

Dissertation Defense

Prevalence and geographic patterns of *Batrachochytrium dendrobatidis* in Texas

Andrea Villamizar - Gomez

Major Advisor: Dr. Michael R.J. Forstner

Committee Members:

Dr. David Rodriguez

Dr. Ivan Castro-Arellano

Dr. Jamie Voyles

Dr. Hsiao-Hsuan Wang

Monday, November 5, 2019, 9:30 a.m., Norris Room

Abstract: Over the past 50 years, amphibian populations have undergone dramatic declines worldwide. Several hypotheses have been proposed to explain the causes for the decline of these populations. Contributing factors include habitat loss, shifts in temperature and rainfall patterns, changes in UV-B, and contamination through anthropogenic activities, and Emergent Infectious Diseases.

Batrachochytrium dendrobatidis (Bd) is the pathogen that causes chytridiomycosis, an emerging infectious pathogen, known to be causing declines of amphibians across the globe and threatening overall ecosystem health. While chytrid fungus in North American amphibians has attracted interest from researchers, the prevalence of this pathogen in Texas remains largely unexplored. To address this deficit, I collected samples during one year from five Wildlife Management Areas across a gradient of temperature and precipitation. These results suggest that community composition, and differences in environmental conditions affect the prevalence of Bd in an area, suggesting that areas with higher species richness and higher annual precipitation have increased pathogen prevalence. Then, to understand Bd prevalence in time and its historic distribution in Texas, I examined the temporal range of the pathogen's prevalence, using museum collection specimens dating from 1930 up to 2010. The earliest detection of Bd in Texas was confirmed to be in 1936, suggesting that this pathogen is enzootic to the region. We also determined two pathogen hotspot areas in Central and East Texas. With this study, we provide an updated assessment of the prevalence of the historic and current distribution of Bd among species as well as across the landscape of the state. Monitoring of the presence and absence of the pathogen in amphibian communities will shed light on the mechanisms of the pathogen dispersal among different landscapes and its interaction with specific amphibian species. It may also reveal species that are not susceptible to the pathogen where their presence can help mitigate the spread of this disease and could aid in the conservation efforts for endangered species.

Andrea Villamizar Gomez was born in Bogota Colombia. She received her DVM at the Universidad de Ciencias Aplicadas y Ambientales (UDCA) in 2008. Started working on *Batrachochytrium dendrobatidis* in Central Texas in 2012, when she joined the Wildlife Ecology MSc. program at Texas State University under the direction of Dr. Michael Forstner, and has not stopped since then.

Thesis Defense

A Morphological and Molecular Reassessment of *Robergea albicedrae* (Ascomycota)

Jessica Rae Bernardin, B.S.

Major Advisor: Dr. David E. Lemke

Committee Members:

Dr. David Rodriguez

Dr. Dittmar Hahn

Monday, November 4, 2019, 9:00 a.m., Supple 376

Abstract: Historically, ascomycete fungi have been classified based on key morphological characteristics such as spore size and shape, ascus morphology, and biochemical indicators. This approach has resulted in groups of organisms that are microscopically and macroscopically similar, however, in some situations these groupings are not supported by the results of modern phylogenetic studies. *Robergea albicedrae* is a fungus that grows on the bark and twigs of a single species of tree, the Ashe juniper (*Juniperus ashei*). First described in 1910, the fungus has been reassigned at the generic and family levels several times over the past century and is now classified in Stictidaceae. The goal of this study was to provide new morphological and molecular data to better understand the life cycle and relationships of the species. Procedures were designed to culture the fungus both in situ and in vitro. Plastic coverslips were placed on the bark of Ashe juniper for 17 months in an attempt to document the stages of the life cycle of the fungus. Samples of *Robergea albicedrae* were also cultured using a variety of media and plating techniques. *Robergea albicedrae*, along with a diversity of other fungi, was successfully grown on coverslips and in pure culture. *Robergea albicedrae* was also sequenced and analyzed at the 18S SSU rDNA and ITS 1 and 2 regions. Analyses of these sequences using Bayesian phylogenetics provided strong support for the placement of *Robergea albicedrae* in the order Ostropales and the family Stictidaceae of the class Lecanoromycetes.

Jessica earned her B.S. in Botany at Oklahoma State University in 2007. She spent six years teaching secondary science in central Texas and after the birth of her daughter in 2015, decided to pursue her masters degree. In the fall of 2017, she began researching a fungus that grows on Ashe juniper bark for her masters research with her advisor Dr. Lemke. She plans to continue her education by earning a doctoral degree studying biodiversity and phylogenetics. In her free time, she enjoys hiking, botanizing, gardening, and camping with her family.

Thesis Defense

ROLE OF MULTIMODAL COMMUNICATION IN REPRODUCTION OF A LIVE-BEARING FISH

McKenna L. Bristow

Major Advisor: Dr. Caitlin Gabor

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

Friday, November 1, 2019, 10:00 a.m., IGRM 3104

Abstract: Complex signals, such as multimodal signals, are putatively more common than single signals, because organisms either have multiple traits to convey, or have multiple back-up signals to ensure signal reception. In nature, these signals occur together in tandem and interact. Behavior and physiology are largely regulated by the endocrine system, which is susceptible to external stimuli, thus information received from the external environment exerts a heavy influence on behavior and physiology. Aquatic organisms, in particular, are prone to influence from multiple external cues, because they are immersed in a medium that is full of chemical signals which have been excreted through urine, feces, and mucus. Yet, studies generally investigate one signal and one response at a time. My thesis investigated complex signaling in a live-bearing fish, *Poecilia latipinna*, to understand how multimodal signals (multiple signals received through different sensory modalities) affected behavioral and physiological responses. *Poecilia latipinna* use visual signals in mate choice, however there is evidence that visual signals alone do not account for all variation in mate choice. Chemical communication may also play a role in reproduction in this species. I hypothesized that multimodal signals, visual and chemical signals specifically, drive both behavioral and physiological responses in *P. latipinna*. First, I tested male and female associative preference for two cue modalities, vision and olfaction, by placing individuals into a two-choice maze, and providing either visual, visual + chemical, chemical, or no cues of mature individuals of the opposite sex. Males and females only had an associative preference visual and visual + chemical cues. To determine physiological response to putative chemical cues, male and female *P. latipinna* were exposed to water-borne hormone extracts from the opposite sex. At 0, 0.5, 1.5, and 4 hrs, we took water samples from each fish and quantified primary sex steroids released by each individual over time. We quantified estradiol (E2), progesterone (P), and prostaglandin F2 α (PGF2 α) in females, and testosterone (T) and 11-ketotestosterone (11-KT). We found that female *P. latipinna* decreased release of E2 in response to male chemical cues. E2 decreases prior to ovulation in many teleost species, thus our results indicate that male cues alter female physiology to coordinate reproduction. We did not find significant differences in release rates for 11-KT, T, P or PGF2 α . Combined, these results and previous research suggest that communication in this species is multimodal. Prior studies on this species had focused on the importance of visual signals in driving behavior but we now know that chemical signals from males drive a physiological response in females that is related to reproduction. This research indicates that important cues have been overlooked in the study of mating behavior in these fish and others and highlights the importance of measuring multiple types of responses to multimodal cues

Bio: McKenna was born and raised in San Jose, CA. She earned her B.S. in Ecology from San Francisco State University in 2015, where she worked in several labs as an undergrad, but had yet to find research topics that interested her. She took a hiatus after graduating, working for Google as an operations

manager until 2016, when she realized her true passions were in science. She applied and joined Dr. Caitlin Gabor's lab in 2017, getting a bonus mentor in Dr. Mar Huertas when she chose her thesis project.

Thesis Defense

Preferential Growth of an Aquatic Bacterium in Low-Shear Modeled Microgravity

Quentin J. DiPasquale, B.S.

Major Advisor: Dr. Robert J.C. McLean

Committee Members:

Dr. David Rodriguez

Dr. Camilla Carlos-Shanley

Dr. Manish Kumar

Friday, November 1, 2019, 10:00 a.m., Ingram 3203

Abstract: Bacteria are known to respond to a variety of chemical and physical stimuli. Although gravity is universally encountered by all life forms, preferential growth in simulated low gravity has not been previously investigated. Water samples from the San Marcos River were cultured in a low-shear modeled microgravity (LSMMG) environment and three isolates were obtained. Culture studies included monoculture and mixed culture studies in LSMMG and full gravity (1g) conditions. The responses that were observed signify a change of growth when cultured in LSMMG between monoculture and polymicrobial cultures, and a change in motility. In addition to growth studies, whole-genome sequencing was performed on the environmental isolates to identify the species and potential genes that explain the response when grown in LSMMG. This study is the first observing competition and preferential growth of environmental bacteria in LSMMG

Quentin was born in Hawaii as an army child. He earned his B.S. in Microbiology at Texas State University in the spring 2017 and has been working with Dr. McLean to earn his MSc. He has been working on his project since the fall of 2017. Once he graduates, he plans on working as a microbiologist and eventually pursue doctoral studies in clinical microbiology.

Thesis Defense

Allelopathy in the invasive warm-season grass *Bothriochloa ischaemum*: investigation of its mechanism and effects on competitor species of the Edwards Plateau

Sierra DaSilva

Major Advisor: Dr. Susan Schwinning, Department of Biology, Texas State University

Committee Members:

Dr. Kelly Lyons, Department of Biology, Trinity University

Dr. James Ott, Department of Biology, Texas State University

Friday, November 1, 2019, 3:30 p.m., IGRM 03204

Abstract: *Bothriochloa ischaemum*, or King Ranch Bluestem, is widely invasive in the savanna and grassland habitats of the Southern US. A limited amount of experimental research has indicated that it has strong allelopathic effects on two prairie species native to the US. I sought to expand on the existing research by testing *B. ischaemum*'s allelopathic effects on several more competitor species found on the Edwards Plateau. My studies also explored the mechanism of *B. ischaemum*'s allelopathic effects, and sought to distinguish between direct chemical inhibitory effects, and more complex microbially-mediated effects, on plant growth and germination. I conducted two experiments, one on vegetative growth and one on germination, which employed both sterilized and unsterilized *B. ischaemum* extracts. In the growth experiment, I grew 7 species in the greenhouse for 9 weeks. Treatments consisted of sterilized whole-plant extracts from either *B. ischaemum* or the native *Schizachyrium scoparium*, which is not known to be allelopathic, for comparison. In the germination experiment, I applied both sterilized and unsterilized whole-plant extracts from *B. ischaemum* or *S. scoparium* to the seeds of 6 species. A water control was used in both experiments. In the growth experiment, when sterilized plant extracts were used, there was no effect on the growth of any of the target species. In the germination experiment, both sterilized and unsterilized *B. ischaemum* extracts caused a delay in the germination of some species. Results indicated much weaker allelopathic effects than previously reported, and only in some species, during the germination phase of development. Results also indicated that the mechanism of *B. ischaemum*'s allelopathy might be different for the growth and germination stages of the target species.

Bio: Sierra grew up in Nacogdoches, Texas. She earned a B.F.A. from the University of North Texas in 2007. She worked with a variety of environmental and botanical organizations, including the LBJ Wildflower Center, before joining Dr. Susan Schwinning's lab in 2016 and beginning her M.S. in the Texas State Biology Department in order to support a career in environmental conservation and ecological restoration. Sierra lives in Austin with her husband and their one-year-old son.

Thesis Defense

THE DISTRIBUTION AND BIOLOGY OF THE INVASIVE EYEFLUKE OF WATERFOWL (*PHILOPHTHALMUS GRALLI*) IN TEXAS

Jeremiah Leach

Major Advisor: Dr. David Huffman

Committee Members:

Dr. Clay Green, Texas State University

Dr. David Rodriguez, Texas State University

Thursday, October 31, 2019, 10:00 a.m., Freeman Aquatic Biology Building 130

Abstract: *Philophthalmus gralli* is an invasive trematode introduced in 1969, but there has been little effort to determine the impacts of this parasite on the native fauna of Texas. The purpose of this research was to explore the introduction of *P. gralli* into Texas and investigate the ecology of the parasite to better understand how it may be impacting the avifauna of Texas. First, I determined the distribution of the parasite both geographically and within waterfowl wintering in Texas. A survey was conducted by collecting the heads of hunter harvested waterfowl from the 2016-2017 and 2017-2018 waterfowl hunting seasons. Then an experiment was conducted to determine substrate selection and behavior of a larval stage of the parasite. This was done with a two-factor experimental design that used six different substrate types, all placed at three depths within a 26.4 X 27.1 mm (diameter X height) aquarium. Lastly an investigation into the interactions of the parasite with competing trematodes in the intermediate snail host was executed. Exposed snails were divided into three groups; *Centrocestus formosanus* infected, *Haplorchis pumilio* infected, and uninfected snails. Each of the three groups were further subdivided into treatment and control groups. The treatment groups received 5-10 *P. gralli* miracidia and after 120 d the snails were crushed and examined for infection by *P. gralli*. The survey estimated prevalence's ranging from 0% to 55% and infected birds were found in all but one sampling location. The substrate study found selection of water stargrass on the surface of the water for encystment site, and *P. gralli* cysts naturally occurring on several different invertebrate species. The co-infection study produced no experimental infections of *P. gralli*. The selection of water stargrass and occurrence of *P. gralli* cysts on a variety of invertebrates indicates that many species of aquatic birds are at risk of infection and further investigations are warranted.

Bio: Jeremiah came to Texas State University in the Summer of 2012 after being injured while serving in Afghanistan in the U.S. Army. During his undergraduate work, he was approached by Dr. Huffman about the possibility of working on a research project in parasitology. This led to Jeremiah developing a keen interest in parasites and wildlife disease. Jeremiah now lives in South Texas with his wife, Nicole Alonso-Leach, where he works as a technician for Texas Parks and Wildlife Department sampling White-tailed Deer for Chronic Wasting Disease. When he is not working, Jeremiah passes the time by fishing, hunting, and spending as much time as possible with his wife.

Thesis Defense

The Reproductive Biology of the Rio Grande Cooter (*Pseudemys gorzugi*) in Texas

Austin M.A. Bohannon

Major Advisor: Dr. Michael R.J. Forstner

Committee Members:

Dr. Sarah R. Fritts

Dr. Dan H. Foley

Tuesday, October 29, 2019, 8:00 a.m., Norris Room

Abstract: Rio Grande Cooters (*Pseudemys gorzugi*) are a unique and narrowly distributed turtle species, restricted to the Rio Grande River and its tributaries in south and west Texas. The species is likely to have undergone reductions in population size and extent of occurrence owing to decreases in-stream flow rates and deterioration in water quality of the Rio Grande and its tributaries. Additionally, collection for the pet trade may represent a significant threat to population persistence. Furthermore, the species continues to remain one of the most poorly known turtles in North America. In order to facilitate conservation management, information on species life-history is urgently required. This study helped inform us of the female *P. gorzugi* reproductive cycle. We captured a total of 99 unique females over a five-month duration. *Pseudemys gorzugi* females bearing shelled eggs were observed from the months of April to August. Clutch size varied from 5 to 17 eggs, with 17 eggs being the maximum number reported for this species. *Pseudemys gorzugi* females bearing follicles were confirmed every month of the study (April 2018 - September 2019). The smallest sized female observed bearing follicles had a Straight-line Carapace Length (SCL) of 150 mm. Our study has yielded novel reproductive information on *P. gorzugi* in Texas, that potentially widen the previously reported nesting duration. Individual capture-histories, likewise, currently indicate a clutch frequency exceeding one.

Austin was born and raised in central Texas. He earned his B.S. in Wildlife Biology at Texas State University in the fall of 2017 and spent the next two years working with Dr. Forstner to earn his MSc. He was accepted into the Texas State Biology Graduate Program in the fall of 2017 working with Dr. Forstner to mentor his research on *P. gorzugi*. Upon graduation, Austin plans to continue working as a field biologist.

Thesis Defense

Mycorrhizae on roots of *Quercus havardii* growing in habitat and non-habitat soils

Phuong Ngoc Minh Le

Major Advisor: Dr. Dittmar Hahn

Committee Members: Dr. Robert McLean and Dr. David Rodriguez

Monday, October 28, 2019, 8:00 a.m., Supple 153

Abstract: Sand shinnery oak (*Quercus havardii*) is a deciduous shrub that rarely exceeds one meter in height. It grows on approximately 50 soil series, all of which are sandy and have poor nutrient contents. Sand shinnery oak communities are established in dry areas ranging from northern Texas to western Oklahoma and southward into the Chihuahuan desert. The root structure of sand shinnery oak is comprised of two components: deep-rooting taproots and lateral roots both of which allow them to withstand droughts and thrive under dry weather conditions. In addition to other physiological adaptations to water limitation such as water uptake capacity during dormancy, or water uptake through rhizomes, roots of sand shinnery oak can enhance ion and water uptake through the formation of mycorrhizal associations. To better assess the potential interactions between sand shinnery oak and potential fungal symbionts, mesocosms were setup and established with two soils, i.e. with habitat sandy soil for sand shinnery oak from West Texas, and with non-habitat sandy from Bastrop, Texas, in a factorial design with soil type, and presence/absence of sand shinnery oak and phosphate fertilization as variables. Fungi in bulk soils and plant rhizospheres were analyzed by growth dependent isolation attempts and culture-independent Next Generation Sequencing using the Illumina MiSeq. Diversity of fungal communities in both soils was low, with usually less than 10 species per soil and treatment and with only few fungi identical in both soils. While significant phosphate amendment and plant effects were obtained in non-habitat soils, these were absent in habitat soils. In contrast to non-habitat soils, habitat soils were dominated by an uncultured fungus with sequence similarity to ectomycorrhizae indicating a potential association of sand shinnery oak with mycorrhizae in habitat soils, but not in non-habitat soils. These results might be useful in restoration attempts that have largely been unsuccessful with nursery-grown plantlets of sand shinnery oak due to extremely high die-off rates of these explants.

Phuong was born and raised in Ho Chi Minh City, Vietnam. She received her Bachelor's degree from Texas State University in Biology in 2017, and initially started her Master's degree as a non-thesis student. She realized her passion for research and joined Dr. Hahn's lab in January 2018, studying microbial ecology and the diversity of fungi in soils.

Dissertation Defense

Hydrogeologic and Speleogenetic Constraints of a Coastal Karst Aquifer: Sistema Jaguar, Quintana Roo, Mexico

Aubri A. Jenson

Major Advisor: Dr. Benjamin F. Schwartz

Committee Members: Dr. Patricia Beddows, Dr. Yongli Gao, Dr. Thom Hardy, Dr. Todd Swannack

Friday, October 25, 2019, 9:00 a.m., FAB 130

Abstract: Karst aquifers are self-organizing, scale-dependent systems with highly heterogeneous hydrogeologic properties. Coastal karst systems are especially complex because sea level changes affect porosity development through geologically rapid processes that result in dissolution or deposition. Regional-scale coastal aquifer models often fail to describe heterogeneity at smaller scales because detailed data is unavailable for parameterization. My research evaluated hydrogeologic heterogeneity in the context of formative processes related to sea level history in a coastal karst aquifer sub-basin in Quintana Roo, Mexico. I used new data and approaches to test models and assumptions of speleogenesis and tectonic stability on the Yucatan Peninsula. First, I measured and analyzed data describing morphology, distribution, and orientation of sinkholes and cave passages, and investigated their utility as indicators of structural and hydrogeologic controls on karstification. Results suggest that karst features are primarily controlled by hydrogeologic properties and secondarily by structural features. Second, I quantified and constrained aquifer properties (diffusivity, transmissivity, hydraulic conductivity, and hydraulic gradient) using long-term, high-resolution water level data collected in cave passages that intersect the water table. The hydraulic gradient steepens near the coastline, which differs from previous measurements near coastal springs and has implications for water budgets. Finally, I constrained the timing of conduit development by comparing sea level records with U-Th dates of speleothems, and calcite overgrowths that form at the water table. Together, these data revealed that conduits are much older than previously assumed, formed at much lower elevations than their current positions, and that significant amounts of both regional uplift and landscape denudation must have occurred. These findings contradict long-held but untested assumptions of recent conduit formation, and tectonic stability in the Yucatan Peninsula throughout the Quaternary. The modern hydrogeologic function and position of conduits is the result of combined and dynamic uplift, speleogenesis, and changing sea levels that occurred over the past >650,000 years, rather than tectonic stability and in-situ speleogenesis occurring during relatively brief sea level high stands.

Bio: Aubri Jenson completed her B.S. in Geology at Bucknell University, PA in 2007. She gained six years of experience as an environmental consultant in the oil and gas industry while working for AECOM in Austin, TX, and obtained her Texas State Professional Geoscientist License in 2013. She entered the Aquatic Resources PhD program at Texas State University in 2014, motivated by an interest in cave exploration and a sense of contribution that comes with helping to responsibly manage development in karst areas. Aubri began working for Zara environmental, a consulting firm in Manchaca, TX, on a part-time basis in 2018 and plans to work for Zara full time following graduation. She is also an officer in the U.S. Navy reserve and anticipates deployment in the next year.

Dissertation Proposal Defense

Ecological and Evolutionary Genomics of Groundwater Biodiversity

William T. Coleman

Major co-Advisors: Dr. Chris Nice and Dr. Benjamin Schwartz

Committee Members:

Dr. Benjamin Hutchins, EARDC, Texas State University

Dr. Matthew Niemiller, Biological Sciences, The University of Alabama in Huntsville

Dr. Weston Nowlin, Biology, Texas State University

October 24, 2019 – 9:30 a.m., FAB 102

Abstract: Identifying mechanisms influencing evolution is essential to understanding modern biological diversity. The implementation of ecological genomics methods provides the opportunity to determine what factors may be most effective in explaining patterns of genetic variation observed in populations. Analysis of gene flow, genetic diversity, and local adaptation allow us to understand the evolutionary history of contemporary populations and explain current patterns of diversity. Groundwater ecosystems, particularly karst aquifers and spring ecosystems, host exceptional diversity and are excellent models for studying evolutionary mechanisms of diversification across the interface of confined aquifers, spring complexes, and rivers. Subterranean systems are difficult to study due to limited accessibility, but long term sampling at springs, caves, and wells provides insight into biotic composition and distribution. Understanding the biogeography of groundwater ecosystems is further complicated by the strong patterns of convergent evolution and cryptic speciation within genera. Thus, a molecular approach is ideal for the study of groundwater-adapted populations. My dissertation will use ecological genomics methods to characterize genetic diversity and identify mechanisms influencing population structure in three groups of groundwater-adapted organisms of conservation concern: karst spring-adapted elmids (genus *Heterelmis*), aquifer-adapted asellid isopods (genus *Lirceolus*), and subterranean obligate dryopid beetles (genus *Stygoparnus*). With these model taxa, I will answer the questions: Does local adaptation drive diversification in groundwater organisms?; and Does within-genus ecological diversification influence patterns of genetic diversity and gene flow? Finally, for the federally endangered *Heterelmis comalensis*, I will implement a temporal sampling approach to answer the question: How did an extreme climatic event impact the genetic diversity and population size of an endangered karst spring-endemic beetle?

Will Coleman was born in Atlanta, GA. In 2014, Will received a B.S. in Ecology from The University of the South in Sewanee, TN, where he studied cave biodiversity in the ridge and valley region of the southern Appalachians. He entered the Ph.D. program in 2016.

Dissertation Defense

The Role of Conservation Physiology and Environmental Change in Amphibian Declines

Cory B. Goff

Major Advisor: Dr. Caitlin Gabor

Committee Members: Dr. Tim Bonner, Dr. Mar Huertas, Dr. Susan Walls, Dr. Robin Warne

Friday, October 4, 2019, 10:00 a.m., IGRM 3203

Abstract: Environmental change associated with anthropogenic alterations to habitat and the synergistic effects with climate change and disease can render habitats unsuitable and affect the physiological health of species. This can ultimately affect survival and fitness. Amphibians are one group of vertebrates especially vulnerable to changes in environmental quality. Using multiple measures of physiological health can aid in identifying populations at increased risk of declines. This dissertation focuses on research that examines the effects of environmental variables on the health of larval amphibians through field sampling, laboratory experiments, and outdoor mesocosms. The first chapter is an introduction to the main topics addressed in my research. The second chapter includes the results of field sampling to measure environmental variables at multiple spatial scales and their effects on three physiological health metrics of ornate chorus frog (*Pseudacris ornata*) tadpoles to identify potential correlates of population declines. The third chapter examines the effects of increased water temperatures on multiple physiological health metrics in a larval anuran, the Rio Grande leopard frog (*Rana berlandieri*) by manipulating water temperatures via tank heaters in the lab and from a lack of shade cover in outdoor mesocosms. Together, my research shows that lower environmental quality, such as increased water temperatures from climate change or habitat alteration, may result in chronic stress in larval amphibians, reducing physiological health and leading to declines. However, depending on the species and aquatic environment, some individuals may benefit from warmer water temperatures. My research suggests multiple health metrics are needed to understand the complex effects of environmental change on larval amphibian health and provides suggestions for the management of these species.

Bio: Cory completed his Bachelor's degree at Liberty University in 2012 where he was introduced to the field of herpetology and where his love for amphibians and reptiles began. He continued his education at Marshall University where he completed his MS in Biology, researching the movement behavior of a montane salamander in Virginia. Cory came to Texas State in 2015 where his research combined measures of population health with conservation of amphibians. While finishing his Dissertation, Cory has returned to his alma mater to begin his teaching career as an assistant professor of biology. Cory, his wife, Beth, and their daughter, Ginny, love exploring the outdoors and "herping" whenever possible and look forward to many more adventures.

Dissertation Defense

Probiotic regulation of fat-storage via Angiopoietin-like 4 (ANGPTL4)

Name: Priscilla Pham

Major Advisor: Dr. Bob McLean

Committee Members: Dr. Dana García, Dr. Shannon Weigum, Dr. Dhiraj Vатtem, Dr. Jennifer Spinler
and Dr. Vatsala Maitin

September 20, 2019, 3:30 p.m., Ingram 3203

Abstract: Gut microbiota have been implicated in obesity by influencing nutrient digestion/absorption and host metabolic pathways related to fat synthesis and storage. One key target is Angiopoietin-like 4 (ANGPTL4), a protein that is regulated by the gut microbiota and responsible for inhibiting lipoprotein lipase (LPL). LPL hydrolyzes triglycerides to free fatty acids for subsequent storage in adipose tissue. Therefore, identifying microbial factors able to enhance ANGPTL4 may reduce fat storage. Probiotics are widely used for the beneficial shift of microbial composition; thus, probiotic bacteria and probiotic-derived bioactive compounds with stimulatory activity towards ANGPTL4 may thus serve a protective function against diet-induced obesity. The objective of this study was to explore the anti-obesity potential of certain bioactives produced by *Bifidobacterium longum* by influencing ANGPTL4, a key molecular target that regulates fat-storage and lipid metabolism; and elucidating the mechanism of action using in vitro and in vivo model systems. Enterocytic cell line HT-29 were used to examine whether the use of freeze-dried *B. longum* (FBLs) retained bioactivity towards ANGPTL4 and the mechanism of ANGPTL4-regulation. Next, the effects of FBLs on fat storage were investigated in 3T3-L1 adipocytes. *Caenorhabditis elegans* were used as an in vivo model to evaluate the dietary effects of FBLs on lipid metabolism genes. Results indicate that the modulatory activity of FBLs towards enterocytic ANGPTL4 may be partially dependent on its transcription factor PPAR α . In adipocytes, FBLs upregulated ANGPTL4 and increased LPL activity. However, FBLs stimulation of ANGPTL4 may potentially reduce further fat storage accumulation by degrading intracellular LPL. In *C. elegans*, FBLs as a supplement to the normal *C. elegans* diet is capable of regulating lipid metabolism genes. This study provides insight for species-specific microbial regulation of obesity via ANGPTL4-mediated mechanism. Further examination of the exact mechanism and direct connections between FBLs and the possible anti-obesity effects of ANGPTL4 in the intestine and adipose tissue are needed.

Bio: Priscilla Pham is from Houston, Texas and received her BS in Human Nutrition and Foods from Prairie View A&M University. In 2010, she entered the Master's in Human Nutrition Program at Texas State University and began her research in the Molecular and Cellular Nutrition Laboratory under Dr. Vatsala Maitin. As a PhD Biology student, she continued her research work under the advisement of Dr. Bob McLean and Dr. Dhiraj Vатtem.

Thesis Defense

A STATISTICALLY DESIGNED KARST FEATURE SURVEY, AND FACTORS CONTROLLING KARST FEATURE DENSITY AND DISTRIBUTION

Lorena Roque Martinez

Major Advisor: Dr. Benjamin Schwartz - Department of Biology, Texas State University; Edwards Aquifer Research and Data Center

Committee Members: Dr. Jennifer Jensen - Department of Geography, Texas State University, & Dr. Todd Swannack - US Army Engineer Research and Development Center

Monday, July 22, 2019, 10:00 a.m., Freeman Aquatic Biology 130

Abstract: Karst feature inventories provide data that are used to evaluate a site's degree of hydrogeologic connectivity to local and regional flow systems, as well as its environmental and ecological sensitivity. For developments proposed on the Edwards Aquifer recharge zone, TCEQ rules require a geological assessment and full-coverage karst feature inventory on the property. However, visual surveys may be subjective, depending on the experience of the person performing a survey, and are extremely time intensive. Considering this, my research question was: is it possible to develop an independent method for identifying the most sensitive recharge areas for visual surveys, and to provide a means for assessing the accuracy of surveys? A partial, statistically-designed, karst feature survey of the 17 km² Freeman Center of Texas State University in San Marcos, Texas resulted in 60 documented karst features, including 3 sinkholes ground-truthed after detection using GIS methods. The survey design used for Freeman was then tested on Camp Bullis, near San Antonio, TX (a site with a complete karst feature inventory), which revealed that random surveying does not yield representative karst feature density results, because karst features are clustered. The entirety of Camp Bullis was then analyzed for factors that influence karst feature density and distribution. An Ordinary Least Squares model determined that slope, distance to nearest flowline, lithology, and apparent resistivity were significant predictors of karst feature density (AICc=7169.4; R= 0.13; p<0.01). A Geographically Weighted Regression was used to visualize the nonstationarity of predictor variables (AICc=5636; R=0.79). Both models reveal spatial autocorrelation of residuals, indicating model misspecification. Despite concluding that karst features density is difficult to model, these methods offer a more nuanced understanding of factors controlling karst feature distribution, and the significance of physical factors on Camp Bullis.

Bio: Lorena grew up in San Benito, Texas, a growing city in the Rio Grande Valley. She earned her B.S. in Environmental Science with a focus in Geology from The University of Texas at Austin. Her interest in karst hydrogeology, field research, and caving was cemented after working at the Buffalo National River in Arkansas. She entered the Aquatic Systems Masters program at Texas State University in Fall 2017. Lorena is currently looking for opportunities where her GIS knowledge together with hydrogeologic field techniques can be used for the protection of water resources in the state of Texas.

Thesis Defense

Vegetation Survey of the Yegua Knobbs Preserve, Bastrop and Lee Counties, Texas

Diana K. Digges

Major Advisor: Dr. David E. Lemke, Department of Biology, Texas State University

Committee Members:

Dr. Paula Williamson and Dr. Sunethra Dharmasiri

Tuesday, July 02, 3:00 p.m., Supple Science Building, Norris Room

Abstract: The Yegua Knobbs Preserve (YKP) is a private, nearly rectangular 122-hectare tract that sits on the Bastrop and Lee County lines in the Oak Woods and Prairies natural region of east-central Texas. This region is considered an ecotone, where the communities from the bordering natural regions, the Pineywoods to the east and the Blackland Prairies to the west, merge. A species inventory was done to identify the vascular plants present at the preserve for a growing season. Woody vegetation was sampled using the line intercept method, and herbaceous components were sampled using the quadrat method. Analysis of the qualitative and quantitative data led to the designation of six plant communities at YKP, four dominated by woody vegetation and two herbaceous. The lack of exotic species present on the preserve was also noted. These communities referred to others previously discussed for the Oak Woods and Prairies, Pineywoods and Blackland Prairies natural regions.

Bio: Diana grew up in Kerrville, Texas. She received her B.A. in Biology from University of Texas, Austin in 2006. She worked for a variety of non-profits in the Austin area until going back to school at Austin Community College where she earned a certificate in Environmental Science and Technology. Afterwards, she pursued internships and employment with various botanical and environmental organizations. She entered the Biology Master's program at Texas State University in 2016, in Dr. David Lemke's lab, to further her botanical studies.

DISSERTATION DEFENSE

ECOPHYSIOLOGY AND FOOD WEB DYNAMICS OF SPRING ECOTONE COMMUNITIES IN THE EDWARDS AQUIFER, USA

Parvathi Nair

Major Advisor: Dr. Weston Nowlin, Department of Biology, Texas State University

Committee Members: Dr. Benjamin Schwartz, Department of Biology, Texas State University

Dr. Thom Hardy, Department of Biology, Texas State University

Dr. Benjamin Hutchins, EARDC, Texas State University

Dr. Joe Tomasso, Auburn University

Thursday, June 27, 9:00 a.m., Freeman Aquatic Building, Room 130

Abstract: Spring orifices serve as ecotones between groundwaters and surface waters. Communities found within spring ecotones are composed of organisms from a variety of habitats, including epigeal, hypogean, and crenic species. I examined the ecophysiology and trophic ecology of invertebrates that occur within spring ecotones of the Edwards Aquifer (Texas, USA). It is thought that organisms living in physicochemically stable spring ecotones should exhibit small tolerance ranges; however, previous experiments examining this are equivocal. I examined this hypothesis by investigating effects of elevated temperature and decreased dissolved oxygen on several riffle beetle species (Coleoptera: Elmidae), including two ecotone specialists. Ecotone-associated species exhibited stenothermal tolerance profiles when compared to surface species. I also examined resource use in invertebrate communities at two spring ecotones using stable isotopes of carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) and amino acid-specific stable isotopes ($\delta^{13}\text{CAA}$). Spring ecotones contain trophically complex communities with substantial niche partitioning among species. I finally examined the hypothesis that organisms in resource poor subterranean habitats can withstand long periods of food shortages due to reduced metabolic rate. In addition, subterranean taxa should exhibit energy resource use patterns different from epigeal counterparts when exposed to prolonged food deprivation periods. Previous studies have also hypothesized that subterranean organisms in systems with ample energy resources (such as guano caves or spring ecotones) may not exhibit reduced metabolic rates. I assessed metabolic and biochemical responses of a subterranean amphipod (*Stygobromus pecki*) that inhabits spring ecotones and compared these responses to their epigeal relative. Results indicate that despite occupying a relatively resource rich habitat, *S. pecki* exhibit lower metabolic rates and differential use of energy resources when compared to epigeal relative. Cumulatively, this body of research provides critical and new information on the ecology and evolution of spring ecotone communities, which are among the least studied and poorly understood aquatic ecosystems.

Bio: Parvathi Nair was born in Kerala, India. She earned a M.S. in Environmental Science in 2013 from University of Houston Clear-Lake, TX. She entered the Aquatic Resources Ph.D. program at Texas State University in 2014, in Dr. Weston Nowlin's lab, to work on the conservation of endangered invertebrates in the Edwards Aquifer.

Thesis Defense

THE ROLE OF IBR5-AtNRPB4 INTERACTION IN PLANT GROWTH AND DEVELOPMENT

Rohit Upendra Katti

Major Advisor: Dr. Nihal Dharmasiri, Department of Biology, Texas State University

Committee Members: Dr. Hong-Gu Kang, Department of Biology, Texas State University

Dr. Sunethra Dharmasiri, Department of Biology, Texas State University

Tuesday, July 02, 10:00 a.m., Supple Science Building, Norris Room

Abstract: Auxin is a crucial plant hormone necessary for the regulation of growth and development in plants. It has been shown that Indole Butyric acid Response 5 (IBR5), which encodes a dual specificity phosphatase, is involved in the auxin signaling pathway. However, its exact molecular mechanism by which it regulates auxin signaling is not well understood. In yeast two hybrid screen, IBR5 interacted with NRPB4, which is known to be an integral part of RNA Polymerase II complex. Previous studies on NRPB4 have shown that it is involved in thermotolerance in yeast. Preliminary work on NRPB4 shows that it physically interacts with IBR5 in-vitro confirming yeast two-hybrid result. Further analysis shows that the catalytic domain of IBR5 is important for the interaction with AtNRPB4. The biological relevance of IBR5-AtNRPB4 interaction is not yet clear, but both proteins have been shown to be linked to heat stress responses. Characterization of Arabidopsis nrpb4 mutants shows severe growth defects in hypocotyl elongation and root growth in response to high temperature. Additionally, nrpb4 show defective auxin responses suggesting possible functional interaction between IBR5 and NRPB4. However, effort to demonstrate IBR5- NRPB4 interaction in vivo was not successful. Nevertheless, in-vitro interaction between IBR5- NRPB4 along with common defective phenotypes of nrpb4 and ibr5 mutants suggest a possible interaction between these two proteins.

Bio: Rohit Upendra Katti was born in Bengaluru, India. He earned a MSc in Biotechnology from Bangalore University, Bengaluru, India. In 2017, he then joined the lab of Dr. Nihal and Sunethra Dharmasiri to pursue his M.S. Biology degree. After graduating with a M.S. in Biology at Texas State University, he will be pursuing a PhD at University of Georgia- Athens in Pharmaceutical and Biological Sciences Department.

Thesis Defense

AN ASSESSMENT OF THE STANDARD DETECTION METHOD FOR AN ELUSIVE SPECIES - THE DUNE SAGEBRUSH LIZARD (*Sceloporus arenicolus*)

Maxie Lu Kiehne

Major Advisor: Dr. Michael R.J. Forstner

Committee Members: Dr. Paul Crump and Dr. Joseph Veech

June 26, 2019, 8:00 a.m., Supple 153

Abstract: The Dunes Sagebrush Lizard (*Sceloporus arenicolus*) is a highly cryptic, habitat specialist that shows a preference for environments comprised of large dune complexes and dense arrays of shinnery oak (*Quercus harvardii*). This species occupies a narrow range in the Monahans Sandhills of Texas and the Mescalero Sands of New Mexico and like many habitat specialists, they are sensitive to disturbances within this environment. Conservation of this species relies upon precise assessments of the occurrence, abundance, and population trends for this lizard. The standard method for detecting the DSL, visual encounter surveys (VES), was utilized to estimate the probability of detection across sites that had varying degrees of reported suitability. The probability of detection, for *S. arenicolus*, was compared to two more commonly detected species, *Uta stansburiana* and *Aspidoscelis marmoratus*. The minimum number of surveys, needed to reliably detect these species, was calculated from detection estimates. A total of 1,135 individual lizards were recorded, 13 of which were *S. arenicolus*. Results of the study indicated that while VES may be suitable for many common species of lizards, it may not be the most beneficial method for accurately determining presence of rarer species of lizards (i.e. the DSL). This could indicate that a more robust survey methodology (i.e. pitfall traps) may be needed when trying to make reliable occupancy or abundance estimates.

Bio: Maxie was born in Midland, Texas and raised in Datil, NM. She graduated from Eastern New Mexico University, in 2017, with a B.S. in Wildlife and Fisheries Biology. Her passion for herpetofaunal species developed early in her undergraduate program and led to her pursuit of a M.S. degree. In 2017, she was accepted into the Wildlife Ecology program at Texas State University, under the guidance of Dr. Forstner. Before eventually pursuing a Ph.D., Maxie has decided work for non-profit organization in Carlsbad, NM, whose main focus is the development of environmental conservation programs.

Thesis Defense

SPATIAL AND TEMPORAL USE OF CAVES BY ELEUTHERODACTYLUS MARNOCKII AND CRAUGASTOR AUGUSTI IN THE WESTERN EDWARDS PLATEAU OF CENTRAL TEXAS

William “Grady” Terry

Advisor: Dr. James Ott and Dr. Joseph Veech

Committee Member: Dr. Ivan Castro-Arellano

Tuesday, June 25, 2019, 10 a.m., Norris Conference Room

Abstract: Understanding the spatial and temporal habitat associations of rarely encountered species is an important component of understanding their ecology. Barking frogs (*Craugastor augusti*) and Cliff-chirping frogs (*Eleutherodactylus marnockii*) are rarely encountered inhabitants of the rugged limestone terrain of the western Edwards Plateau of Texas. In order to explore the mechanisms of co-occurrence between these two species in a spatially restricted environment, I examined the habitat-use and dispersion patterns within and between these species. Six caves varying in length from 6 to 120 m were surveyed monthly from January through December 2017. Additionally, one cave was also surveyed at 6 h intervals across a 24 h period, quarterly. The locations of individuals with respect to cave entrance were recorded during each survey. Caves were used continuously rather than as temporary daily or seasonal refugia. Both species were present day and night throughout the year with peak abundance observed during spring-summer and summer-fall for *E. marnockii* and *C. augusti* respectively. Cave occupancy was not restricted spatially or temporally during the 24 h period or seasonally. Both species were found throughout the entire length of each cave but differed in patterns of microhabitat use. Individuals of *C. augusti* used elevated open faces greater than expected, while *E. marnockii* used this microhabitat less than expected. *Eleutherodactylus marnockii* exhibited seasonal patterns of intraspecific aggregation within caves whereas *C. augusti* did not. However, nearest-neighbor distances consistently failed to reveal evidence of interspecific repulsion or aggregation. The sole exception was that during peak abundance of *C. augusti*, *E. marnockii* displayed a repulsed pattern of dispersion away from the larger-bodied *C. augusti*. This repulsion may be a predator-avoidance behavior. This study is a primer to further investigations into the ecological interactions between these two ecologically specialized anurans.

Bio: Grady was born and raised in central Texas. He earned his B.S. in Wildlife Biology at Texas State University during 2015 and spent the next year working various field biology jobs. He was accepted into the Texas State Biology Graduate Program in the fall of 2016 working with Dr. Ott and Dr. Veech to mentor his research. Upon graduation, Grady plans to continue working as a field biologist for a consulting firm.

Dissertation Defense

A CONSIDERATION INTO WAYS BIOLOGY-BASED STUDENT ORGANIZATIONS FACILITATE PARTICIPATION
IN STEM

Zachary L Nolen

Major Advisor: Dr. Kristy L Daniel

Committee Members: Dr. Carrie Bucklin, Dr. Ivan Castro-Arellano, Dr. Eleanor Close, and Dr. Paula
Williamson

Wednesday, June 26, 2019, 11:00 a.m., Supple 257

Abstract: Over the past decade, there has been a strong push for ways of increasing the leaky STEM pipeline that results in students leaving STEM fields. Researchers speculate that one reason students leave STEM is because students have not developed a strong perceived attachment to the field of science. One way that students may build this perceived attachment to science is through participation in science-based social organizations. The purpose of my study was to investigate how biology-based student organizations functioned as affinity groups and how these groups influenced individuals' perceived cohesion to science. I followed three biology-based student organizations, Biological Honor Society, Microbiology Club, and Wildlife Club, over the course of one academic year to identify the extent they exhibited the characteristics of affinity groups. After collecting and analyzing data from field observations, I found that all three groups exhibited the criteria of affinity groups to various degrees. Through analyzing student responses to an open-ended questionnaire, I was able to uncover the motivations students had for joining their respective student organizations and what benefits they reported receiving from their participation. I found three major overarching themes for what motivated students to join their respective student organization: they liked the content the organization was based on, to meet some form of social need, or the reputation of the organization drew them into the organization. Students reported a wide range of benefits they received from their participation in these organizations. I grouped these benefits into five overarching themes: Networking, Professional Development, Learning Opportunities, Community Involvement, and Prestige. I found that there was some overlap between students' motivations for joining their student organization and what benefit they received from their participation. With this overlap, I speculate that a feedback loop exists where students join an organization for a specific reason that guides what events they choose to participate in which then leads into the benefit they receive from their participation. Now that we better understand how these organizations function, what motivates students to join content-based student organizations, and what they are getting from their experiences, we can further promote these groups to new students. By joining a content-based student organization, students will be better able to find their place in science through networking with others in their field and honing and developing skills that they can take into the workforce, ultimately making them more competitive on the job market.

Bio: Zach was born and raised in central Alabama. He earned his B.S. in Biology from the University of North Alabama in Florence, Alabama and his M.S. in Biology from the University of Alabama at Birmingham in 2014. He began studying under Dr. Kristy Daniel at the University of Southern Mississippi in 2014 before transferring with her to Texas State University where he joined the Aquatic Resources

program. Upon completing his doctoral degree, Zach plans to pursue his passion for teaching at the university level and help shape the next generation of scientists.

Dissertation Defense

UNDERSTANDING WIND ENERGY IMPACTS ON BATS AND TESTING REDUCTION STRATEGIES IN SOUTH TEXAS

Sara P. Weaver

Major Advisor: Dr. Ivan Castro-Arellano

Committee Members: Drs. Thomas R. Simpson, M. Clay Green, Cris D. Hein, & Amanda M. Hale

Thursday, June 20, 2019 10:00 a.m., Ingram Hall, room 3204

Abstract: Impacts from burning of fossil fuels, including climate change, are promoting an increase in development of renewable energy alternatives. In response, wind energy development is expanding at an exponential rate across the globe. However, wind energy development has long been known to directly impact bats, which incur fatalities at wind turbines when struck by moving turbine blades. In the U.S., Texas is the leading producer of wind energy with >13,300 commercially operating wind turbines while also having the greatest diversity of bats. Despite this, research in Texas on this topic is lacking with only a few wind energy facilities producing publicly available or peer-reviewed data. In this dissertation, I conducted one of the first comprehensive studies on wind energy impacts on bats at the Los Vientos Wind Energy Facility in Starr County, Texas, part of the Lower Rio Grande Valley. Using a novel fatality estimator, I estimated the bat fatality rate by megawatt (MW) and per turbine, and found a moderate to high fatality rate, in which Brazilian free-tailed bats (*Tadarida brasiliensis*) were the most impacted species. I also studied bat acoustic activity at wind turbines in relationship to weather covariates and fatalities to further our knowledge of conditions that potentially increase susceptibility to turbine strikes. My results revealed specific climatic and temporal conditions during which bats are most active at wind turbines, as well as a relationship between activity and fatality, thereby informing on conditions in which bats are more susceptible to fatality. Finally, I tested efficacy of a novel ultrasonic acoustic deterrent system to reduce bat fatalities at wind turbines. Results of this study indicate this technology is a promising tool for fatality reductions, and was one of the most successful field trials using acoustic deterrents in the world. Studies investigating wind energy impacts to bats are extremely relevant and necessary for conservation of impacted species, informing policy, and guiding wind energy development. Moreover, developing regional and site specific impact reduction strategies are important conservation actions. Results of my studies can be used to develop such strategies in other data deficient regions with similar climates and bat species such as the southwestern U.S. and northern Mexico, and applications of the acoustic deterrent technology I tested are global in reach.

Bio: Sara was born and raised in Carrollton, Texas. She graduated summa cum laude with her B.S. in Biology from Texas State University in 2009. She then went on to complete her M.S. in Wildlife Ecology in August 2012 while studying overwintering populations of Brazilian free-tailed bats in central Texas. After working as an environmental consultant for several years, she returned to complete her PhD in August 2015. In addition to her doctoral research, she currently works as a full-time biology lecturer at Texas A&M University-San Antonio (A&M-SA). Her decision to return for a PhD was due to her desire to become a tenure-track professor at A&M-SA once she graduates, and create a Wildlife and Fisheries degree program.

Dissertation Defense

RE-EVALUATING THE REPRODUCTIVE ECOLOGY OF THE ENDANGERED HOUSTON TOAD (BUFO [=ANAXYRUS] HOUSTONENSIS) USING AUTOMATED AUDIO MONITORING TECHNIQUES

Andrew R. MacLaren

Major Advisor: Dr. Michael R.J. Forstner

Committee Members: Drs. Ben M. Bolker, Shawn F. McCracken, J. Andrew Royle, & Floyd W. Weckerly.

Wednesday, May 29, 2019, 9:00AM, Supple 257

Abstract: The Houston Toad (*Bufo* [=Anaxyrus] *houstonensis*) is a diminutive species of toad endemic to the gulf coastal and east-central sand counties of Texas. The species has been in perpetual decline since being described in 1956. In 1970 it was granted status as federally endangered. There has been sustained interest in recovering this species over the last 5 decades, and my dissertation sought to apply technological innovations towards improving our approach to monitoring for this species long-term. I utilized automated audio recording devices to collect data from potential breeding locations for this species from 2014-2018, but archives of these data date back to 2010. I used automated detection software to develop a recognizer for the distinct call that male Houston Toads produce. This enabled me to re-evaluate the daily and seasonal activity of the Houston Toad from multiple locations throughout its current geographic distribution. I found that temperature and humidity are the most influential abiotic environmental variables that influence chorusing behavior. I monitored locations with the greatest abundance of toads continuously from years 2015-2018, and utilized these data to assess the limitations of repeat aural surveys for this species. I tested the influence of both survey length and survey number on the probability of detection, along with investigating whether selecting against environmental thresholds improved detection overall. I found that the current suggested minimum number of annual surveys (11) is too few, even for surveys of increased duration. In a separate study I evaluated the landscape induced heterogeneity in detection probability and found that surveys conducted through forested areas are likely ineffective, and suggest surveyors minimize the distance between chorusing locations and survey points whenever possible. Finally, I evaluated the voice and general morphology of the Houston Toad relative to its nearest related congener the Dwarf American Toad (*B. americanus charlesmithi*). I found that once preserved these species are physically indistinguishable. The calls of each species varied widely by dominant frequency, both among and within species. Each of these studies provide information that is critical to improving the approach and outcome of long term and range wide monitoring for this critically endangered species.

Bio: Andrew grew up around the towns of Bay City, Michigan and Houston, Texas. He received his B.S. in Biology from Texas State University in 2013, and after a short hiatus returned to pursue a Masters, and ultimately a PhD. Andrew has been a lifelong musician, and builds electric guitars and basses in his sparse free-time. It is his affinity for music, and all things that make noise, that enabled him to flourish in his dissertation research studying the songs of frogs and toads.

Dissertation Defense

DETERMINING THE STATUS AND DISTRIBUTION OF THE EASTERN BLACK RAIL (*LATERALLUS JAMAICENSIS*) IN COASTAL TEXAS

Amanda A. Haverland

Major Advisors: Dr. Floyd Weckerly & M. Clay Green

Committee Members: Dr. Thom Hardy, Dr. Chris Butler, & Dr. Paul Leberg

Friday, May 3, 2019, 8:30 a.m., Ingram Hall 3204

Abstract: The black rail (*Laterallus jamaicensis*) is a small and secretive marsh bird that inhabits coastal high marshes and freshwater wetlands throughout the Americas and is a species of conservation concern. In Texas, winter migrant and breeding populations of the eastern black rail (*L. j. jamaicensis*) are known to occur in disjunct wetlands along the Gulf Coast. Black rail distribution and life history, however, are poorly studied in Texas. I studied the spatial ecology and habitat requirements of black rails in marshes of the Texas Gulf Coast from 2015 to 2018. Through the application of occupancy models, radio telemetry, capture-recapture studies, and a geographic information system, I provide an evaluation of factors that influence the distribution of black rails at multiple spatial scales in coastal Texas. Using occupancy data, I developed a species distribution model for the black rail in coastal Texas to identify important areas for the bird on a landscape-scale. I found positive associations between black rail occurrence and average annual precipitation as well as herbaceous vegetation density. Using radio telemetry, I tracked individual black rails during winter to estimate home range size and examine habitat associations at the home-range scale. I also looked at effects of disturbance from prescribed fire within black rail habitats. Prescribed fire is a common method used to manage the coastal marshes inhabited by black rails. My studies provide information that is crucial for beginning to understand black rail distribution in coastal Texas as well as for managing habitat for the species.

Bio: Amanda was born and raised in the suburbs of Chicago where she fell in love with the forest, nature, and especially birds. After obtaining a bachelor's degree in art & technology, she switched gears to follow a passion for wildlife and moved to San Marcos to pursue a graduate degree at Texas State in wildlife ecology. Since then, it's been an amazing and challenging 7-year journey from masters to PhD and she will miss being a grad student (sort of), but she's finally ready to fledge.

Thesis Defense

Elk population dynamics when carrying capacities vary across and within herds

Lisa Koetk

Major Advisor: Dr. Floyd Weckerly

Committee Members: Dr. Adam Duarte & Dr. Todd Swannack

Wednesday, April 17, 2019, 8:30 a.m., Ingram Hall 4102

Abstract: Variation in carrying capacity (K) across and within populations should impact population dynamics and stability. I fit linear regressions using Bayesian statistics to seven time series of population survey data of elk (*Cervus elaphus*). I explored the effects of variation in K across herds (i.e., populations) and temporal variation in r_{max} and strength of density dependence within herds at a landscape scale. I also estimated stochastic fluctuations in abundance around K for each herd. I checked for biases from observer error by comparing the results of the regressions to state-space Ricker models fit to the same time series. The regressions were likely not biased much by observer error due to accurate survey methods. My results indicate that r_{max} was similar across herds due to similar life history traits, while K and strength of density dependence varied across herds. Also, r_{max} and strength of density dependence varied temporally within herds. Variation in r_{max} is traditionally viewed as being generated from density-independent factors such as climatic variables, but the variation might also be generated from individual movement. I also found that herds with smaller K will have stronger density dependence, higher temporal variation in the strength of density dependence within herds, and less fluctuation in abundances around K . These results have implications for population conservation and land management, especially in the face of ongoing environmental changes which might affect population stability.

Bio: Lisa grew up in Redmond, Washington. She graduated from St. Olaf College in Northfield, Minnesota, in 2016 with a B.A. in Biology. She then received a Fulbright grant to conduct research in India, where she studied the diets of livestock and wild herbivores in high elevation alpine meadows of the Himalayas. She will be beginning a Ph.D. program in the fall at the University of Northern British Columbia, where her dissertation will be focused on moose foraging and movement ecology after a mountain pine beetle outbreak.

Thesis Defense

Interaction of IBR5 And Small GTP-BINDING Proteins in Groth and Development of Arabidopsis I

Idrees Ahmad

Major Advisor: Dr. Nihal Dharmasiri

Committee Members: Dr. Sunethra Dharmasiri, Dr. Hong-Gu Kang & Dr. Ratnayaka

Tuesday, April 9, 6:00 p.m. Norris Room

Abstract: Auxin is a plant hormone that regulates plant growth and development. Auxin controls the expression of auxin-responsive genes by regulating the degradation of a group of transcriptional repressor proteins known as Aux/IAAs (AUXIN/INDOLE-3-ACETIC ACID) via the ubiquitin-proteasome pathway involving nuclear auxin receptors. Recent studies have demonstrated that a dual-specificity phosphatase, INDOLE 3 BUTYRIC ACID RESPONSE5 (IBR5) is involved in auxin signaling. Previous studies indicate that several GTP binding proteins regulate auxin responses in plants. The aim of this study was to uncover the role of the interaction between IBR5 and small GTP binding proteins in auxin signaling using biochemical and genetic analysis. According to our yeast two-hybrid screen, in vitro binding assays, and co-immunoprecipitation studies, IBR5 physically interacts with several small GTP binding proteins. To analyze genetic interaction double mutants were generated between *ibr5* mutants and several mutants of small G proteins in Arabidopsis. Results indicate that *ibr5*,small G proteins double mutants exhibit altered growth patterning of epidermal cells when compared to wild-type or single mutants. At least one Small G protein mutant suppresses the auxin insensitive phenotype of *ibr5-4* suggesting that interaction between these small G proteins and IBR5 play an important role in plant auxin response.

Bio: Idrees Ahmad was born and raised in Philadelphia, PA and attended Central High school. He had a strong desire to pursue Biology and eventually completed his undergraduate degree in Biology at Xavier University of Louisiana in 2016. He later joined the lab of Dr. Nihal and Sunethra Dharmasiri at Texas State University to pursue his M.S degree. After completion of his M.S he is interested in pursuing jobs in the agritech industry.

Thesis Defense

Molecular analysis of Haemogregarinidae in freshwater turtles

Stephanie C. Nordmeyer

Major Advisor: Dr. Dittmar Hahn

Committee Members:

Dr. David Rodriguez, Texas State University

Dr. Michael Forstner, Texas State University

Tuesday, April 9, 2019 5.00 p.m., IGRM 4104

Abstract: Habitat fragmentation and other environmental stressors are major factors in declines of biodiversity and can impact threatened animal populations. To aid in conservation efforts, individuals from affected animal populations are sometimes removed from at-risk areas to be bred in captivity, after which the resulting offspring are released back into the environment. This strategy is commonly applied in conservation efforts on turtle populations. These turtles are often stressed, and consequently are more susceptible to diseases and parasites. In addition, captive propagation can increase the risk of disease or parasite transmission due to high density propagation and transport. In freshwater turtles, parasites are specifically represented by members of the Haemogregarinidae. Three genera, Haemogregarina, Hemolivia and Hepatozoon, are the most common parasites found in turtles. We determined the prevalence of these parasites in different freshwater turtles and tested for host-parasite associations. Samples were collected from eight different locations, and classified as Wild, Captive, or Wild Caught Captive Raised which comprised of 326 blood samples from six turtle families. SybrGreen-based qPCR detected Haemogregarinidae in 88 of these samples. 53% of individuals belonging to the Bataguridae, 26% belonging to the Emydinae and 23% belonging to the Kinosternidae were infected. No infections were detected in members of the Chelidae, Pelomedusidae, and Trionychidae. Comparative sequence analyses of PCR products indicated preference of parasites from the genus Hepatozoon for the Bataguridae, and those from the genus Haemogregarina to the Emydinae. Infections of single individuals by other genera were generally related to transport phenomena or captivity status, and therefore potentially artifacts.

Stephanie was born in Austin, Texas. She graduated from Texas State University in 2017 with a B.S. in Microbiology. After completing her M.S. in Biology, she will attend the University of Texas Health and Science Center in pursuit of her PhD.

Thesis Defense

Stormwater and Non-Point Source Pollutants in Sessom Creek, San Marcos, TX

Dalila Jazmin Loiacomo

Major Advisor: Dr. Benjamin Schwartz - Texas State University and Edwards Aquifer Research and Data Center.

Committee Members: Dr. Weston Nowlin - Texas State University & Dr. Thom Hardy | Texas State University

Tuesday, April 9, 2019, 1:00 p.m., Freeman Aquatic Biology Building 130

Abstract: The primary goal of this project was to evaluate and model the transport (timing and amounts) of non-point source pollutants (NPS) from the Sessom Creek watershed into the Upper San Marcos River (San Marcos, Texas) during storm events. Sessom Creek is a small and heavily urbanized tributary of the Upper San Marcos River, a spring-fed river from the Edwards Aquifer. Runoff is extremely rapid in the high-gradient Sessom Creek watershed, and there are no significant stormwater retention or detention structures in the watershed. Therefore, rapid transport and loading of contaminants from Sessom Creek into the San Marcos River occurs during storm events. This is a concern due to the presence of several federally endangered or threatened species in the river, and its heavy recreational use. Twelve storm events were sampled during 2018 with an ISCO automatic sampler. NPS pollutants, including total/volatile/non-volatile suspended solids, nutrients (dissolved and total forms of nitrogen and phosphorous), and bacteria (*E. coli*) were analyzed in all samples using standard methods. Results indicate that transport and loading of stormwater pollutants to the river are highly variable and primarily dependent on the peak flow, maximum rain intensity, and antecedent rain. Increases in discharge and peak flow can occur within 5 minutes of rain. Most of the load is transported during the first hour of a storm event, and peak concentrations of pollutants often occur before the peak flow for each event, suggesting that remediation efforts should focus on detention and retention to avoid transport during the first flush portion of the hydrograph.

Bio: Dalila was born in Buenos Aires, Argentina and was raised in Boconó, Venezuela. She moved back to Argentina to study Environmental Science, where she participated in a project to study the impacts of industrial agriculture in water. In 2013, she studied abroad at the University of Sao Paulo, Brazil, where she took more water-related courses and learned a new culture. She graduated from her BS in 2016, her passion for water brought her to study her MS at Texas State University. Currently, she is looking for new opportunities to work on the protection and sustainable management of water resources

Thesis Defense

The Role of IBR5 in Regulating Plant Auxin Response Through the SCFTIR1/AFBs Complex

Timothy J. Cioffi

Major Advisor: Dr. Nihal Dharmasiri - Texas State University, Department of Biology

Committee Members: Dr. Sunethra Dharmasiri - Texas State University, Department of Biology & Dr. Hong-Gu Kang - Texas State University, Department of Biology

Monday, April 8, 2019, 5:30 p.m., Supple Science Building 112

Abstract: Plant growth and development is a highly regulated process that involves synthesis, cellular transport, and perception of the growth hormone indole-3-acetic acid (IAA). Cellular responses to auxin involve the degradation of the Aux/IAA family of repressors through SCFTIR1/AFBs complex, which is composed of ASK1, CUL1, RBX1, and the F-box protein TIR1/AFBs, subsequently modulating the expression of auxin-related genes to control growth and development. Previous studies identified IBR5 as a gene involved in the auxin response pathway, as primary root growth of *ibr5* mutants exhibited insensitivity to indole-3-butyric acid (IBA), a precursor to IAA in plants, as well as IAA and other auxin analogues. Additionally, *ibr5* is defective in several other hormone and stress response pathways. Interestingly, Aux/IAs are rapidly degraded in *ibr5* mutants, which is contrary to other mutant genes identified in the auxin signaling pathway. This research sought to characterize the role of IBR5 in regulating the auxin response pathway. Previous results indicated that SCFTIR1/AFBs subunit, ASK1, interacts *in vitro* with IBR5. Results of this research indicate that steady state levels of ASK1 and TIR1 proteins are subjected to modulation in *ibr5* mutant and 35S:IBR5-Myc overexpression lines, suggesting direct or indirect regulation of these SCF components by IBR5. Since SGT1b is also known to regulate TIR1 abundance, the genetic interaction between IBR5 and SGT1b was also analyzed. *ibr5, sgt1b* double mutants show increased auxin resistance compared to single mutants. Collectively, findings in this study suggest that IBR5 may be involved in proper subcellular localization of TIR1 through an unknown mechanism.

Bio: Tim was born in Grapevine, TX, where he grew up, and was involved in Drumline before he graduated from Colleyville Heritage High School in 2010. He later attended Texas State University, performing undergraduate research under Dr. Jim Ott, and graduated with a B.S. in Biology in 2016. After graduating with a M.S. in Biology at Texas State University he will be pursuing a PhD at Indiana University – Bloomington in Genome, Cell, and Developmental Biology.

Thesis Defense

Perceptions of Principals in a Science and Mathematics Professional

Development Program

Sara M. Hanson

Major Advisor: Dr. Sandra West, Texas State University

Committee Members: Dr. Julie Westerlund, Texas State University, Dr. Emily Summers, Texas State University, Dr. Sandra Browning, University of Houston-Clear Lake

Monday, April 8th, 4:00 pm, Supple 257

Abstract: The need for qualified individuals to fill positions in science, technology, engineering, and mathematics (STEM) careers has increased the attention on STEM education over the last decade. Therefore, a greater need exists than ever to ensure that students have a deeper understanding of science and mathematics. The available literature emphasizes the need for quality science and mathematics education, specifically the integration of science and mathematics in the classroom. Professional development can be utilized to better enable teachers to employ best practices in their science and mathematics teaching. However, effective professional development must adhere to best practices. Moreover, studies have shown that teachers are more likely to utilize learning from professional development and more effectively implement strategies and approaches gained during attendance if they have the support of their principal. My study aimed to find teacher and principal perceptions of a science and mathematics leader and the support that they provide their teachers when attending a science and mathematics-specific professional development program. I used a mixed-methods approach to answer my research questions. My results showed that teachers and principals identified common qualities and behaviors in principals that support teachers' science and mathematics instruction. The principal characteristics identified by participants were many of the same qualities and behaviors described by the professional development program to enhance teachers' science and mathematics instruction. Further studies would need to be conducted to confirm the results of my study before making recommendations. However, once additional studies have been conducted, recommendations could potentially be made to involve principals more in science and mathematics-specific professional development with their teachers in order to enable principals to have a better understanding of what quality science and mathematics support is and how it can best be supported by principals.

Bio: Sara was born in Dallas, TX and raised in Austin. She graduated from Texas State University in 2008 with a B.S. in Bilingual Elementary Education. After teaching 3rd and 4th grade in Austin ISD for seven years, she decided to pursue an M.S.I.S. in Interdisciplinary Studies with a concentration in Science, Mathematics, and Technology Education for Elementary and Middle School Teachers. She returned to the classroom as a 4th grade mathematics and science teacher in the fall of 2018.

Thesis Defense

Rumen-reticulum organ mass and rumen mucosa surface area of white-tailed deer
(*Odocoileus virginianus*) consuming two diets

Sterling Spilinek

Major Advisor: Dr. Floyd Weckerly

Committee Members:

Dr. Ivan Castro-Arellano, Texas State University

Dr. M. Clay Green, Texas State University

Friday, April 5, 2019, 11:00 a.m., IGRM 3204

Abstract: Ungulate diets display spatial and temporal variation. To accommodate dietary variation, elasticity, organ mass, and absorptive capacity presumably change in the rumen-reticulum. The gastrointestinal organs with most of the capacity and where most digestion occurs. I measured rumen-reticulum organ mass and absorptive capacity in white-tailed deer (*Odocoileus virginianus*) collected at Kerr Wildlife Management Area, Texas. I hypothesized that nutrient poor diets would result in greater mass-specific food intake because of low nutrient concentrations. The consequence would be heavy rumen-reticulum organs and low absorptive capacity. Since weaning, deer were fed a pelleted diet, ad libitum, of 1.77 or 2.67 kcal/gm digestible energy. In December 2017, 4.5- and 5.5-year-old deer were euthanized, the rumen-reticulum was extracted, thoroughly rinsed, rung out, and weighted. Four, 1 x 3 cm samples were cut from four regions of the rumen. The samples were fixed in ExCell plus™ for 24 hours, then preserved in 70% ethanol until measured. For each 1 cm² sample, I measured length and width of 10 randomly selected papillae, counted papillae density, and calculated a surface enlargement factor (SEF). My surrogate of food intake was first molar height measured on the right side of the jaw. Diet consumed by deer was unbeknownst to the measurer. Analyses of general linear models indicated that deer consuming the low energy diet had higher food intake, heavier rumen-reticulum organs, and lower SEF than deer consuming the higher energy diet. White-tailed deer adjust rumen-reticulum morphology to maintain digestive functions when diets vary in energy content.

Bio: Sterling was born and raised in Douglas Wyoming. He graduated from Whitman College in 2014 with a B.A. in Biology. After completing his M.S. at Texas State University, he is planning to move back to the rocky mountain region in pursuit of a job.

Thesis Defense

EFFECTS OF COBALT ON CHROMOBACTERIUM VIOLACEUM QUORUM SIGNALING IN THE ABSENCE AND PRESENCE OF OXYGEN

Sahar Kianarsi

Major Advisor: Dr. Robert JC McLean- Texas State University, Department of Biology

Committee Members: Dr. Manish Kumar- Texas State University, Department of Biology

Dr. Karen Lewis- Texas State University, Department of Chemistry and Biochemistry

Friday, April 5, 2019, 10:00 a.m., IGRM 3207

Abstract: Bacteria exist as colonial organisms, that utilize signaling system for communication. Quorum signaling is a cell-density dependent cell-to-cell bacterial communication which regulates several phenotypes such as biofilm formation, pigmentation, and virulence. *Chromobacterium violaceum* is a gram-negative, facultative anaerobic bacterium dwelling in the soil and water of tropical environments. Quorum signaling is responsible of the *C. violaceum* biofilm formation and violacein production, deep purple pigment. Several biological and organic molecules have been identified as quorum signaling inhibitors. Previous research showed that sub-lethal concentrations of heavy metals such as cadmium and nickel inhibited *C. violaceum* quorum signaling. These inhibitory effects of heavy metal divalent cations were shown in violacein production, virulence, biofilm formation, and gene expression. In this study, we showed that cobalt inhibited floc biofilm formation in both aerobic and anaerobic conditions, but did not affect attached biofilm. This study is the first report of the effects of heavy metal on quorum signaling inhibition of *C. violaceum* in anaerobic condition.

Bio: Sahar moved to US from Tehran, Iran, where she received her Bachelor in microbiology. In 2016, she joined the graduate program in Biology at Texas State University. After graduating wit

Thesis Defense

Influence of Surface and Near-surface Geology on Fish Assemblages in the Colorado River basin of Texas

Peter J. Pfaff

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

Committee Members:

Dr. Alan Groeger, Department of Biology, Texas State University

Dr. Benjamin Schwartz, Department of Biology, Texas State University

Tuesday, April 2, 2019, 2:00 p.m., FAB, Room 130

Abstract: Fish communities are distributed heterogeneously within river basins. This heterogeneity is attributed to a number of physical, chemical, and biological processes. Among river basins that traverse a diversity of geological strata, physical and chemical properties of geological strata influence stream characteristics and regional aquatic communities. Likewise, stream characteristics and aquatic communities of geological strata (i.e., georegions) can respond differently to anthropogenic stressors. Purposes of this study were to assess the influence of geological strata (i.e., georegions) on stream characteristics and fish communities in the Colorado River basin of Texas, a representative western gulf slope basin of southcentral USA, and determine if anthropogenic stressors differentially affect fish communities by georegion. Using measures of discrete (i.e., georegions, stream type) and continuous (e.g., stream order, distance from river mouth) community variation (i.e., spatial delineations), I found that georegion, stream type, stream order, and distance from mouth distinguished stream characteristic types within the basin, but only georegion explained a significant portion (41%) of the fish community variation. Using fish community changes between time periods (1933 to 1980; 1981 to 2017), which generally corresponds with pre- and post-dam constructions within the basin, I found that anthropogenic flow alterations had more of an effect on fish communities in some georegions than others. My findings support the concept of geological strata having a hierarchical influence on stream characteristics and aquatic community heterogeneity within a basin, and that anthropogenic modifications can differentially affect aquatic communities, depending on factors associated with geological strata (i.e., stream characteristics). Potential benefits of this work include understanding factors influencing the heterogeneity in aquatic communities and the role of anthropogenic stressors across georegions (e.g., prairie streams, karst terrains, lowland coastal rivers) within and outside the western gulf slope basins.

Bio: Peter was born in Seoul, South Korea but grew up in Kansas and Texas. After graduating from Lutheran South Academy in Houston Texas, he began his coursework at Concordia University Texas where he graduated cum laude with a degree in biology in 2009. Following graduation, he moved to Japan and worked as an English teacher and school manager. In 2016, Peter returned to Texas and entered the Graduate College at Texas State University-San Marcos in June the following year.

Dissertation Defense

FOSSIL ANGIOSPERM WOODS FROM THE JOSE CREEK MEMBER OF THE MCRAE FORMATION

Joan M. Parrott

Co-Chairs: Dr. Paula Williamson and Dr. Garland Upchurch, Jr

Committee Members: Dr. Chris Nice, Dr. Lisa Boucher and Dr. Cindy Looy

Monday, April 1, 2019, 9:30 a.m., SUPP 153

Abstract: The Jose Creek Member of the McRae Formation, south-central New Mexico, preserves a diverse angiosperm flora of Late Campanian (76.5 to >72.5 Ma) age. The site is of special interest because it provides an abundance of fossil evidence in the form of leaves, reproductive structures, and silicified woods found in situ and as float. The wood flora is the third most diverse Cretaceous wood floras in the world. Approximately thirty-four species of non-monocot angiosperms have been discovered. Many of the McRae xyloids are common elements in other Cretaceous wood assemblages. Most magnoliids represent Lauraceae (~seven wood types), a dominant element in modern Asian tropical and subtropical vegetation. Two genera (*Agujoxylon* and *Metcalfexylon*) with exclusively scalariform perforation plates co-occur in assemblages in the southwest of North America. Four xyloids have a combination of exceptionally wide (>10 cells wide) and nearly homogeneous rays, features that characterize extant *Platanus*. The *Platanus*-like woods fall outside the generic limits for *Platanoxylon*, warranting a new genus. The Forest of Giants is an assemblage of exceptionally large angiosperm in situ stumps that represent a riparian forest preserved in a sequence of fluvial sandstones. The site is dominated by one species of *Paraphyllanthoxylon* with wood anatomical features that suggests affinity with the extant family Kirkiaceae. One McRae *Paraphyllanthoxylon* stump is the largest Cretaceous angiosperm stump yet recorded worldwide. Three individual stumps represent probable Lauraceae, Sapotaceae and Urticales (Rosales). Woods from the Forest of Giants add to a growing body of evidence from in situ assemblages for large angiosperm trees as dominants during the Late Cretaceous, especially in regions of warmer climate such as the southern Western Interior of North America. Affinities of most woods with simple perforation plates are, as yet, unidentified. The McRae Formation flora will provide unique insight into the stature and diversification of angiosperms at a critical period in their radiation.

Bio: Joan is originally from the small farming community of Alice, North Dakota. She earned a B.A and an M.A from the University of Texas at Austin in 1979 and 1982, respectively, both in the Department of Botany.

Thesis Defense

Response of Unionid Mussels Density and Distribution to Extreme Climactic Events in the Big Thicket Ecoregion of Texas

Alison A. Tarter

Major Advisor: Dr. Astrid N. Schwalb

Committee Members: Dr. Thom Hardy and Clint Robertson

Thursday March 28, 2019, 1:30 p.m., FAB 130

Abstract: The Big Thicket ecoregion located in (South)east Texas harbors the highest number of regional endemic freshwater mussel species and the highest diversity of unionid mussel in the state, including 5 of the 14 state threatened species. Unfortunately, mussels in this region are threatened by pollution, habitat alteration and destruction due to human impact caused by petrochemical activities, climatic changes and urbanization. The goals of this project were to (1) survey mussels in the Big Thicket National Preserve, particularly in the poorly surveyed southern portion of the preserve, and (2) to examine historical changes in mussel communities. In addition, DNA samples were taken and the analysis of 97 mussels informed identification of eleven species, some of which can be difficult to distinguish morphologically. A total of 39 sites in the Lower Neches River, Village Creek and Pine Island Bayou basins were surveyed. Historical data from 2014 were available for 13 of these sites and were used to examine the impact of extreme flooding in 2017 to different parts of the basin. Comparison with data from 2002 were restricted to 10 sites in the Village Creek sub-basin. The survey showed that species richness and mussel densities generally increased from upstream tributaries towards lower Village Creek and mainstem Neches, where rare and threatened species were mostly found. Evidence for recruitment was mostly found in the backwaters of the lower Neches, which may act as refuge during flooding. Declines between 2014 and 2018 were most severe in parts of the Neches basin that most likely experienced the highest shear stress during flooding based on the channel morphology. Declines were also detected when data from 2002 were compared with 2014 suggesting that the exceptional drought in 2011 may have also contributed to long-term declines in Village Creek. Future studies should examine the role of backwaters for recruitment of threatened mussels.

Bio: Alison is from Bridge City, Texas, she earned her B.A. from Stephen F. Austin University in 1999 with a major in Photojournalism and a minor in Graphic Arts. Alison's hobbies fishing, travel, medieval battle reenactment, and playing roller derby.

Dissertation Defense

Factors influencing community structure of riverine organisms: implications for imperiled species management

David S. Ruppel

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

Committee Members: Noland H. Martin, Department of Biology, Texas State University, Kenneth Ostrand, U.S. Fish and Wildlife Service, San Marcos, Texas, Jim A. Stoeckel, School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University, Joseph A. Veech, Department of Biology, Texas State University

Tuesday, March 26, 2019, 2:00 p.m., Freeman Aquatics Building, Room 102

Abstract: Riverine environments are dynamic with numerous biophysical components influencing community structure of riverine biota. Common theme among my dissertation chapters is the quantification of community structure related to biophysical components of riverine environments in an effort to identify mechanisms underlying community structure (e.g., species richness, species abundances, life history traits). Communities within two Texas river basins (i.e., Red River drainage, Colorado River drainage) include several species identified as imperiled species, either federally or by states. A goal for each chapter was to integrate patterns and processes of community structure with current efforts to list species under the Endangered Species Act or to mediate negative anthropogenic influences on species and communities. Chapter 1 addressed gaps in life history information, current distribution, and habitat associations for the Red River Shiner, an endemic cyprinid in the Red River basin. Information was used to estimate redundancy, resiliency, and representation of the Red River Shiner, following the framework of U.S. Fish and Wildlife Service in species status assessments and eventually listing decisions. Chapter 2 tested three theories related to largescale migrations of prairie stream fishes, using the federal candidate for listing Prairie Chub as a model organism. Chapter 3 was a fish community assessment of the upper Red River of Texas and Oklahoma and quantified historical to contemporary changes in occurrences and abundances of six species of greatest conservation need. Chapter 4 was a mussel community assessment of the Colorado River basin that identified georegion, along with associated substrates, stream gradient, and water quality, as more powerful predictor of community structure than smaller scale mesohabitat characteristics. Mechanisms of community structure are still elusive and in need of further investigation, but I was able to use a multiscale approach to advance the general understanding of processes influencing observed patterns among riverine biota.

Bio: David was born in Saginaw, Michigan but lived in the quaint town of Ishpeming in Michigan's upper peninsula for most his childhood. He graduated cum laude with his B.S. in Zoology from Northern Michigan University in 2012. David completed his M.S. in Aquatic Resources in August 2014 studying the effects of instream flow on larval fish diets in the San Antonio and Guadalupe Rivers. He began as a PhD student in 2015 and plans to complete his PhD in May 2019. Long term goals include pursuing a tenure-track professor position at an accredited university and establish a laboratory that focuses on studying riverine community ecology.

Thesis Defense

Intra- and Interspecies Variability in Mercury Concentrations in Texas Marine Fish and Shellfish

Kristyn D. Cunningham

Major Advisor: Dr. Jessica Dutton

Committee Members: Dr. Timothy Bonner and Dr. Weston Nowlin

Monday March 25, 2019, 2 p.m., FAB 130

Mercury (Hg) is a toxic nonessential trace element which can bioaccumulate in marine organisms and biomagnify up marine food webs, so top predators including tuna, swordfish, and sharks have the highest body burden. Humans are primarily exposed to Hg through seafood consumption. Fish in the Gulf of Mexico can have a higher Hg concentration than the same species in the connecting Atlantic Ocean, and all 5 states bordering the Gulf (TX, LA, MS, AL, and FL) have issued Hg advisories regarding fish consumption. This study investigated the concentration of Hg in 26 fish and 4 shellfish species (n = 1,468 samples) caught along the Texas coast during 2016 and 2017 using a Direct Mercury Analyzer and determined which species exceeded federal and state Hg advisory levels. The relationship between Hg concentration and body size was also examined for 26 of these species. Eighteen species, including king mackerel, red snapper, dolphinfish, red drum, and southern flounder had a positive relationship between Hg concentration and body length. One species, striped mullet, was found to have a negative relationship, suggesting that growth dilution was occurring. On average, Hg concentrations were highest in offshore fish species (e.g., blue marlin, cobia, sailfish, little tunny, and king mackerel), followed by nearshore fish species, and lowest in shellfish (e.g., blue crab, brown shrimp, and American oyster). Seven out of 12 offshore fish species had an average Hg concentration that exceeded the Texas Department of State Health Services (TDSHS) health-based standard of 0.7 $\mu\text{g/g}$ wet wt, and three of these species (blue marlin, sailfish, king mackerel) also exceeded the Food and Drug Administration (FDA) Hg action limit of 1 $\mu\text{g/g}$ wet wt. With the exception of gafftopsail catfish, none of the examined nearshore fish species and shellfish had an average Hg concentration that exceeded the Environmental Protection Agency (EPA) Hg human health criterion of 0.3 $\mu\text{g/g}$ wet wt, indicating that these species should be consumed if you want to limit your Hg exposure through seafood consumption.

Bio: Kristyn is from Marble Falls, Texas and earned her B.S. from Texas State University in 2016 with a major in Biology and minor in Chemistry. She enjoys collecting many types of cacti and her dream job is to work for Texas Parks and Wildlife.

Dissertation Defense

Predicting Future Range Expansion of Whooping Crane (*Grus americana*) Winter Habitat Using Long-Term Census and Remotely Sensed Data

Nicole A. Davis

Major Advisor: Dr. Thomas Hardy

Committee Members: Dr. M. Clay Green, Dr. Jennifer Jensen, Dr. Susan Schwinning and Dr. Elizabeth Smith

Monday, March 11, 2019, 8:00 a.m., Freeman Aquatic Building #102

The whooping crane (*Grus Americana*; referred to as cranes) is one of the most threatened crane species in the world and has been identified as an endangered species since 1967. The feasibility of meeting down-list objectives requires an assessment of space-use by cranes and of the amount of available habitat within the winter range to support the recovery goal population size. Using a long-term dataset on the locations of wintering cranes, I analyzed space-use strategies of subadult (Immature), associated (non-mating pair), and paired/family (mating pair) cranes using home range and core area estimators, developed a distribution model for wintering cranes, and explored potential carrying capacity limitations of the current winter range using a rule-based simulation model. I used location data for 42 color-banded cranes and kernel density estimators to identify the extent of winter home ranges and core areas. The resulting home range and core area estimates yielded similar spatial distributions identified by U.S. Fish and Wildlife Service annual winter monitoring, and identified a positive relationship between core area size and land cover diversity. I created winter crane distribution models using over 5,000 crane locations and combinations of 35 GIS-derived layers as environmental and ecological input in Maxent. The most parsimonious model included 11 data layers that best described crane distribution within the winter grounds and identified 181,000 ha of highly suitable habitat that could support an exponentially growing crane population. Using habitat suitability estimates from the crane distribution model, I developed a simulation model that mimics territory establishment by wintering cranes. I then used the model to explore rules on territory development and winter carrying capacity estimates. Overall, my results provide quantitative understanding of the distribution of wintering cranes and contributes to predicting future range expansion that will be required as the population increases towards down-listing goals.

Bio: Nicole A. Davis earned a B.S. in Biology from the University of Texas – San Antonio in 2007. She decided to continue her education at Texas A&M University- Corpus Christi where she completed a M.S. in Biology in 2011 and continue as a research associate identifying priority locations for restoration and conservation efforts within the mid-Texas Coast. As a Ph.D. student, Nicole continued her interests in research and conservation by participating in field studies for the endangered Whooping Crane and conducting habitat surveys using UAVs.

Thesis Defense

Invertebrate community structure and habitat associations in the arid Davis Mountains region of west Texas

Nina Noreika

Major Advisor: Dr. Weston Nowlin

Committee Members:

Dr. Astrid Schwalb, Texas State University

Dr. Benjamin Schwartz, Texas State University

Chad Norris, TPWD

Tuesday, February 19, 2019 8 a.m., Freeman Aquatic Biology Building 130

Abstract: In arid regions, springs often represent ecologically important aquatic habitats which are patchily distributed across the landscape. This separation can lead to localized endemic populations of organisms that exhibit small species distributions and are adapted to local environmental conditions. Desert spring aquatic organisms are also frequently of high conservation priority and are listed as imperiled and in need of protection. This study examined invertebrate community structure and habitat associations at seven sites in and around the Davis Mountains in the Trans Pecos region of west Texas. The overall purpose of this study was to determine mesohabitat associations and estimate population sizes of three endangered aquatic invertebrates found in the region: the Phantom springsnail (*Pyrgulopsis texana*), the Phantom tryonia (*Tryonia cheatumi*), and the diminutive amphipod (*Gammarus hyalleloides*). I conducted stratified random sampling at all sites quarterly for a year starting in March of 2017. Results indicate that the abundance of most of the endangered species was most strongly influenced by site (the particular location that was sampled) and that mesohabitat conditions were substantially less important in influencing the density of species. In addition, I found that two species of non-native and invasive snails (*Melanoides tuberculata* and *Tarebia granifera*) were found at most of the study sites sometimes at densities higher than populations of native invertebrates. These results suggest that regionally distributed invertebrates with low dispersal potential (such as snails and amphipods with no desiccation-resistant life stages) exhibit high site-specific occurrence. In addition, these results indicate that conservation of these populations in the wild should focus on site-specific objectives to preserve water quality and habitat conditions. However, this management strategy is complicated by the fact that these spring systems are interconnected by a larger regional groundwater pool. With agricultural demands and oil and gas development increasing in the Trans-Pecos region, the risk for groundwater over-pumping and contamination place individual and collective regional populations at risk.

Bio: Nina was born in northern Virginia and was raised in Newnan, Georgia. She graduated from Auburn University in 2015 with a BS in Organismal Biology: Ecology, Evolution, and Behavior. After completing her MS at Texas State University, she is moving to Prague to pursue her PhD in environmental engineering at Czech Technical University.

Thesis Defense

Using museum and citizen-science data to examine the range contraction of a threatened lizard species

Jared Haney

Major Advisor: Dr. Joseph Veech

Committee Members: Dr. Sarah Fritts, Dr. Chris Nice, Dr. Ivan Castro-Arellano

Wednesday, February 13, 2019, 1:00 p.m., IGRM 4102

I assessed the utility of museum and citizen-science databases for observing range dynamics of a species that is suspected to have experienced a significant contraction in recent decades, the Texas horned lizard (*Phrynosoma cornutum*). By integrating spatial data from two sources, VertNet and iNaturalist, into a GIS computing environment and segregating observations into five time periods, I calculated several metrics to characterize the size and location of the *P. cornutum* range over time. These metrics were based on fitting a minimum convex polygon (MCP) to the lizard observations of each time period. I compared the location of the range edge for consecutive time periods so as to test whether the range has been contracting in each of the four cardinal directions as assessed by distances between the historic center and recorded lizard observations and the distances between the historic center and the range edge. The area of the geographic range declined 10% between historic and current time periods. All four ANOVAs (one for each quadrant) comparing mean distance of lizard observations to the historic center revealed statistically significant differences among the time periods (East, $F_{4,462} = 66.5$, $P < 0.00001$; West, $F_{4,835} = 20.8$, $P < 0.00001$; North, $F_{4,927} = 81.4$, $P < 0.00001$; South, $F_{4,594} = 4.7$, $P = 0.0009$). For mean distance to the edge, only the East ($F_{4,81} = 5.0$, $P = 0.001$) and South ($F_{4,194} = 23.5$, $P < 0.00001$) had significant differences among time periods. The eastern quadrant was the only quadrant to experience a steady decline in mean edge distance and mean observation distance from the historic to the current time period. The southern quadrant is characterized by small sample sizes and erratic patterns of change among time periods. Range size and edge location in the northern and western quadrants remained relatively stable over time. The main conclusion is that the eastern portion of the *P. cornutum* range has contracted between 1960 and 2017. The exact cause of the contraction remains unknown, although it could be indirectly related to increasing human population density and landscape alteration in the eastern part of the range. The use of citizen science and museum records provides a level of data collection necessary for monitoring broad-scale range dynamics. MCPs and derived metrics provide a straightforward approach for monitoring range dynamics, although they may sometimes be prone to overestimate range size and may not be informative for irregularly-shaped distributions or for rare species. The methods employed in my study could be applied to other species that may be undergoing range contraction or expansion.

Bio: Jared was born in Humble, Texas and went to the Woodlands High School. He attended the University of Texas at San Antonio and received his B.S. in Biology in 2013. After a trial run of grad school at UTSA, a year of travel and a period of self-reflection, Jared began his masters in Wildlife Ecology at Texas State University in 2017.

Dissertation Proposal Defense

The role of life history strategies and drying events for mussel communities: A multiscale approach

Zachary Mitchell

Major Advisor: Dr. Astrid Schwalb Committee Members:

Dr. Thom Hardy, Texas State University

Dr. Todd Swannack, US Army ERDC Dr. Karl Cottenie, University of Guelph

Dr. Joshua Perkin, Texas A&M University

Wednesday, February 6, 2019, 11 a.m., Freeman Aquatic Building 104

Abstract: Drying events, such as anthropogenic dewatering and drought, which are predicted to occur more often and with greater intensity due to global climate change, pose a great risk to stream organisms requiring perennial flow. Freshwater mussels are particularly sensitive to drying events because they are relatively sessile and cannot easily escape disturbance events. Both drought and excessive water extraction pose a major threat in Texas. Therefore, the primary objective of this dissertation is to examine the role of drying events on mussel communities by using a multi-spatial, temporal and organizational scale approach. Chapter 1 investigates the role of life history strategies of mussels for the behavioral and physiological responses to drying events by utilizing lab experiments and a review of existing literature. Chapter 2 will examine how varying environmental conditions impact population dynamic rates of mussels with different life history strategies within three central Texas rivers using mark-recapture techniques. Chapter 3 will examine the role of life history strategies and other selective forces on mussel distribution and metacommunity structure along a longitudinal gradient of two central Texas rivers using spatial analyses of continuous survey and remotely sensed data. Chapter 4 examines long-term changes in mussel communities between two periods in four central Texas rivers in relation to a major drought event. Chapter 5 will provide a synthesis and attempt to develop a holistic conceptual model to predict the distribution and structure of mussel metacommunities in rivers subject to drying events based upon life history strategies and other selective forces.

Bio: Zach was born in Paris, Texas and raised in central Florida. He graduated from Mississippi State University in 2014 with a B.S. in Wildlife, Fisheries, and Aquaculture Science. Subsequently, he completed his master's degree in 2016 at Eastern Illinois University in Biological Sciences focusing on fisheries management. He started his PhD here in 2016 in Aquatic Resources.