dr. Roland Kays, Department of Forestry & Environment, North Carolina State University; North Carolina Museum of Natural Sciences

Friday, 20 November 2020, 1:00pm, Zoom, <https://txstate.zoom.us/j/96855246496>

Maintaining connectivity is essential for the long-term viability of wildlife populations. Connectivity can affect species and populations of species in different ways, due to within-population vital rates, the biodiversity of the community, and the type of corridor. Roads have differing effects on wildlife because they can facilitate movement of some species, inhibit movement of others, and are a source of mortality. Wildlife underpasses (i.e., crossing structures constructed underneath roads) are used to increase the permeability of linear infrastructures, thereby decreasing negative impacts to wildlife. Mitigating for habitat fragmentation, compensating for loss of connectivity, and minimizing road mortality are crucial for regional persistence of most wildlife populations. In this dissertation, I intend to address several issues important to the conservation of wildlife at road crossing structures, including: 1) temporal heterogeneity of mammalian fauna, 2) bobcat demographic parameter estimates (e.g., detection, abundance, survival), and 3) design features most effective for wildlife movement through road crossing structures. I intend to obtain results regarding use and passage of mammalian fauna at underpasses. Specifically, I expect to ascertain activity patterns of both individual species and guilds. This work will enable me to determine when species are present to inform transportation-related activities, such as road and underpass construction and maintenance. I aim to provide recommendations to wildlife personnel and transportation planners regarding the most effective crossing design features that can be implemented to modify existing crossings and design new structures to facilitate wildlife passage.

Bio: Michelle Adcock was born in Staunton, Virginia, and lived in Europe and various places within the United States when she was young. She earned a B.S. from the University of Tennessee at Chattanooga in 2005, majoring in Environmental Science with a concentration in Biology. After graduating, she worked at a rescue, rehabilitation, and release aquarium in Florida as an educational outreach coordinator. She then worked as a wildlife and wetland environmental consultant in Florida prior to relocating to Texas. She entered into the Wildlife Ecology program here at Texas State University in 2012, earning her M.S. degree in 2016. Immediately following, she began the Ph.D. program in Aquatic Resources and Integrative Biology to continue work on the conservation and management of wildlife. She and her husband, Zach Adcock, have two sons, Davis and Coleman, of whom they are very proud.

Thesis Defense

CHARACTERIZATION OF TEXAS TORTOISE (*GOPHERUS BERLANDIERI*) HOME RANGES, HABITAT USE, AND LANDSCAPE-SCALE HABITAT CONNECTIVITY IN CAMERON COUNTY, TEXAS

Daniel Guerra

Major Advisor: Dr. Joseph Veech

Committee Members: Dr. Todd Swannack, Dr. Todd Esque (USGS, Henderson, NV)

Wednesday, October 28, 2020, 11:00 AM

Meeting ID: 995 1935 6410

Join the Zoom meeting with passcode: tortoise

Zoom link: <https://txstate.zoom.us/j/99519356410?pwd=QmE4YVBZaXNIY1pZYkZWNjNaMEtSdz09>

Knowledge of species habitat use is essential for conservation planning, especially in species with restricted home ranges such as Gopherus tortoises. The Texas Tortoise (*Gopherus berlandieri*) inhabits Tamaulipan scrublands throughout south Texas, and coastal populations are associated with low relief ridges filled with mesquital scrub known as lomas. My study examined *G. berlandieri* habitat use in a protected natural area in Cameron County, Palo Alto Battlefield National Historical Park. Eleven tortoises were outfitted with GPS loggers which recorded locations once an hour for several months. Three home ranges of different size were calculated for each individual tortoise based on subsets of the locations: 100% Minimum Convex Polygon, 95% and 50% Kernel Density Estimate. I conducted a  $\chi^2$ -analysis for each individual tortoise at each home range size to compare tortoise use of loma habitat to prairie habitat. A  $\chi^2$ -analysis was also performed at the population level (all tortoises included) for each home range metric. No individual tortoise showed significant differential use of loma and prairie at any home range size. Observed use of loma and prairie habitat was not significantly different from expected frequencies of use. As a study population, the eleven tortoises used loma and prairie habitat at frequencies that were significantly similar to the availability of these two habitat types in the immediate vicinity (100 m) of each home range. This result runs counter to previous studies which document a strong association of *G. berlandieri* with loma habitat in coastal locations. My study also examined potential habitat connectivity for *G. berlandieri* in Cameron County. I used Circuitscape software and ArcGIS to model landscape resistance to hypothetical tortoise movement. Resistance values were assigned based on landcover type, soil type, and road presence. Connectivity between focal lomas in protected natural areas was examined. Simulated hypothetical tortoise movement through the landscape was generally determined by the amount of a given landcover type and its specified resistance value. However, spatial arrangement of the landcover types was also important. Simulated movement occurred through dried wetlands at a rate greater than expected likely because this cover type formed much of the matrix separating protected areas in the eastern part of the county. The knowledge acquired by my study could be useful for within-site habitat management and in regional- and landscape-level planning for Texas tortoise conservation.

Bio: Daniel was born and raised in San Antonio, Texas and graduated with his bachelor's degree from Texas A&M University-San Antonio in 2018. He joined Dr. Joe Veech's lab that fall in pursuit of a master's degree in population and conservation biology and has been working with Texas Tortoises at

Palo Alto Battlefield National Historical Park towards that goal since late 2019. He plans to pursue his Ph.D. with Dr. Veech continuing his research on Texas Tortoise ecology at Texas State University. While tortoises are his primary focus, Daniel hopes to contribute to the conservation of various taxa, especially other reptiles and birds.

Thesis Defense

DRIVERS OF A TEMPORAL CHANGE IN THE ADULT SEX RATIO OF A POPULATION OF ROOSEVELT ELK  
(*Cervus elaphus roosevelti*)

Zaavian (Sebastian) Espinoza

Major Advisor: Dr. Floyd (Butch) Weckerly

Committee Members: Dr. Ivan Castro-Arellano and Dr. Clay Green

Friday, October 30, 2020 11:00 a.m.

Meeting ID: 961 159 0728

Join the Zoom meeting with the passcode: elk

<https://txstate.zoom.us/j/9611590728?pwd=L0kweFFndWhYOU1ad3AxbEF5WVQ5UT09>

**Abstract:** Ecological processes driving female-biased adult sex ratios (ASR, males:female) in ungulate populations have been addressed theoretically but empirical study is lacking. The female-substitution hypothesis asserts that a female-biased ASR reflects an overall fitness benefit to females and also males competitive in access to reproductive females. The hypothesis predicts that as female abundance increases females should acquire forage in a given area in lieu of males, thereby resulting in a declining ASR via scramble competition. My study examined a population of Roosevelt elk (*Cervus elaphus roosevelti*) inhabiting the Redwood National and State Parks, California. I sought to discern which of two potential ecological mechanisms could explain the female-biased ASR. The first mechanism was that increasing female abundance associated with a decline in forage abundance led to the passive displacement of males into the study periphery, and the second was that a decline in ASR was precipitated by a lack of males in the area. Systematic population surveys across 24-years were done by driving along a predetermined route within meadow complexes to estimate abundance and ASR, and in nearby areas to assess male abundance. Forage biomass was estimated from vegetation height and cover measurements in quarter-m<sup>2</sup> plots randomly placed in meadows inhabited by elk. My multiple regression model detected an inverse relationship between abundance and ASR indicating it was density dependent. Males were in the study periphery when female abundance increased, and male abundance declined in the study area. A generalized least squares model indicated declining food supplies across years when female abundance increased. My empirical findings were consistent with the female-substitution hypothesis.

**Bio:** Sebastian was born in Harlingen, TX in the Rio Grande Valley. He earned his bachelor's degree from the University of Austin in 2016. He joined Dr. Floyd Weckerly's lab in 2020 to pursue a master's in wildlife ecology. He is passionate about the conservation of threatened species, especially of mammals or birds, but is keen on gaining expertise necessary to study any taxa. He enjoys camping, hiking, kayaking, photography, and anything that involves being out in the sun.

## Dissertation Proposal Defense

### BIOFILM GROWTH, CONTROL, AND MICROBIALLY INFLUENCE CORROSION IN SPACE FLIGHT

Starla G Thornhill

Major Advisor: Robert McLean

Committee Members: Cheryl Nickerson (Arizona State), C Mark Ott (NASA-JSC), David Rodriguez, Dana Garcia

Friday, October 30, 2020, 2:00 pm CDT,

<https://txstate.zoom.us/j/94484616121?pwd=M1ZwQ21xRmwyK25mQ1FDY2ZVWHcvQT09> Meeting ID: 944 8461 6121 Passcode: 982771

**Abstract:** The International Space Station (ISS) is a built environment that has been continuously inhabited since November 2000. Living with the crew are the microorganisms which were carried to the ISS as normal astronaut flora and by accidental introduction in supplies. Microorganisms have established biofilms in the Water Recovery System (WRS) that recycles urine to provide drinking water to the ISS crew. Biofilms in the WRS can serve as a reservoir for opportunistic pathogens including *Escherichia coli* and *Pseudomonas aeruginosa* and can also induce clogs and corrosion damage on stainless-steel components. To investigate biofilm formation, silver disinfection susceptibility, and potential microbial corrosion in spaceflight, an experiment will be launched to the ISS on SpaceX-21 in November 2020. To model biofouling in the WRS, mixed-species biofilms of *E. coli* and *P. aeruginosa* will be cultured in artificial urine on 316L stainless-steel using a specialized BioCell apparatus. Flight samples will be compared to simultaneously tested ground (full gravity) controls. This research describes the design and optimization of the flight experiment, BioCell apparatus, ground-based silver disinfection capability, and data collection and analysis pathways for post-flight corrosion analysis. Pre-flight experiment analysis shows that there is a differential response to long-term silver disinfection treatment and suggests that corrosion on stainless steel could be the result of electrochemical processes, which may be exacerbated by silver fluoride treatment. Characterizing the microbial response to silver disinfection in flight will allow for a better understanding of the growth and treatment of biofilms on ISS.

**Bio:** Starla was born in KS and raised in Austin, TX. She earned her B.S. in Microbiology in 2014, and her M.S. in Biology in 2016. Her interests are space microbiology (as shown by her photo in the pilot's seat of the space shuttle) and polymicrobial biofilms. In her free time, she likes writing high fantasy, playing video games, and hanging out with her cat.

## Thesis Defense

Repellent activity of DEET, Icaridin, Permethrin, Lemon Eucalyptus Oil (*Corymbia citriodora*), and Tea Tree Oil (*Melaleuca alternifolia*) against *Ornithodoros turicata* nymphs

Michaela Bowlsby

Major Advisor: Dr. Ivan Castro-Arellano

Committee Members:

Dr. Benjamin Schwartz, Texas State University

Dr. Andrew Li, United States Department of Agriculture

Wednesday, July 8, 2020, 3:00 p.m.

Join Zoom meeting with password: tick, Meeting ID: 945 2748 3696

<https://txstate.zoom.us/j/94527483696?pwd=NkwvdVB5RThGZlNiYmd6OGpXaVBKZz09>

**Abstract:** Tick-borne diseases are among the fastest-growing diseases in correlation with increased interactions with humans, wildlife, and livestock. Although tick-borne diseases have a wide-ranging importance for public health and food production, most of the research efforts have been on ticks from the family Ixodidae (hard ticks), whereas ticks from the family Argasidae (soft ticks) have received much less attention. *Ornithodoros turicata* is an Argasid tick, whose range overlaps most of the southwestern United States, that is a vector for Tick-Borne Relapsing Fever, and a putative vector of African Swine Fever. Because soft ticks are understudied, there is little knowledge about the efficacy of common deterrents that would prevent bites from these species. This study aimed to investigate the effectiveness of three commercial deterrents and two essential oils against nymphs of *O. turicata*. Efficacy was assessed using a petri-dish bioassay on nymphal ticks collected from caves in the Purgatory Green Space of San Marcos, Texas. All five repellents were tested three times in ten different concentrations. Ten nymphal ticks were used for each concentration, and their location was recorded every five minutes for half an hour. 83% of ticks absconded from the paper within five minutes, so a temporal analysis was ultimately deemed unnecessary. The data collected at five minutes was analyzed to determine the main effects of concentration and repellent and if there was an interaction between these two. Both concentration and repellent showed significant effects, while there was no significant interaction detected. The percentage of ticks repelled was determined by their location on the filter paper at five minutes. Based on this study, Lemon Eucalyptus Oil and Tea Tree Oil performed well, being able to deter 90% of ticks at 20% concentration. DEET effectively repelled 50% of ticks consistently, even at low concentrations. Icaridin only repelled 50% of ticks at the highest concentration. Permethrin showed very low repellency at all concentrations.

**Bio:** Michaela was born in Albuquerque, New Mexico and raised as an Army brat. She hails from Alpine, Texas as her self-proclaimed hometown and earned her B.S. in Biology from Sul Ross State University there in 2014. She joined Dr. Castro's disease ecology lab at Texas State University in 2017. She is passionate about conservation and biodiversity, especially of arthropods. Her interests are in disease systems that require arthropod vectors, and ecology and evolution of insects and arachnids as a whole.

## Thesis Defense

### Endangered Species and Private Landowners: Investigating Environmental Stewardship Through Incentive Program Participation

Jared A. Messick

Major Advisor: Dr. Christopher Serenari

Committee Members:

Dr. Kristy L. Daniel, Texas State University

Dr. Bob Fischer, Texas State University

Monday, June 22, 2020 3 PM

Join Zoom Meeting with password: endangered

<https://txstate.zoom.us/j/97894130014?pwd=bjJldG5wWGxSMlhmVzIEVGpwVmwrZz09>

Abstract: Private property is critical to the protection of wildlife, particularly endangered species. To attract landowners to engage in wildlife conservation, agencies have created voluntary incentive programs (VIPs). Engaging in private lands conservation (PLC) to protect endangered species through a VIP is an exercise in environmental stewardship. However, most of the research investigating PLCs and VIPs in the context of endangered species has thus far focused on specific species, government interventions, and geographic areas, overlooking the role of environmental stewardship. To understand the efficacy of a new VIP designed to protect the critically endangered Houston toad (*Anaxyrus houstonensis*) on private lands in Texas, I situate findings from 24 interviews with key informants into a novel, untested stewardship framework. I also analyze interview data through a relational values lens to reveal the utility of value-based approaches in explaining conflict between landowners and the goals of the Houston toad VIP. The first approach revealed that if VIPs provide landowners with the necessary resources to actualize their stewardship goals, motivational attitudes and obligations can overcome intrinsic barriers to PLC behavior. Social capital, such as trust and face-to-face communications with local agency personnel, was critical for landowners to consider enrolling in the VIP. A relational value lens revealed that landowners derive a variety of anthropocentric values from relations between property, toads, and other wildlife, driving an ethic of stewardship. These values can supersede culturally embedded myths about the consequences of enrolling in a government-sponsored VIP, resulting in independent toad protection projects, but not enrollment. Taken in aggregate, historical and current approaches to government-sponsored endangered species conservation projects in Houston toad range can often conflict with the conservation goals of private landowners who adhere to a stewardship ethic. Indeed, trusted agency personnel can enhance landowners' efforts to protect and conserve endangered species through awareness and knowledge, but a landowner's stewardship ethic does not render VIPs compulsory to achieve PLC goals. Identifying a plurality of landowner relational values and incorporating them into VIPs will improve policy design and implementation, bridging a wide gap between landowners and VIPs.

Bio: Jared was raised in Laurel, Delaware. He earned a dual B.S. in Agriculture & Natural Resources and Wildlife Conservation & Ecology in 2017. Jared joined Dr. Christopher Serenari's lab in 2019 to pursue a

Master's in Wildlife Ecology. He is passionate about bridging the gap between institutional goals for conservation and sustainability and public well-being.

Thesis Defense

Environmental Effects of Nitrite on Goldfish (*Carassius auratus*) Communication

Melody Martinez

Major Advisor: Dr. Mar Huertas

Committee Members:

Dr. Jessica Dutton, Texas State University

Dr. Dana Garcia, Texas State University

Friday, July 1, 2020 3 PM

Join Zoom Meeting: <https://txstate.zoom.us/j/91997191710>

**Abstract:** Increased agriculture and industrial activity have elevated the concentration of nitrogenous compounds in aquatic ecosystems. Exposure to elevated nitrite concentrations disrupt physiological and endocrine processes such as ion and hormone regulation, respiratory, and cardiovascular activity. However, there is a lack of research in the effects of nitrite on sensitive organs such as the olfactory epithelium. Fish olfactory systems are highly sensitive and can detect odors in the picomolar concentration. Odorant signals are integrated in the brain and trigger vital physiological functions (e.g. reproduction and feeding) and behavior. Therefore, disruption of the olfactory system will have a cascade of effects, affecting the viability of species in the short or long term. To detect odors, this specialized sensitive organ is continuously exposed to the aquatic environment, making it highly susceptible to toxins like nitrite. We hypothesize olfactory tissue will be adversely affected by nitrite. Thus, nitrite will accumulate and structurally alter the olfactory organ, which will change behavioral responses to odors and therefore act as a neurotoxin. The goal, to determine the acute and chronic effects of nitrite and its accumulation in the olfactory system and vital organs in goldfish. To test our hypothesis, three experiments were conducted; acute nitrite exposure, chronic nitrite exposure, and behavior assessments on chronically exposed fish. Acute exposure, fish were exposed to nitrite concentrations (0, 0.3, 1.0, and 10 mM) for 5 days. Chronic exposure, fish were exposed to nitrite concentrations (0, 0.01, 0.1, and 1.0 mM) for 69 days. Behavioral assessments were conducted on fish chronically exposed to nitrite concentrations (0, 0.01, 0.3, and 1.0 mM) for 28 days. In both experiments gill, nose and brain was collected for biochemical and histological analysis and nitrite accumulate was significant in acute and chronic experiment. Histological analysis showed an inflammatory process and cellular alteration in acute and chronic exposure. Behavioral assessment showed a decrease in food odor preference after nitrite treatments. Results demonstrate that environmental nitrite concentrations are potentially acting as a neurotoxin that alters olfactory function.

**Bio:** Melody is from Dallas, Texas and earned her B.S. in Aquatic Biology from Texas State University in 2016. She is passionate about conservation, diversity in STEM, snorkeling, and hiking. Her favorite pastime is camping, looking for cool fish, and finding new advance trails to hike. Her dream job is to be a researcher where she can conduct toxicological study in fish and mentor scientists from traditionally under-represented backgrounds.

## Thesis Defense

Investigations into *Huffmanella* (Nematoda): New Endemic Populations, Life Cycles, Thermal Tolerance, and Eggshell Finestructure

Alan T. Bond

Major Advisor: Dr. David G. Huffman Committee Members:

Dr. Weston H. Nowlin, Texas State University

Dr. Benjamin F. Schwartz, Texas State University Wednesday, July 1, 2020, 10:00 A.M.

Zoom ID: 943 3693 9333; PW: 476953

Join Zoom

Meeting <https://txstate.zoom.us/j/94336939333?pwd=WU9WR0p3VXhSa3JISHFFM3pSRmYwQT09>

Meeting ID: 943 3693 9333 Password: 476953

Join by SIP 94336939333@zoomcrc.com

Join by H.323 162.255.37.11 (US West) 162.255.36.11 (US East)

Meeting ID: 943 3693 9333 Password: 476953

Abstract: *Huffmanella huffmanii* is a histozoic nematode that parasitizes the swim bladders of centrarchid fishes, and is endemic to the spring-influenced upper 3 km of the San Marcos River. Previously, it was the only known freshwater species in an otherwise exclusively marine genus of some 20+ species from fishes of all major oceans except the Indian Ocean. Recently, two additional freshwater populations were discovered in Texas springs. Adults of *Huffmanella* species are ephemeral and rarely recovered, and are known for only 6 of the 21 nominate species. Descriptions of the remainder are based solely on the features and morphometrics of their eggs. Unfortunately, many descriptions of these highly refractile eggshells are based on features discerned from simple light microscopy, and this has resulted in a confusing body of literature containing an array of ambiguous and sometimes obsolete terminology referring to categorical and morphometric characters that are often applied inconsistently. Some of the taxonomic characters are based on technique artifacts, and others are imaginary structures based on optical illusions caused by refraction halos. However, recent studies of eggshell formation in *Caenorhabditis elegans* has provided a fundamentally new paradigm for characterizing nematode eggs. The aims of this study were several fold. Firstly, to determine the degree of morphological divergence between the three freshwater populations in Texas by (a) comparing eggshell features and morphometrics using SEM, TEM and confocal technologies, and (b) comparing the life cycles of the two new populations to the 12- month life cycle of *H. huffmanii*. Secondly, to experimentally study the factors that restrict the freshwater populations to spring-influenced environments by treating eggs of *H. huffmanii* with naturally occurring seasonal extremes in water temperature before exposing intermediate hosts to the treated eggs. Finally, to develop a new system of anatomical terminology for eggs of the genus that is based on the most recent research, and that can be used to retrospectively reduce some of the glaring inconsistencies in the existing *Huffmanella* literature.

Bio: Alan was born in Austin, Texas, before his family moved out to the Texas Hill Country at an early age. Growing up in the Hill Country gave him a great love for the outdoors, especially all things aquatic and finny. This led him to complete his bachelor's degree in biology at Texas State University in 2014, and return later to pursue a master's degree in Aquatic Resource Management.

Thesis Defense

Evaluating Structure Class and Construction Effects on Wildlife Use of Road Underpasses

Joshua D. Renner

Major Advisor: Dr. M. Clay Green

Committee Members:

Dr. T. Randy Simpson, Texas State University

Dr. Floyd Weckerly, Texas State University

Thursday, July 2, 2020, 10:00 AM

<https://txstate.zoom.us/j/94513580048>

**Abstract:** Road ecology, the ecological effects of roads, has become a major topic of study. Road ecology involves the study of a variety of road effects such as erosion, hydrological effects, soil chemistry alterations, direct road mortality, and consequences to wildlife at the local and population level. This study aims to assess wildlife interactions between two separate types of road underpasses (bridges and culverts) and looks into the effect of road construction in the area during the observation period. Six road underpasses were monitored on a 24 km stretch of bifurcated highway US 281, 4 km south of George West, Texas within the South Texas Brush Country near the Bordas Scarp. Two types of established underpasses were monitored: bridge (n=3) and culvert (n=3). Camera arrays were installed at each underpass to maximize the detection of wildlife utilizing or interacting within the corridors of the underpass as well as the surrounding road-effect zone habitat. Linear mixed-effects models were used to analyze the effects of disturbance and class between the two data sets where time intervals between independent captures responded to pre and post disturbance and bridge and culvert classes, respectively. Between the dates monitored 6/10/2017 to 7/6/2019, a total of 2,111 independent captures events were observed, 950 prior to the disturbance and 1,161 afterwards from the two disturbed bridge sites. Between the dates monitored 6/10/2017 to 5/23/2018, a total of 4,940 independent captures events were observed, 2,301 under bridge structures and 2,639 under culverts at 6 monitored sites. Our findings suggest that disturbance under bridges nor structure type affected use by the entire wildlife population; however, we did see differential use among species. Post-construction monitoring studies, such as this one, can shed light on the effectiveness of these road underpasses as mitigation measures and can also provide information about how an existing road could be altered to achieve similar results.

**Bio:** Josh was born in Fort Hood, Texas and raised in central Texas. He completed his B.S. in Wildlife Biology at Texas State University in 2017. He then went on to join Dr. Green's lab pursuing his M.S. in Wildlife Ecology later that same year at Texas State University. His love for the outdoors has brought him to pursue a formal education in the field and looks forward to applying the skills and knowledge in future endeavors.

## Thesis Defense

Comparing life history traits and responses to environmental variation between mussel species in the San Saba river

Kayla Hayes

Major Advisor: Dr. Astrid Schwalb

Committee Members: Dr. Clay Green and Dr. Benjamin Schwartz

Thursday, July 2, 2020, 1:00 PM,

Join Zoom meeting: <https://txstate.zoom.us/j/99941383616>

Freshwater mussel species (Unionidae) can vary considerably in their life history traits (e.g., longevity) and mussels with different life history strategies may dominate in different types of habitat. Unfortunately, data on life history traits are still missing for many species, and the factors that determine freshwater mussel distribution along a river are not well understood. Such information, however, is crucial for the conservation of this highly imperiled group of organisms. The objectives of my study were to (1) determine the maximum age and growth constant for three mussel species with different life history strategies; and (2) to perform translocation experiments at two spatial scales (within and between river segments) where mussels were moved to locations from which they were absent to determine if local habitat conditions were limiting their survival and performance. The translocation experiments were carried out in the San Saba River, Texas, using mussels with two different life history strategies (opportunistic and equilibrium). Thin sectioning of mussels and analyzing their size in relation to the number of annuli showed that the maximum lifespan differed considerably between species and was highest for *Cyclonaias petrina* (31 years), lowest for *Utterbackia imbecillis* (9 years), and intermediate for *Lampsilis bracteata* (16 years). In contrast, growth constants were rather similar between species. The translocation experiments showed that local habitat conditions are limiting the opportunistic species (*U. imbecillis*) more strongly than the equilibrium species (*C. petrina* and *pustolosa*). Detection was considerably and consistently lower and mortality higher for *U. imbecillis* that were translocated to a habitat from which they were absent. Responses of *C. petrina* and *C. pustolosa* to translocation provided mixed evidence. Although several measures (e.g., mortality and glycogen within the lower segment, growth between segments) indicated that mussels performed better in the control habitat, it was not a consistent pattern. This suggests that other factors, which may affect earlier life stages not tested here, may limit their distribution. Detection of *Cyclonaias* declined considerably in a treatment pool in the upper segment after a flooding event, whereas it remained high in the upper riffle. Thus, disturbance may play an important role for the distribution of mussels, which should be investigated further by future studies. The study shows that suitable habitat is not necessarily indicated by presence of mussels especially those with different life history strategies, which needs to be considered in relocation efforts.

Bio: Kayla is from Bradenton, Florida and longingly wants to return there. She completed her bachelor's degree in Environmental Studies at Eckerd College in 2018. Her love of all things freshwater encouraged her to pursue her master's degree in Aquatic Resources at Texas State.

## Thesis Defense

Investigations into *Huffmanella* (Nematoda): New Endemic Populations. Life Cycles, Thermal Tolerance, AN Eggshell Finestruature

Alan T. Bond

Major Advisor: Dr. David G. Huffman Committee Members:

Dr. Weston H. Nowlin, Texas State University

Dr. Benjamin F. Schwartz, Texas State University Wednesday, July 1, 2020, 10:00 A.M.

Zoom ID: 943 3693 9333; PW: 476953

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Bio: Alan was born in Austin, Texas, before his family moved out to the Texas Hill Country at an early age. Growing up in the Hill Country gave him a great love for the outdoors, especially all things aquatic and finny. This led him to complete his bachelor's degree in biology at Texas State University in 2014, and return later to pursue a master's degree in Aquatic Resource Management.

## Thesis Defense

Investigating motility performance of *Batrachochytrium dendrobatidis* zoospores and its association with mitochondrial density and pathogenicity

Devlin Burk Jackson

Major Advisor: Dr. David Rodriguez

Committee Members:

Dr. Camila Carlos-Shanley, Texas State University

Dr. Dittmar Hahn, Texas State University

Thursday, April 16, 2020, 3PM, via Zoom

**Abstract:** Chytridiomycosis, an emerging infectious disease caused by *Batrachochytrium dendrobatidis* (Bd), has spread globally and demonstrates high genetic diversity amongst multiple strains. I investigated the use of a mitochondrial SNP in a digital PCR assay to evaluate the variance in copy number between isolates and compared it to a quantitative PCR assay that is the current standard protocol for determining pathogen load of Bd on host amphibians. I also tested for differences in mitochondrial density in Texas isolates using TEM and confocal microscopy. Furthermore, I used a timed series of images taken with the confocal to compare zoospore motility performance between isolates. To determine if host susceptibility differs according to strains of Bd isolated from Texas with differing motility performance, I conducted an infection experiment on 27 northern cricket frogs (*Acris crepitans*). The frogs were divided into two experimental groups ( $n = 10$  in each) and one control group ( $n = 7$ ). The two experimental groups were each inoculated twice with local Bd isolates TXST002 and TXST015 (BdGPL) and a third time with isolate BAF038 (BdASIA-2/BdBRAZIL). My results show that motility was not correlated to mitochondrial counts, infectivity and pathogenicity is not associated with zoospore performance, and *Acris crepitans* is highly resistant to chytridiomycosis, which suggests that this wide-ranging species could serve as a potential Bd super-spreader in the wild.

**Bio:** Devlin was born in Hobbs, New Mexico and attended the University of New Mexico in Albuquerque where he received a B.A. in Political Science in 2002. He started his M.S. under Dr. David Rodriguez in 2017. He is a dedicated husband to Valerie Zurcher. His passions are woodworking and mushroom hunting.

## Thesis Defense

### Herbivore Food Supply Early in the Plant Growing Season: Influences from Precipitation and Elk Abundance

Name Lee Williamson

Major Advisor: Dr. Floyd (Butch) Weckerly

Committee Members: Dr. Clay Green and Dr. Mark Ricca

Friday, April 3, 11:00AM

**Abstract:** Large herbivores interact with the plant communities via grazing and trampling, and the response of plant communities to these disturbances is influenced by available moisture. Whether herbivore disturbances and available moisture influence biomass of plant communities additively or multiplicatively, however, can vary based on the temporal and spatial scale at which these factors are observed. Examining these relationships is needed to understand the dynamics of plant and herbivore populations. Early in the plant growing season, most of the plant's energy goes towards above ground growth, and herbivore disturbances can accelerate this growth given adequate soil moisture. The relationship between these factors can also vary spatially as conditions for plant growth differ. I measured the entire food supply for a non-migratory population of elk (*Cervus elaphus*) in a temperate rainforest over a 15-year period when population abundance and total precipitation varied. The food supply was a 50-hectare meadow complex that was divided into 7 sectors, 2-10 hectares in size. I compared linear mixed effect models using Akaike Information Criterion to determine whether elk abundance and total precipitation had an additive or multiplicative influence on the herbivore food supply. The selected model included elk abundance and precipitation as additive, not multiplicative, predictors of food supply. Also, the relationship between food supply and precipitation varied across sectors. Forage biomass in some sectors showed a positive asymptotic relationship with precipitation but in other sectors showed little increase with precipitation. Even in this temperate rainforest, elk herbivory influenced meadow plant communities when precipitation was low.

**Bio:** Lee grew up in Wichita Falls, Texas. He graduated from Austin College in Sherman, Texas with a B.A. in biology in spring 2017. He then did seasonal work for the USGS before enrolling in Texas State in fall 2018. After completing his M.S., Lee will continue pursuing seasonal work across the United States.

## Dissertation Proposal Defense

Host-pathogen dynamics of *Ophidiomyces ophiodiicola* in Texas

Stephen Forrest Harding

Major Advisor: Dr. David Rodriguez

Dr. Paul Crump, Texas Parks and Wildlife

Dr. Michael R.J. Forstner, Texas State University

Dr. Sarah Fritts, Texas State University

Dr. Camilla Carlos-Shanley, Texas State University

Wednesday, April 1, 2020, 5:00 PM, Ingram Hall 3103

**Abstract:** The disease triangle, a conceptual framework that illustrates how hosts, pathogens, and environmental factors interact during an epidemic, is useful when considering emerging infectious diseases (EIDs) in wildlife. EIDs are caused by a sudden increase in pathogen virulence and/or pathogenicity, owing to one or several factors; EIDs have become a major concern in wildlife conservation. For example, the fungus *Ophidiomyces ophiodiicola* (Oo) causes Snake Fungal Disease (SFD), which negatively impacts snake populations in the US—particularly on the east coast. Recently, Oo has been detected in Texas. However, very little is known regarding its incidence, distribution, and host range. Thus, filling major gaps in the epidemiology of SFD is critically needed to determine if Texas snake populations are at risk of an epidemic. For my dissertation, I intend to address these gaps and explore the interactions highlighted in the disease triangle framework as they pertain to SFD and Oo. Chapter 1 will investigate the ecology and distribution of Oo in Texas by identifying areas with infected populations, estimating the prevalence of Oo within them, and modeling species distributions to identify at-risk populations across the state. Chapter 2 will explore the spatiotemporal distribution of Oo in Texas by conducting a retrospective survey of the fungus among preserved snakes in museum collections. Chapter 3 aims to determine the likely origin of Oo in Texas by isolating pure cultures from the wild, generating DNA sequence data, and conducting phylogenetic analyses to estimate genetic similarity/dissimilarity of Texas isolates compared to global strains. Chapter 4 will investigate the effects of host heterozygosity and host microbiome on infection status via experimental infections and monitoring of individual host responses over time.

**Bio:** Stephen was born in Temple, Texas and raised in central Texas. He received his B.S. in Aquatic Biology from Texas State University in 2014. He completed his M.S. in 2016 at Texas State University in Aquatic Resources, focusing on the population genetics of invasive snails. He started his Ph.D. under Dr. David Rodriguez in 2017. He is the proud father of Jace Forrest Harding and soon-to-be-born Paige Anne Harding. He is a dedicated husband to Hope Harding. His passions are fishing, music, and the pursuit of knowledge.

Thesis Defense

DETECTION OF TRYPANOSOMA CRUZI IN ANIMALS FROM CENTRAL TEXAS, USA

Rebecca Kilgore

Major Advisor: Dr. Dittmar Hahn, Texas State University

Committee Members:

Dr. Michael Forstner, Texas State University

Dr. Ivan Castro-Arellano, Texas State University

Tuesday, March 31, 2020, 3PM, Supple Science Building, Room 376 (Norris Room)

**Abstract:** Chagas disease is one of many neglected tropical diseases shared across North, Central, and South America. Previously considered endemic to only Central and South America it has recently been classified as a reportable disease in Texas and other states in the USA. The causative agent of Chagas is *Trypanosoma cruzi*, a parasitic protozoan that has been recorded in many mammalian hosts or reservoirs as well as some reptiles. This pathogen is vectored by hematophagous insects in the Reduviidae family, further classified into the subfamily Triatominae, also called triatomines or Kissing Bugs. The pathogen is typically spread through infected feces of the insect vector excreted onto the host during or after a blood meal. This research analyzed a sampling of insect vectors and potential hosts with different environmental history, i.e. pet dogs (canines) from domiciliary and indoor environments, and rodents from sylvatic and peridomestic outdoor environments as well as domestic environments in the geographic regions of Hays, Guadalupe, and Caldwell County in Central Texas, USA, for *Trypanosoma cruzi*. Analysis was performed on DNA extracts from tissue and blood samples with multiple procedures of PCR amplification followed by Sanger sequencing and sequence comparison to sequences of previously identified *T. cruzi* strains. Presence of the pathogen was detected by qPCR amplification in over 63% of insect vectors examined across multiple seasons of capture. Fewer than 1% of the rodents and none of the dogs harbored *T. cruzi*. Analysis of these results will provide further information to form management plans regarding treatment modalities of the disease process or prevention strategies to lower transmission events.

**Bio:** Rebecca complete her A.S. at Cisco Junior College in 1998. She worked for several years as an emergency medical provider before completing her B.S. in Biology at Texas State University in 2017. She remained at Texas State University to complete her M.S. in Biology. She hopes to continue working in positions related to health care, infection control, and disease research.

## Dissertation Defense

Influences of historical and contemporary environmental conditions on threatened and endemic aquatic organisms

Alex Sotola

Major Advisor: Dr. Noland Martin, Texas State University

Committee Members:

Dr. Timothy Bonner, Texas State University

Dr. Chris Nice, Texas State University

Dr. Daniel Stich, SUNY Oneonta

Dr. Jess Jones, Virginia Tech

Tuesday March 31, 2020, 9AM, Supple Science Building 376 (Norris Room)

**Abstract:** Historical and contemporary environmental conditions affect the distribution of aquatic species. The three chapters of my dissertation seek to assess the degree to which conditions have impacted current distribution and population structure of fishes and mussels. My first chapter assessed genomic hybridization dynamics between the endemic and threatened *Macrhybopsis australis* and the widespread *M. hyostoma* in the Red River basin of Texas. This work found hybridization in a reach of the river upstream from Lake Texoma, and the distribution of hybrid and pure organisms is associated with several water quality parameters. My second chapter is a biogeographical assessment of the *Macrhybopsis* species complex within Texas. I used genomic techniques, and found a complex history of dispersal and vicariance, which likely occurred during the Pliocene and Pleistocene, that influenced current distributions. My work supports a stepping-stone model of dispersal, suggesting coastal drainages act as islands, where species were able to transfer via connections during low sea levels. My third chapter assessed the effects of floods on mussel populations using a closed robust mark-capture design to account for imperfect detection at two sites on the Colorado River. There were significant decreases in estimated abundances and apparent survival at one site, but not the other. The differential effects observed in estimated abundance and apparent survival among species were attributed to flood magnitude differences, substrate differences, and life-history traits of each species. My three chapters ultimately provide valuable information about the effects of historical and contemporary environmental conditions on threatened and endemic aquatic organisms. I show that hybridization dynamics of fishes are associated with water quality parameters, the evolutionary history of fishes in Texas shows patterns indicative of a stepping-stone model of dispersal, and population dynamics of freshwater mussels have a complex relationship with flood magnitude, substrate, and life-history traits. Through my dissertation work, I tested and provided evidence that historical and contemporary environmental conditions shape the biology and ecology of aquatic organisms.

**Bio:** Alex was born and raised in upstate New York. He graduated from Plattsburgh State University in 2012 with a B.S. in Ecology. Subsequently worked for two years at the University of Vermont as a fisheries research technician. Completed his master's degree in 2016 at Eastern Illinois University in Biological Sciences focusing on fisheries genetics. Started his PhD here in 2016 in Aquatic Resources.

## Thesis Defense

Urbanization Affects the Physiology, Behavior, and Life-history Traits of a Tolerant Stream Fish

Name: Arseniy Kolonin

Major Advisor: Dr. Caitlin Gabor

Committee Members: Dr. Tim Bonner, Dr. Mar Huertas

Friday, March 27, 1pm, IGRM 3103

**Abstract:** Anthropogenic alterations to habitat through land-use conversion comprise one of the main drivers of wildlife population extinctions and loss of biodiversity. Freshwater fishes are among the taxa most affected by land-use conversion, with an estimated 25% of species at risk of extinction. Urbanization is a rapidly growing form of land-use conversion that has been negatively impacting stream ecosystems. The change in stream quality associated with urbanization often pushes native and sensitive fish species past their physiological limits. However, those that can cope with urban perturbations and adjust their phenotypes to match their environments are better able to colonize and persist in urban areas. I explored the effects of urbanization on the physiology, life-history, and behavior of *Gambusia affinis*, a species of live-bearing fish that frequently inhabits urban streams. I collected *G. affinis* from four streams in 2018 and four streams in 2019, which differed in their degree of urbanization. There was twice as much rainfall in 2019 than 2018, which is known to exacerbate the effects of urbanization. I found that urban populations of *G. affinis* had more offspring and heavier broods than rural populations. Additionally, urban populations had higher baseline cortisol release rates, which was associated with differences in reproductive allotment in 2018 but not 2019. However, the interaction between physiological responsiveness and recovery was associated with differences in reproductive allotment in 2019. My results suggest that baseline and stress-induced cortisol release rates play different roles in coping with environmental perturbations, depending on the severity and stochasticity associated with the environment. Lastly, I suggest that various components of glucocorticoid regulation help increase fitness across environments, thereby helping *G. affinis* to adapt and persist in urban streams.

**Bio:** Arseniy was born in Siberia and raised in Michigan/Texas. He earned his B.S. in Biomedical Sciences from Texas A&M University in 2014. After graduation he worked for 3 years at Baylor College of Medicine in Houston TX, studying the molecular mechanisms of the neuromuscular disease, myotonic dystrophy. Inspired by his life-long passion for wildlife ecology and conservation, he left the lab bench and began working as a field technician, surveying salmon on the Southern Washington coast. He joined Texas State University in January 2018. After graduation he hopes to begin his professional career in wildlife conservation.

## Thesis Defense

### Examining Bat Ecology in an Understudied Region

Jacob A. Rogers, B.S.

Major Advisor: Dr. Sarah R. Fritts

Committee Members: Dr. Allen Kurta, Eastern Michigan University

Dr. Liam P. McGuire, University of Waterloo

Thursday, March 26, 2020, 8:00 AM, Norris Room (Supple 376)

**Abstract:** I assessed activity and habitat associations of bats in and surrounding San Bernard National Wildlife Refuge on the Gulf Coast of Texas from May to August 2018 and 2019. My objective was to examine two major components of bat ecology in a region with no prior data: 1) nighttime activity and habitat use of all species and 2) day-roost use of evening bats (*Nycticeius humeralis*). I used autonomous bioacoustic detectors to assess nighttime activity of bats in various habitats across the refuge and recorded vegetation surrounding the deployment sites. I then conducted generalized linear mixed-effect models to assess drivers of bat activity. I also conducted Kruskal-Wallis non-parametric analysis of variance tests to determine differences in activity among habitats. For both analyses, I used the number of bat calls of each species in each year as response variables and habitat types and vegetation estimates as independent variables. Seven species of bats were detected and used all available habitats. Activity increased throughout the summer, likely because bat pups reached volancy. Alongside bioacoustics, I utilized radio telemetry to assess day-roost use of evening bats, an abundant species in the region. I radiotracked 11 evening bats to 9 unique roost locations. All bats roosted within a <1.0 km<sup>2</sup> area of an urban neighborhood, 3–5 km from a protected area. No bats switched roosts, contrary to most literature, which documents regular roost switching in evening bats. Roost trees were over twice as tall and generally greater in DBH, with less surrounding canopy cover and nearly 20-fold less understory vegetation than trees in the protected area. This study has determined baseline ecological data surrounding bats in an area with no previous data. Acoustic detectors can continue to be deployed by biologists and allow long-term, year-round monitoring of bats. Repeated sampling of the refuge may allow researchers to examine changes in activity prior to the likely arrival of the disease white-nose syndrome. Preservation of large trees in the urban area has created bat roosts and allowed a population of tree-roosting bats to thrive in a city. However, bats regularly use the protected tract of land potentially as foraging habitat. The combination of large trees with no understory clutter in the city and the preserved old-growth forest on the refuge may together provide the needed food and habitat resources for these bats. The telemetry study is the southernmost research on roosting ecology of evening bats, and as such, this population may be one of the first impacted by critical maximum temperatures.

**Bio:** Jacob grew up in the jackpines of Northern Michigan. He began working with bats as an undergraduate at Eastern Michigan University, where he earned a B.S. in Environmental Biology in 2016. After graduation, he traveled the country as a field technician. He started at Texas State in the Fall of 2017, as the first M.Sc. student of Dr. Sarah Fritts. After graduation, Jacob begins working for Copperhead Consulting, a bat-specialized environmental company in Kentucky. In his free time, Jacob enjoys obsessing over fantasy football, brewing beer, and seeing as much live music as possible.

## Dissertation Defense

Descriptions, classifications, and explanations of processes and patterns structuring and maintaining inland fish communities

Cody A. Craig

Major Advisor: Timothy H. Bonner, Department of Biology, Texas State University

Committee Members:

Emmanuel Frimpong, Department of Fish and Wildlife Conservation, Virginia Tech

Keith B. Gido, Division of Biology, Kansas State University

Noland H. Martin, Department of Biology, Texas State University

Chris C. Nice, Department of Biology, Texas State University

Day: Monday, March 23, 2020, 9:00 AM, Freeman Aquatic Biology Building, Room 102

Factors influencing community structure are numerous, complex, and interdependent. Structuring mechanisms of inland fish communities fall within four broad classes (i.e., zoogeography and deep-evolution, local abiotic and biotic phenomena, autecology of individual species, and biotic interactions) and explain why fishes are found in local and regional communities. The common theme among chapters is identification and use of patterns that aid in understanding contributions of the four broad classes in regulating fish community structure. A unique contribution of my work is the application of theoretical community ecology framework across multiple scales, from individuals to ecoregions, using descriptive and manipulative field and laboratory experiments. Chapter 1 provides updated drainage checklist and keys for Texas inland fishes, which provides accurate identification of study organisms. Chapter 2 establishes standardized and adaptable framework for assessing and reporting fish-environment associations. The framework was then applied to 11 habitat variables and 146 inland fishes of Texas. Remaining chapters focus on identification of mechanisms that maintain fish community structure within spring complexes, including water quantity and water quality (Chapter 3--San Antonio historical and current fish community, Chapter 4-- Testing expectations of an understudied spring fish community using models and historical data) and biotic factors (Chapter 5--Temperature-mediated feeding between spring-associated and riverine-associated congeners, with implications for community segregation).

Bio: Cody is from Longview, Texas. He graduated with his B.S.-Wildlife and Fisheries Management from Texas Tech University in 2012. Cody completed his M.S.-Aquatic Resources in December 2014 studying the relationship between spring flow magnitude and fish communities.

## Thesis Defense

Spore-formation on inoculated Frankia strains in nodules formed on *Alnus glutinosa* (European alder)

Christophe Chahine, B.S.

Major Advisor: Dr. Dittmar Hahn

Committee Members: Dr. Robert McLean and Dr. Camila Carlos-Shanley

Thursday, February 27, 2020, 2:00 p.m., Norris Room

Members of the genus *Frankia* are soil-dwelling actinobacteria that are generally characterized as nitrogen-fixing symbionts forming root nodules on specific woody plants. In nodules, the presence or absence of spores formed by *Frankia* populations has led to the recognition of two distinct phenotypes, i.e. spore-positive and spore-negative frankiae. Isolates obtained so far have not been shown to form spores in nodules on their host plants after re-inoculation, however, are able to produce spores in pure culture in stationary phase. We therefore speculated that isolates might form spores as a function of environmental triggers related to plant dormancy and assessed spore-formation in nodules formed by nitrogen-fixing *Frankia* strains isolated from spore-negative nodules, on dormant and on growing plants of *Alnus glutinosa*. The presence of sporangia and spores in nodules of dormant plants, but not of growing plants was documented by scanning electron microscopy and in situ hybridizations with Cy3-labeled, 23S rRNA-targeted oligonucleotide probes of nodule sections and crushed nodules, while the identity of both inoculated strains in nodules of both dormant and growing plants was indicated by qPCR analyses and confirmed by comparative sequence analyses of a 23S rRNA gene insertion, *nifH* and *nifD-K* IGS gene fragments. These results support our hypothesis that limited availability of carbon sources during plant dormancy could potentially result in dormant stages, i.e. spores, of the bacterial symbiont in the nodules as well.

Christophe earned his B.S in Biology and Computer Science at St. Edwards University in 2016. In Fall 2017, he started as non-thesis student in the Masters program in Biology, but switched to do research and a thesis into the MS program in Biology in Spring 2018.

## Thesis Defense

Artificial Light at Night Alters Physiology, Behavior, and Reproduction in the Western Mosquitofish (*Gambusia affinis*)

Krystie Miner, B.S.

Major Advisor: Dr. Caitlin Gabor

Committee Members: Dr. Mar Huertas and Dr. Andrea Aspbury

Thursday, March 12, 2020, 11:30 a.m., Norris Room

Human population growth and its associated effects have contributed to the rapid decrease in biodiversity worldwide. Artificial light at night (ALAN) is an anthropogenic pollutant that is increasing with the spread of urbanization and may contribute to biodiversity declines. ALAN alters the migration patterns of birds, communication in frogs, and has various other impacts on reproduction, behavior, and physiology of multiple taxa. However, its effects on freshwater organisms are largely understudied. Here, I investigated how ALAN affects the physiology, behavior, and reproduction of a widespread freshwater fish. *Gambusia affinis* are small livebearing fish often found in urban streams. I exposed female *G. affinis* to a natural light cycle and a constant 24-hour light cycle in the laboratory for 60 days and in outdoor mesocosms for 32 days. I found that ALAN influences glucose levels found in brain tissue, alters behavior, and has marginal effects on the condition of offspring, but has no effect on cortisol release rates, survival, or growth. These results suggest that ALAN has detrimental effects even on a tolerant species and serious efforts should be taken to reduce its propagation.

Bio: Krystie was born and raised in Nevada. She earned her B.S. in Ecology from Boise State University in 2014. Afterwards she worked on a wind farm in North Texas examining bat and bird fatalities then continued working at Boise State in Dr. Jesse Barber's Sensory Ecology Lab studying bat-moth interactions. She joined Texas State University in January of 2018. After graduation she hopes to begin her career in wildlife conservation.