Thesis Defense

ASSESSING THE INFLUENCE OF LANDSCAPE CHARACTERISTICS ON BAT FATALITIES AT SOUTH TEXAS WIND ENERGY FACILITIES

Houston L. Kimes

Major Advisor: Dr. Sarah Fritts
Committee Members: Dr. Erin Baerwald - University of Northern British Columbia
Dr. Weston Nowlin - Texas State University
Dr. Sara Weaver – Bowman

Wednesday, November 10, 2021, 12:00 PM
Attend in-person (with mask) in Norris Conference Room, Supple 376 or on Zoom:
https://txstate.zoom.us/j/99821378706?pwd=UTN1U1VRL1MrVmJMUTlMMll1MkVCZz09
Passcode: windbat

Although wind energy is a viable renewable energy source, it unintentionally causes bat fatalities by wind turbine blade strikes. Previous research has suggested wind energy facility siting and turbine placement within facilities influence the number of bat fatalities; however, there is a knowledge gap regarding the reasons for the variability. This study occurred in Texas, the leading producer of wind energy and home to the greatest diversity and largest colonies of bats in the United States. My objective was to assess the influence of landscape characteristics surrounding two wind energy facilities in southern Texas and around specific turbines at the facilities on the number of bat fatalities. We systematically searched and collected 1,067 bat carcasses under 200 wind turbines at Hidalgo and Los Vientos Wind Energy Facilities from 2017–2018. Total bat fatality estimates were then calculated by GenEst per species: Tadarida brasiliensis (n = 9663), Lasiurus intermedius (n = 2397), Nycticeius humerali (n = 798), L. ega (n = 740), L. cinereus (n = 331), L. xanthinus (n = 264), L. blossevilli (n = 85), Myotis velifer (n = 26), Nyctinomops macrotis (n = 26), Perimyotis subflavus (n = 5), and unknown spp (n = 1656). I used ArcGIS Pro to spatially analyze landscape characteristics at the two facilities and among the 100 wind turbines at each facility at multiple spatial scales (100 m, 500 m, 1 km, 5 km, and 25 km). Landscape characteristics included landcover types such as barren, crops, grassland, developed, shrub/scrub, hay/pasture, forest, wetlands, and open water, proximity to water sources, elevation, and degree of slope. Using generalized linear models, zero-inflated negative binomial models, and AIC model selection, results indicate that landscape characteristics at the broadest scale examined were most strongly associated with estimated bat fatality rates. I suggest minimization efforts such as acoustic deterrents, pre-construction risk assessments with adequate surveys of the landscape and nearby hibernacula, and a post-construction assessment to reduce bat fatalities. For post construction monitoring, I suggest increased or prioritized fatality monitoring of wind turbines in areas that include the landscape characteristics associated with increased bat fatalities, particularly for curtailment, as it is possible that only individual or a set of wind turbines need to be curtailed instead of all, which maintains the viability and socioeconomic advantages of wind energy.

Bio: Houston Kimes is from a small town south of San Antonio, Texas. She received her Bachelor's of Science in Wildlife and Fisheries Sciences at Texas A&M University in 2017, following her family tradition as a third-generation Aggie. She spent the 2018 summer conducting various wildlife surveys in Utah which sparked her love for mammals. Houston joined Dr. Sarah Fritts' lab in 2020 to pursue a Master's in

Wildlife Ecology. Houston hopes to continue contributing to the conservation and management of various taxa and their habitats.

Dissertation Defense

ALL IN THE FAMILY: THE EFFECTS OF URBANIZAITION AND WEATHER VARIABILITY ON THE BEHAVIOR, SOCIALITY, AND POPULATION DYNAMICS OF A KIN-STRUCTURED PASSERINE, THE BLACK-CRESTED TITMOUSE (BAEOLOPHUS ATRICRISTATUS)

Rebekah J. Rylander

Major Advisor: Dr. Sarah Fritts
Committee Members: Dr. Butch Weckerly - Texas State University
Dr. Andrea Aspbury - Texas State University
Dr. Thomas R. Simpson - Texas State University – Professor Emeritus
Dr. Michael Patten - Nord University

Monday, November 1, 2021 at 12:00 PM in Alkek 441/442

Attend in-person (with mask) or on Zoom - Meeting ID: 989 1440 8770, Passcode: titmouse https://txstate.zoom.us/j/98914408770?pwd=aUo0TXFYUXo0YTBmVG1HdjJVMU11QT09

Habitat fragmentation through urbanization poses a threat to avian biodiversity on a global scale. Though many species are capable of co-existing in anthropogenic landscapes, there often are compromises to survivorship, nesting success, and dispersal mechanisms. Avian species that are social can be further influenced by urbanization due to additional challenges of maintaining familial bonds. A residential species of central Texas, the black-crested titmouse (Baeolophus atricristatus, BCTI), is a social songbird that forms kin-structured neighborhoods in rural, less-disturbed regions of its range. However, the BCTI also is regularly encountered in anthropogenically impacted areas, yet it is unknown how this altered landscape affects BCTI demographics, behaviors, and sociality. Thus, the focus of my dissertation research was four-fold: 1) assess the influence of urbanization on BCTI kin-structured neighborhood formation; 2) examine how nesting success, productivity, and clutch initiation dates vary with habitat composition; 3) compare BCTI population demographics across varying levels of anthropogenic disturbance: and 4) examine fitness costs and benefits associated with BCTI familial-living through resource sharing behaviors. After nine years of capturing, color-banding, and monitoring family groups of BCTI in San Marcos, Texas, my research revealed significant differences between urban and rural populations. Urban BCTI have lower, less-stable apparent survival rates, form kin-structured neighborhoods less frequently, and begin nesting ~9 days earlier than rural BCTI. Moreover, BCTI occupying residential neighborhoods have smaller home range sizes but higher nesting failure than BCTI in any other urban or rural location. This is possibly due to the presence of bird feeders that decrease distances BCTI fly to obtain resources, but they also attract domestic cats and other predators. Additionally, BCTI share resources with extended kin but in a “quality over quantity” manner, where feeding bouts with kin are longer in duration but less frequent that expected. Thus, resource sharing is likely not a strong kin-selected behavior driving BCTI to maintain familial bonds with distant relatives. Overall, my dissertation results suggest that BCTI have adapted to urbanized landscapes but at a cost, and their inability to maintain stable kin-structure likely magnifies the stressors commonly encountered by wildlife in altered habitats.

Bio: Rebekah Rylander grew up in central Texas where she fell in love with birds during her bachelor’s degree at UT Austin. After a whirlwind of travel and field experience, Rebekah settled into Texas State University where she earned her master’s degree studying social flocking dynamics of the black-crested

titmouse. Because of the questions that surfaced after degree completion, Rebekah decided to continue working with titmice and their unique behaviors. During her limited spare time, Rebekah enjoys assisting undergraduates in research projects, performing banding station demos, and monitoring a local population of golden-cheeked warblers.

Thesis Defense

RED BAT MOVEMENT RESPONSE TO AN ULTRASONIC ACOUSTIC DETERRENT
IN FLIGHT CAGE TRIALS: IMPLICATIONS FOR REDUCING BAT FATALIES AT WIND FACILITIES

Brittany F. Stamps

Major Advisor: Dr. Sarah Fritts
Committee Members: Dr. Sara Weaver - Bowman Consulting
Dr. Amanda Hale - Texas Christian University
Dr. David Rodriguez – Texas State University

Monday, November 8, 2021, 1:00 PM

Attend in-person (with mask) in Norris Conference Room, Supple #376
or on Zoom https://txstate.zoom.us/j/91544993094?pwd=QStKZGhVYi85bnRVRVVEMU9kdHlwQT09
Passcode: ThermalBat

Wind energy is an essential aspect of combating climate change, but it is not without risks. Bat fatalities due to wind turbine blade strikes are an unintended consequence of this renewable energy source. To date, results from strategies to reduce bat fatalities have been inconsistent among species or too expensive to implement. Ultrasonic acoustic deterrents (UADs) are designed to create a disorienting airspace around wind turbines by emitting sounds that jam bat echolocation calls; however, field tests of UADs have had variable success among species. Variability may be due to higher-frequency sounds attenuating over shorter distances or, relatedly, due to bats not encountering their characteristic frequency range at greater distances from the UAD thus the UAD not effectively jamming bat echolocation. Red bats (Lasiurus borealis and Lasiurus blossevillii) are of particular interest as this species is commonly reported at wind energy facilities and existing data indicates UADs are not successful in reducing red bat fatalities. My objective was to compare the effectiveness of various sound emissions from an NRG Systems-manufactured UAD at deterring red bats and compare seasonal and sex differences in responses. During July-October 2020 and March-May 2021, I individually released red bats (n = 51) into a 60 x 10 x 4.5-m (L x W x H) outdoor flight cage located in San Marcos, Texas, USA. I tracked flight using thermal video cameras during three, four-minute trials of three frequency ranges: 20–32 kHz (low), 38–50 kHz (high), and 20–50 kHz (combined), interspersed by four-minute control periods (i.e., UADs powered off). I assessed differences in distances red bats flew from UADs and compared between each treatment and the control period using Kolmogorov-Smirnov analyses. Results indicated all treatments were similarly and significantly effective compared to controls, causing red bats to vacate treated airspace to similar distances during any treatment. These results indicate low-frequency ultrasound may provide a viable option to deter red bats, as the sound does not attenuate as quickly; thus, may be more effective at greater distances as wind turbine blade size increases.

Bio: Brittany Stamps was born in Oregon and raised in Houston, Texas. She graduated in 2017 from Texas A&M University with a B.S. in Wildlife and Fisheries Sciences. After working in the field for a few years, Brittany joined the Wildlife Ecology master's program at Texas State University in 2019.

Thesis Defense

USING SCENARIO PLANNING TO TEACH PRE-NURSING UNDERGRADUATES ABOUT MANAGING ANTIBIOTIC RESISTANCE

Toni Mac Crossan
Major Advisors: Dr. Julie Westerlund
Committee Members: Dr. Robert J. C. McLean & Dr. M. Greg Abel

Wednesday, November 3, 2021, 4:00 PM,
Zoom Meeting: https://txstate.zoom.us/j/91039652721?pwd=OTJ4NTdaaHZYRmxvMDN5eXloTTlxQT09
Meeting ID: 910 3965 2721 Passcode: antibiotix

Abstract: Pre-nursing undergraduates in the United States are required to take microbiology courses before they can apply to nursing schools, but newly graduated nurses in the US do not demonstrate a high knowledge of microbiology and related concepts, such as infection control, antibiotic resistance, and antibiotic stewardship. In order to mitigate this problem before students enter the clinical environment, new interventions must be introduced in microbiology courses to ensure students learn key microbiology concepts that can help them become better nurses. In this study, I wanted to evaluate these pre-nursing undergraduates' knowledge about antibiotic resistance, measure the changes in this knowledge before and after different types of instruction, and understand how students utilized a scenario planning-based activity in order to learn about antibiotic resistance. I designed a curricular intervention involving scenario planning in order to encourage pre-nursing students to think about how the antibiotic resistance crisis is expected to evolve over the next twenty years, and to consider their role in changing its impact on patients. To test the efficacy of this intervention, I first collected pre- and post-lab questionnaires testing students' knowledge of infection control, responsible antibiotic use, and antibiotic resistance in a control semester, in which the scenario planning intervention was not given. I then compared the data collected in the control semester to data collected using the same questionnaire tool in an experimental semester, in which all students participated in the intervention. Quantitative data measuring students' correct responses to multiple-choice questions in the questionnaire were compared statistically using two-tailed t tests, and qualitative data evaluating students' rationales behind their answers to these multiple choice questions were coded and compared descriptively. No significant quantitative differences were found between the control and experimental groups, but the conclusions drawn from qualitative data allowed me to better understand students' misconceptions about antibiotic use and resistance and the way those misconceptions fit into students' frameworks of scientific knowledge gained from coursework. I was also able to collect evaluation data that will help me to refine the educational intervention for future use.

Bio: Toni is from New Braunfels, Texas, and attended Texas State University for her B.S. in Biology, graduating in 2019. She has taught labs for BIO 2440 since 2018 and has developed a passion for teaching and learning about microbiology. Toni looks forward to pursuing a Ph.D. and continuing to teach about microbiology at the university level as a career.

Thesis Defense

EVALUATING SPECIES-SPECIFIC ACOUSTIC RESPONSE TO ULTRASONIC ACOUSTIC DETERRENT STIMULI FOR INCREASED EFFECTIVENESS OF DETERRENT TECHNOLOGY ACROSS SPECIES

Emma E. Guest

Major Advisor: Dr. Sarah Fritts
Committee Members: Dr. Amanda M. Hale (Texas Christian University), Dr. Sara P. Weaver (Bowman)

Tuesday, October 26, 2021, 2:00 PM
Attend in-person (with mask) in RFM 5242
or on Zoom https://txstate.zoom.us/j/92893298208?pwd=ZHplMTU4VHlpNkp5aHdFejZxdUZTQT09
Passcode: 981095

An unintended consequence of wind energy is bat fatalities caused by wind turbine blade strikes. Ultrasonic acoustic deterrents (UADs), produced to "jam" bat echolocation and cause airspace surrounding wind turbines to be undesirable, have resulted in lower overall bat fatalities in preliminary studies. However, effectiveness at the species level is variable, potentially due to some species altering their echolocation frequency during UAD emissions to resist jamming. My broad objective was to maximize effectiveness of an UAD by filling knowledge gaps regarding bat behavior during UAD emissions. Specifically, I compared changes in echolocation frequencies during three UAD frequency emissions among species, between seasons, and between sex. My hypotheses were 1) UAD emissions with frequencies most similar to each species' echolocation signatures would be more probable at altering the bats' echolocation, and 2) bat responses will vary between seasons and sex for each species. I released wild-captured bats into a 60 m- x 10 m- x 4.5 m (l x w x h) flight cage located in San Marcos, Texas, USA from July – October 2020 and March – May 2021 and monitored echolocation frequencies with ultrasonic microphones. I conducted field trials on cave myotis (Myotis velifer; n = 50), Brazilian free-tailed bats (Tadarida brasiliensis; n = 77), red bats (Lasiurus blossevilli, Lasiurus borealis; n = 45), evening bats (Nycticeius humeralis; n = 37), tricolored bats (Perimyotis subflavus; n = 8), northern yellow bats (Lasiurus intermedius; n = 3), southern yellow bats (Lasiurus ega; n = 4), and hoary bats (Lasiurus cinereus; n = 4). Results comparing shifts in various echolocation characteristics indicated species-specific ability to alter typical echolocation characteristics potentially resulting in jamming avoidance. Results supported my hypothesis that species with high frequency echolocation calls alter their echolocation signatures more commonly during high frequency UAD emissions and low frequency bats during low frequency UAD emissions. Additionally, echolocation responses varied between seasons and sexes for several species. Variations in responses may be dependent on species migratory status, differences in mating behavior and mating season, hormonal differences between sexes and seasons, or constraints on echolocation adaptability. Results offer possible explanation to the variability in effectiveness of UADs at reducing bat fatalities at wind turbines and provide information for potential adjustments to UADs for improved success.

Bio: Emma Guest followed in her brother's footsteps and graduated with a B.S. in Natural Resources Management from Texas Tech University in 2019. She spent her time in Lubbock working as an undergraduate research assistant for Dr. Richard Stevens, where her love for bat research and fieldwork began. She joined Dr. Sarah Fritts's lab at Texas State University in the spring of 2020 and will graduate with a M.S. in Wildlife Ecology in the fall of 2021.

Thesis Defense

Habitat-characteristic profiles: An intuitive approach to evaluate species-habitat relationships as demonstrated on several Texas scrubland bird species

Joseph Plappert

Major Advisor: Dr. Joseph Veech
Committee Members: Dr. Jason Martina, Dr. Jim Giocomo (American Bird Conservancy) Wednesday, October 20, 2021, 12:00 PM
Attend in-person (with mask) in Norris Conference Room
or on Zoom: https://txstate.zoom.us/j/95156363729?pwd=bTE5TjlSbnJNRmNXZDZjRFFvTFRyZz09
Passcode: 630394

Identifying the habitat characteristics that matter most to a species is crucial to understanding its basic ecology and conservation needs. Although species-habitat relationships are often considered complex and best understood with large, multi-faceted models, a simpler approach may prove fast, cost-effective, and powerful. I used logistic regression models to generate habitat-characteristic profiles (HCPs), a graphical interpretation method wherein a single habitat variable is plotted on the x-axis and the probability of species occurrence is on the y-axis. For a group of ten scrubland bird species, I evaluated four habitat variables, all related to vegetation structure: canopy cover, contagion index (a measure of spatial heterogeneity), broadleaf:juniper ratio, and mean canopy height. All four variables were measured remotely with canopy cover, contagion index, and broadleaf:juniper ratio being generated from remote-sensing satellite imagery of the National Agricultural Imagery Program and mean canopy height coming from LiDAR data of the Global Ecosystem Dynamics Investigation. All ten bird species are “species of conservation concern”, as identified by the Oaks and Prairies Joint Venture (OPJV). Model building was completed using seven years (2012-2019) of OPJV point count species presence-absence data. These data originate from 19 survey routes, in six Texas counties, for a total of 478 points. I used ArcGIS to circumscribe a 250 m radius circular buffer around each point and subsequently derive each of the four habitat variables within each buffer. Logistic regression models were developed to examine the effect of each habitat variable separately and in combination with the other variables. The models were compared using AIC. Competitive models ($\Delta AIC < 3$) were used to generate HCPs for each variable and species. HCPs proved to be an effective method for understanding and displaying species-habitat relationships and comparing among species. For most species, vegetation structure appeared to strongly influence species occurrence (habitat use) within the relatively small local area of the 250 m radius buffers. Furthermore, percent canopy cover alone was sufficient in explaining patterns of habitat use for the majority of focal species. This suggests that species-habitat relationships may be relatively simple, contrary to many habitat characterizations that sometimes include dozens of habitat variables. As a further assessment of the HCPs, I conducted model validation using two sets of independently collected species presence-absence data. I found that the models performed well at predicting probability of occurrence for all species ($AUC > 0.5$). In a time when many species are in steep decline, a quick method of evaluating species-habitat relationships could prove very beneficial. By utilizing HCPs, the habitat associations of any species could be quickly evaluated with minimal survey effort potentially resulting in better conservation outcomes.

Bio: Joseph Plappert was born and raised in Austin, TX. He graduated with a B.S. in Wildlife Biology from Texas State University in 2017. Joseph’s interest in birds began at a young age, having been instilled in him by his father and grandmother. Taking Field Ornithology in summer of 2016 developed that interest

into a passion. After being given a scholarship from the Ornithological Society at Texas State to conduct research on nest boxes, Joseph decided to pursue a master's degree in Wildlife Ecology, joining Dr. Joseph Veech's lab in Fall 2018. After graduation, Joseph plans to continue his research in birds, remote sensing, and monitoring by pursuing a Ph.D. degree.

Thesis Defense

HOW A FACULTY MEMBER DESIGNS AND IMPLEMENTS A NEW ACTIVE LEARNING BIOLOGY COURSE IN-PERSON AND ONLINE

Myra J. McConnell
Major Advisors: Dr. Kristy Daniel
Committee Members: Dr. Julie Westerlund & Dr. Paula Williamson

Friday, July 9, 2021, 10:00 AM,
Zoom Meeting: https://txstate.zoom.us/j/7419179749?pwd=YWJVVTJRQkt0bC9MWHF2Z1lJUWQ1Zz09
Meeting ID: 741 917 9749 Passcode: Pablo

Abstract: Traditional science classroom lectures focus on the instructor as the primary information source in the front of the room. In active learning classrooms, students gain more control over their knowledge construction by engaging in activities that combine content knowledge with applying critical thinking skills to solve current science issues. Active learning activities can include case studies, concept maps, or group work. Students who participate in active learning-based courses have higher academic success and higher self-confidence. Active learning also lowers the achievement gap for underrepresented minority groups. The purpose of my research was to examine the process of developing and implementing a new active learning-based biology course. Additionally, I explored how an exemplar instructor transitioned the new course to accommodate emergency remote teaching during the Covid-19 pandemic. I used a qualitative, case study design to capture faculty reflections on course development and later implementation. I generated data from semi-structured interviews, journal entries, and classroom observations from the course taught in both an in-person and an emergency remote teaching setting. I created hierarchy steps about decision making for course design drawing upon theory of critical thinking in higher education. I used these steps to explore the process by which a faculty member created an upper-level, active learning biology course. Then, I used the fidelity of implementation framework to compare the original course design to implementation during class. In the event that the instructor maintained fidelity to course design while also adding supplemental instruction, I reference those data as adaptable instruction. I found the instructor used textbook and research resources most frequently in course content design, and teaching site resources most often for supporting active learning components. The faculty also relied upon colleagues to support classroom space usage as well as obtain additional tips about pedagogy beyond the resources. The faculty relied upon prior experience and educated prediction to determine the amount of content appropriate to cover in any given class. The faculty also designed their course in a way that anticipated student needs in terms of prior knowledge, frequently asked questions, prior evaluation feedback, extension opportunities, community dynamics, and equity. When implementing the designed course, I found that the faculty most often demonstrated adaptable instruction, followed by maintaining fidelity, with limited events of low fidelity. Additionally, I found that when moving to emergency remote teaching, the faculty used mostly the same approach to transform the course to the online format. However, when they could not pivot in-person curricula into the learning management system, the faculty elected to draw upon best practices for online education, adding, adapting, or removing content. My case study documents how an instructor built a new university active learning biology course, transitions to an online platform, and the relationship between course design and implementation. Overall, this case study of an exemplar faculty may be used to support best practices offered to other faculty development for designing courses in both physical and online environments, ultimately enhancing student learning outcomes.

Bio: Myra was born and raised in New York and earned her Bachelor of Arts in Biology at Alfred University in 2019. She is passionate about biology and education and will be going to her Ph.D. program after graduation. She plans to attend University of Minnesota for a Ph.D. in STEM education.

Dissertation Defense

UTILIZING MULTIDISICPLINARY METHODS TO UNDERSTAND TRACE ELEMENT ACCUMULATION IN NORTHERN GULF OF MEXICO ODONTOCETES

Name: Meaghan A. McCormack
Major Advisor: Dr. Jessica Dutton
Committee Members: Dr. Weston Nowlin, Dr. Todd Swannack, Dr. Butch Weckerly, and Dr. Aaron Roberts (University of North Texas)

Tuesday, July 6, 2021, 12:00 pm
Zoom meeting:
https://txstate.zoom.us/j/92451350415?pwd=YmxNaHc3RXE5NkNvTWFxYm9vMHZ3QT09
Meeting ID: 924 5135 0415 Passcode: Dolphin

Abstract: Due to their long lifespan and top trophic position, odontocetes (toothed whales) can accumulate high concentrations of trace elements [e.g., mercury (Hg)] in their tissues. In addition, their coastal distribution makes them appropriate sentinels for ecosystem and human health. Acquiring odontocete tissues is challenging due to logistical and legal constraints. Although data is opportunistic, collecting tissues from deceased stranded individuals is a viable alternative to sampling free-ranging populations. My dissertation includes five data chapters that focused on trace element accumulation in odontocetes, primarily bottlenose dolphins (Tursiops trunactus), that stranded along the northern Gulf of Mexico (nGOM) coast. Many samples were from dolphins that stranded during the nGOM Cetacean Unusual Morality Event (2010-2014). In Chapter 2, I explored the influence of biological variables (body length, age, and sex), diet/trophic position (δ13C and δ15N), and foraging habitat (δ34S) on skin and blubber Hg concentrations in bottlenose dolphins that stranded along the Florida panhandle and Louisiana coasts. In Chapter 3, I assigned stranded bottlenose dolphins to habitats according to their skin δ13C and δ34S values, estimated trophic positions, and explored whether differences in trophic position among dolphins explained variation in Hg concentrations. Chapter 4 investigated the relationship between Hg and selenium (Se) in 11 tissues from 11 odontocete species and the potential protective role of Se against Hg toxicity. Having obtained tissue subsamples from individual bottlenose dolphins that had been preserved in formalin and frozen, in Chapter 5, I measured the concentration of 14 trace elements to determine the effects of long-term (3-7 years) and short-term (6 weeks) formalin fixation on tissue trace element concentrations. Finally, in Chapter 6, I used a scanning electron microscope (SEM) equipped with energy dispersive x-ray spectroscopy (EDS) to determine the presence and distribution of major, minor, and trace elements in bottlenose dolphin teeth. Using multiple methods, my work contributes to the knowledge of trace elements, especially Hg and Se, in odontocete tissues and addresses important methodological questions in marine mammal toxicology.

Bio: Meaghan is from Long Island, New York. She graduated with a B.S in Biology from Adelphi University in 2013 and a M.S. in Marine Affairs and Policy from the University of Miami in 2015. She joined the Aquatic Resources and Integrative Biology doctoral program at Texas State University in 2016. She is currently a marine zoologist with the New York Natural Heritage Program.

Thesis Defense

Bioaccumulation and Maternal Transfer of Mercury in Sharks off the Southeastern United States and in the Northern Gulf of Mexico

Jacob R. Ketchum
Major Advisor: Dr. Jessica Dutton
Committee Members: Dr. Timothy H. Bonner & Dr. Weston H. Nowlin

Monday, July 5, 2021, 2:00 pm, on Zoom
Link: https://txstate.zoom.us/j/98487469629?pwd=OFR0aGEwOURrdnRiSysvbjlSVGkyQT09
Meeting ID: 984 8746 9629 Password: shark

Mercury (Hg) is a global, pervasive, nonessential trace element that is capable of biomagnifying through marine food webs, bioaccumulating in tissues of large predatory species, and being maternally transferred during embryonic development. Since many shark species occupy high trophic positions, they are at increased risk of Hg exposure through their diet. To better understand the concentrations of Hg in adult sharks off the southeastern United States and in the northern Gulf of Mexico, I measured the concentration of total Hg (THg) in the muscle, liver, and fin of ten species (spinner, bull, blacktip, sandbar, tiger, lemon, Atlantic sharpnose, scalloped hammerhead, great hammerhead, smooth hammerhead) using a direct mercury analyzer. I also investigated the maternal transfer of Hg in embryonic sharks by measuring THg concentrations in the muscle, heart, brain, kidney, liver, skin, and fin of bull, blacktip, and sandbar shark embryos. In adult sharks, I observed both inter- and intraspecies differences in THg concentrations. Overall, the greatest THg concentrations were measured in the liver, followed by the muscle and fin, with the smooth hammerhead, lemon, and blacktip sharks containing the greatest liver THg concentrations while the smooth, scalloped, and great hammerhead sharks contained the greatest THg concentrations in the muscle. Significant positive relationships between muscle and liver THg concentration and body length were also observed for bull, blacktip, and sandbar sharks. Except for the Atlantic sharpnose, the mean muscle THg concentration for each species exceeded the U.S. Food and Drug Administration (FDA) 1 µg/g wet weight action limit for human consumption. I measured the greatest THg concentration in the muscle of bull, blacktip, and sandbar embryos followed by either the heart or kidney, and the lowest THg concentrations in the fin and liver. Overall, THg concentrations were greater in bull and blacktip embryos than in sandbar embryos. The results from this study suggest that THg is accumulating to high concentration in tissues of sharks caught off the southeastern United States and in the northern Gulf of Mexico, and therefore human consumption of these species should be limited to reduce the risk of Hg exposure. In addition, the accumulation of THg in embryos provided further evidence to suggest that maternal transfer represents a significant exposure pathway for THg in sharks that could, in part, account for the elevated THg tissue concentrations previously observed in young-of-year sharks.

Bio: Jacob is from San Antonio, TX and earned his B.S in Aquatic Biology from Texas State University in 2017. His passions for aquatic and marine ecology stemmed from a young age as he has always enjoyed spending his time outdoors. He is about to start a job as a fishery observer in the Gulf of Mexico to learn more about fisheries management and to advance his career in marine and environmental science.

Thesis Defense

Monitoring Changes in Trace Element Concentrations in Amblema plicata in the Guadalupe River Basin (Texas, USA) Using a Caged Transplant Experiment

Joseph W. Bakker
Major Advisor: Dr. Jessica Dutton
Committee Members:
Dr. Astrid N. Schwalb
Clint Robertson (Texas Parks and Wildlife Department)

Thursday, June 24, 2021, 10 AM, on Zoom

Link: https://txstate.zoom.us/j/92774837871?pwd=NXVmUUNGVlJMU2VuTDB6SGcwRmtvZz09
Meeting ID: 927 7483 7871
Password:mussel

Exposure to contaminants, including trace elements, has been partially responsible for unionid mussel population declines throughout North America. Texas has over 50 species of native mussels, including 16 species that are state threatened; however, little is known about the impact of contaminants on Texas mussels. I investigated the accumulation of seven essential (Co, Cu, Fe, Mn, Ni, Se, and Zn) and eight non-essential (Ag, As, Bi, Cd, Cr, Hg, Pb and U) trace elements in gill tissue of Threeridge (Amblema plicata) at six sites in the Guadalupe River Basin using a caged transplant experiment. I collected mussels from a reference site (Lake Wood) and transplanted them to five different sites (Palmetto State Park, Plum Creek, Sandies Creek, and two sites in Victoria) for up to 12 weeks. After 3 weeks and 12 weeks, I collected mussels and the concentration of trace elements in gill tissue was determined using microwave acid digestion and ICP-MS analysis. I compared the concentration of trace elements in gill tissue and calculated Biota Sediment Accumulation Factors (BSAF) within and among sites and between week 0, 3 and 12. Overall, mean gill tissue concentrations for essential trace elements were greater than non-essential trace elements. Changes in trace element concentrations varied by individual element and location, and there was no clear accumulation pattern over time. This could be due to heavy rain events that occurred during the experiment which resulted in either trace elements being added to the river due to urban and agricultural runoff or the dilution of trace elements at a given site. The mean Se:Hg molar ratio in gill tissue was > 1:1 at each site, indicating that Se may have a protective effect against Hg toxicity in freshwater mussels. A. plicata at each site had a mean BSAF > 1 for all trace elements except Co, Cr, Fe, Ni, Pb, and U indicating that mussels are generally more enriched in trace elements than sediment at each location. Previous caged transplant experiments have been successful in identifying accumulation patterns in mussels placed in small riverine systems; however, my research identified the difficulties associated with conducting the same experiment in a large river system with a flashy regime. Data collected from this study will provide important information that will aid in the development of conservation and recovery plans for Texas mussels. sciences.

Bio: Joe is from Littleton, CO and earned his B.S. in Biological Sciences from Colorado State University in 2017. He enjoys being outdoors, traveling, and spending time with his dog and wife. After graduation he plans to pursue a career in environmental sciences.

Thesis Defense

THE IMPACT OF SUMMER MORTALITY OF INVASIVE ZEBRA MUSSELS ON NUTRIENT CYCLING IN A TEXAS RESERVOIR

David L. Swearingen
Major Advisor: Dr. Astrid Schwalb
Committee Members: Dr. Weston Nowlin
Dr. Todd Swannack

Tuesday, June 22, 2021, 9:00AM FAB 130

Large mortality events can cause nutrient pulses that affect nutrient cycling within a system and ecosystem functioning. Invasive zebra mussels (Dreissena polymorpha) in Canyon Lake, Texas occur at the southern edge of their North American distribution and hot temperatures during summer can lead to high mortality. The goal of this study was to examine nutrient release in decaying mussels in the laboratory and to combine this with field observations of zebra mussel density and mortality to estimate the amount of nutrients released during summer mortality events. Zebra mussels were decayed at 30°C to determine mass loss and nutrient release rates. Dive surveys along several transects in July and October 2019 and 2020 were used to estimate population size of zebra mussels at different depths throughout the lake. Cages with smaller (<15mm) and larger (> 15mm) zebra mussels were placed at three marinas and monitored bimonthly to determine mortality rates. The decline of zebra mussels in summer 2019 was larger compared to 2020, which was associated with a longer period of high water temperatures (27 vs. 17 days over 30°C respectively). Mortality in the cages varied with mussel size, depth and location. Temperature was likely the most important driver, but other factors such as total suspended solids and dissolved oxygen also played a role. Nitrogen and carbon were lost more quickly from the decaying tissue than phosphorus. Estimated nutrient releases for the lake with low to high summer mortality over a month ranged between 4.5 and 26.2 t for nitrogen and 0.1 to 0.8 t of phosphorus. This would mean zebra mussels may increase nutrient loading from the Guadalupe River flowing into Canyon Lake by 2-6 fold for nitrogen and increase phosphorus by 11-68%. The potential impacts on ecosystem processes remain to be studied.

David was born and raised in Austin, Texas and earned his bachelor's in Aquatic Biology from Texas State University in 2019. He started working with the invasive zebra mussel in his junior year of undergraduate studies and has since then studied various aspects of their ecology.

Dissertation Defense

FACTORS AFFECTING ROOT NODULE FORMATION IN FRANKIA-ACTINORHIZAL SYMBIOSIS

Spandana Vemulapally
Major Advisor: Dr. Dittmar Hahn
Committee Members: Dr. Mark Paschke (Colorado State University)
Dr. Jeffrey O. Dawson (University of Illinois, Urbana-Champaign)
Dr. Robert McLean
Dr. David Rodriguez

Friday, June 18, 2021, 1:00 pm
Join Zoom meeting:
https://txstate.zoom.us/j/98464882211?pwd=VExrZ2lZd1JncEdJSzNySm1oK2ZOdz09
Passcode: Spandana

Actinorhizal plants can form symbiotic associations with root-nodule forming Gram-positive actinobacteria of the genus Frankia. These filamentous heterotrophic bacteria provide the plants with reduced nitrogen resources through nitrogen fixation. Previous studies using qPCR and Illumina sequencing suggested that root nodule formation is not a function of abundance or relative diversity of specific Frankia populations in soils. Root nodule formation could therefore be affected by alternative traits of Frankia populations present in the environment, such as competition between strains, diversity of frankiae in soils, occurrence of Frankia as numbers of individual cells or multicellular fragments potentially capable of inducing nodules on host plant species. The studies in this dissertation research focused on four topics involved in the establishment of the symbiosis between Frankia and the respective host plant species. First, I investigated the potential role of infective isolates on the potential establishment of non-infective Frankia strains in the root nodules formed on the host plant under controlled microcosm conditions. In the next study, I assessed the nodule-forming capacities and competition for nodulation of two Frankia strains inoculated in defined nodulation units, i.e., specific cell or filament numbers, and identical inoculation procedure, in soil microcosms vegetated with their host plant. These studies were expanded to assess nodulation capacities of a prolific spore-forming Frankia strain on its host plant. Nodulation capacities were related to different nodulation units (i.e., individual cells such as spores and single vegetative cells, as well as filaments of different fragment sizes). Finally, I studied the host plant effects on the abundance and distribution of introduced or indigenous Frankia populations in soils and in root nodules.

Bio: Spandana Vemulapally is from Vijayawada, India. She graduated with a Master of Science degree in Biotechnology from Texas Tech University in 2012 and a Master of Science degree in Biomedical Sciences from Texas Tech University Health Sciences Center in 2015. She enrolled in the PhD program at Texas State University in Spring 2016.

Dissertation Defense

EXPLORING THE COMMUNICATION OF CLIMATE CHANGE SOCIOSCIENTIFIC ISSUES IN AQUARIUM EXHIBITS

Jenn Idema
Major Advisors: Dr. Kristy Daniel
Committee Members: Dr. Jess Dutton, Dr. Shelly Forsythe, Dr. Patricia Patrick, & Dr. Paula Williamson

Tuesday, June 15, 2021, 11:30 AM,
Zoom Meeting: https://txstate.zoom.us/j/93564536784?pwd=NVYrakgvVllYenZzUmxudXZhWk1mUT09
Meeting ID: 935 6453 6784 Passcode: Shark

Abstract: Anthropogenic pressures humans have placed on the planet create complex, socially embedded scientific problems that are not easily solved. Aptly known as socioscientific issues (SSI), these issues are often controversial because their open-ended nature is greatly influenced by the multiple socio-cultural dimensions and entities involved. As the environmental issues of today continue to grow, so too does the need for a more scientifically literate society. However, creating a science literate society is challenging when the average person spends less than 5% of their life in a formal science classroom. Reaching people in informal places they visit to learn about science is an important step toward improving scientific literacy. The socioscientific issues framework (SSIF) is an instructional approach used in formal classrooms designed to improve science literacy by engaging students in real-world science contexts, while also increasing development of questioning, argumentation, empathy, and moral reasoning skills. Because of its cross-disciplinary nature and societal impacts, this project explores using the SSIF as a lens for understanding how informal science institutions (ISI) communicate SSIs as part of their science education mission. To accomplish my research goals, first, I adapted the SSIF for exhibit design application in informal settings. Then, I used the updated SSIF to guide an exploration of in-person and virtual aquarium exhibits focused on communicating the science of climate change. Through a survey of 420 in-person exhibits across nine countries, I found only three in-person and one virtual exhibit featured climate change messaging throughout the exhibit while 30 in-person and 20 virtual exhibits mention climate change or a human-induced impact associated with climate change at least once. None of these SSI exhibits presented climate change science in ways that warranted being classified as representative of a holistic SSIF instructional approach. I documented patterns in exhibit communication approaches across aquariums. I found a disconnect between theory and implementation of best practices. This project provides insight into how existing exhibits in aquariums communicate the SSI of climate change as well as identifies what aspects of the SSIF can be found in those exhibits, contributing to this gap in the literature. SSIs are complex issues and while ISIs may want to present the issues such as climate change to visitors, they may not choose or be able to for a variety of reasons. The intention of my project is to bring to the surface the need for communicating climate change and other SSIs in contexts local and relevant for visitors. Incorporating the SSIF into the places people visit to learn science outside of the classroom (i.e., ISIs) has the potential to contribute to a science literate society, but only if exhibits are effectively designed.

Bio: Jenn was born and raised on the Texas Gulf Coast where she fell in love with sharks and doing community outreach. She has worked in both the formal and informal science education field for over a decade. With a Master's degree in Informal Science Education, she has experience in curriculum design and evaluation, visitor studies research, and interpretation from multiple zoological facilities in the U.S.

and abroad. Jenn's philosophy of "If you want people to care, you first have to get them to connect" influences her research interests in science communication and the human dimensions of conservation.

Dissertation Defense

THE IMPACT OF DISPERSAL ASSESSMENT METHODS ON THE RESULTING MANAGEMENT INTERPRETATIONS OF ENDANGERED SPECIES STEWARDSHIP

Shashwat Sirsi
Major Advisor: Dr. Michael R.J. Forstner
Committee Members: Drs. M. Clay Green, Brian J. Halstead, Yongmei Lu, Michael L. Morrison, & David Rodriguez

Friday, 11 June 2021, 11AM
Join Zoom Meeting:
https://txstate.zoom.us/j/98416245428?pwd=dHFUck0yOVltQ0lLOWIwWVQwVFRVZz09
Passcode: Sirsi

Abstract: Taxonomic biases in conservation research were observed two decades ago, with an under-representation of amphibian and reptile studies relative to birds and mammals. However, societal preferences, methodological limitations, and a relative lack of funding opportunities likely contribute to a continuing slow redress of the issue. Consequently, knowledge gaps limit management decisions for many taxonomic groups. At the same time, advances in telemetry and genetic approaches have begun to mitigate some of methodological limitations inherent for some groups (e.g., reptiles and amphibians). I sought to apply relatively recent, high-resolution direct (i.e., telemetry) and indirect (i.e., genetic) methods to address knowledge gaps in one freshwater reptile and one endemic amphibian species and therein provide context for their management. I used GPS enabled telemetry to estimate and identify proximate cues of movement in Rio Grande Cooters (Pseudemys gorzugi). Similarly, I used ~20,000 genome-wide markers to determine the evolutionary status and population genetic structure of Houston Toads (Bufo [=Anaxyrus] houstonensis). Based on findings from these studies, I conducted a meta-analytical comparison among direct and indirect approaches in amphibian, reptile, bird, and mammalian dispersal studies to determine the relative efficiency of each study type for dispersal assessment. Maximum net displacement observed in the GPS telemetry study of P. gorzugi was two orders of magnitude larger than previous estimates for this riverine turtle. With an increase in sampling resolution for the direct, telemetry study of P. gorzugi, I found support for the dispersal implicit in previous genetic data and therein, the recommended range-wide scale for management efforts. Similarly, the increased resolution afforded by the genome-wide study of Houston Toads enabled inference at a deeper timescale. We found support across analyses for the influence of historic processes on population connectivity and ancient gene flow between and within populations of Nearctic toad taxa. Our data also direct Houston Toad population supplementation and habitat restoration measures at broader spatial scales relative to previous studies. Further, I observed large (one order of magnitude) sample sizes and low (< two-fold to five orders of magnitude) variability in genetic dispersal estimates. These are tenable indicators of an increased probability of detecting long-distance dispersal and precision in dispersal estimates, thereby lending a higher relative efficiency to genetic methods in dispersal assessment. Genetic methods potentially serve as a powerful alternative when measuring dispersal by direct methods is intractable at broad scales or when the morphology and underlying abundance of the study organism is not amenable to direct, field-based methods. Further, dispersal indices from genetic data can be complementary to direct dispersal information and when combined, these indices can provide a relatively more holistic perspective on species dispersal. I emphasize the need to bridge gaps in the application of genetic data, particularly for data deficient taxonomic groups with limited funding opportunities.

Bio: Shash is from Bangalore in southern India. He graduated with a Bachelor's degree in Environmental Sciences and subsequently earned a Master's Degree from the University of Kent at Canterbury, UK. He worked for an NGO that attempted freshwater turtle recovery in India, for over 8 years. He hopes to subsequently be able to effectively contribute to conservation research, especially in India.

Thesis Defense

The Diet of the Rio Grande Cooter (Pseudemys gorzugi) in San Felipe Creek, Texas with an Isotopic Comparison to the Syntopic Red-eared Slider (Trachemys scripta elegans)

Lawrence Grant Bassett

Major Advisor: Dr. Michael R.J.Forstner

Committee Members: Dr. Ivana Mali
Dr. Weston H. Nowlin
Dr. Daniel H. Foley

Friday, 04 June 2021, 10:00AM, Join Zoom Meeting
https://txstate.zoom.us/j/93666476232?pwd=emhjN1ExcExuNS94UlFBQ1RGMFYxUT09
Passcode: gorzugi

Abstract: The Rio Grande Cooter (Pseudemys gorzugi) is a freshwater chelonian endemic to the southwestern United States and northeastern Mexico. Although locally abundant in some areas, P. gorzugi is rare throughout its overall distribution and is currently in review for listing under the United States Endangered Species Act. Few natural history studies have been conducted on this taxon. Two studies have investigated the diet of P. gorzugi in southeastern New Mexico but published information regarding the diet of P. gorzugi in Texas is currently unavailable. I studied the diet of a P. gorzugi population inhabiting San Felipe Creek in west Texas through the use of fecal content identification and stable isotope analyses. Stable isotope analyses were also utilized to compare the dietary niche of P. gorzugi with that of syntopic red-eared sliders (Trachemys scripta elegans). Identifiable fecal contents and isotope data both indicated P. gorzugi to be primarily algivorous and herbivorous. Thirteen novel food items were identified in the feces collected with algae being the most important dietary resource volumetrically across all sex and age classes of P. gorzugi. Results from stable isotope mixing models likewise indicated that algae provides the most important dietary resource for P. gorzugi. The isotopic niche of P. gorzugi was found to be significantly lower than that of T. s. elegans indicating a more carnivorous diet in the latter. This study contributes towards a more comprehensive understanding of the ecology of this imperiled taxon and may prove useful for the formulation of effective recovery plans in the future.

Bio: Grant was born and raised in El Paso, Texas and earned his bachelor's in wildlife biology from Texas State University in 2019. He is passionate about herpetofauna research and hopes to further pursue this interest as a doctoral student working under the tutelage of his current advisor Dr. Michael R.J. Forstner.

Thesis Defense

Olfactory-Immuno Pathway of Infectious Hematopoietic Necrosis Virus and Yersinia Ruckeri in Rainbow Trout

Fabiola Mancha

Major Advisor: Dr. Mar Huertas
Committee Members: Dr. Dana Garcia and Dr. Kelly Woytek

Wednesday, 9 June 2021, 1:00PM
Join Zoom Meeting:
https://txstate.zoom.us/j/93602732650?pwd=d0ZVYjJreUYyRmJJTVVsUDM4VGNhQT09

Abstract: Aquatic pathogens contribute to disease in commercial and wild fish farms worldwide. Two pathogens, Infectious Hematopoietic Necrosis Virus (IHNV) and Yersina ruckeri, are harmful in aquaculture and are known to commonly cause disease in salmonid species such as rainbow trout. These pathogens are highly contagious, and, under poor rearing conditions, fish are more susceptible to infection. In fish, external tissues like the gills and skin are in direct contact with the environment and are more likely to become infected. However, our lab discovered that IHNV infection also occurs in the nose through the olfactory sensory organ. IHNV is detected by the sense of smell and the resulting nervous signal activates the brain host's immune system. However, it is unknown if Y. ruckeri has a similar neuro-immune activation mechanism as IHNV or how bacteria olfactory signals are integrated in brain. The goal of our research is to visualize the neural pathway used to transmit bacteria olfactory signal and to determine which parts of the brain are activated and how this affects the fish physiology and behavior. I hypothesize that IHNV and Y. ruckeri are detected by a different subset of olfactory cells and the information is integrated in different areas of the brain by neurosteroid signaling. Furthermore, we expect neurosteroids to induce aversive swimming behavior in rainbow trout. To complete this we 1) visualized olfactory detection of IHNV and Y. ruckeri 2) measured the concentration of neurosteroids in the olfactory tissues and the brain after IHNV and Y. ruckeri delivery and 3) assessed fish behavior when exposed to Y. ruckeri. Our results showed that IHNV or Y. ruckeri activate olfactory sensory neurons (OSN) in the epithelium. OSN morphology differed between the two pathogens indicating that activation through different subset neurons. Second, we saw a differential change of neurosteroid concentration within treated trout, implying that that neuro-immune signals are modulated by neurosteroids. Lastly, behavioral results showed that trout detected and actively avoided Y. ruckeri. Overall, our results provide insight on how trout smell virus and bacteria and elicits the physiology and behavior in fish. The results of this research are critical for the advance of nasal vaccine formulation in aquaculture and advances the unexplored area of olfactory immune function in vertebrates.

Bio: Fabiola is from Willis, Texas and received her Bachelor of Science in Microbiology from Texas State University in 2018. She then joined the Aquatic Resources Master's Program the following semester. She is passionate about education in science and human health and will be joining a surgical research lab after graduation. She plans to apply to medical school to become a primary care physician and serve Hispanic communities.

Thesis Defense

Monitoring the movement and habitat associations of two threatened primates along a conservation corridor in western Ecuador

Jacquelyn Tleimat

Major Advisor: Dr. Sarah Fritts
Committee Members: Dr. Shawn McCracken, Dr. Joseph Veech, Dr. Ivan Castro-Arellano

Wednesday, June 2, 2021, 1:00 P.M.
Meeting ID: 984 7617 1919
Join the Zoom meeting with passcode: 098401
Zoom link: https://txstate.zoom.us/j/98476171919?pwd=MVVvZkUraEw3U3FZMERpZnpiMlRrdz09

Abstract: The Chocó rainforest in coastal Ecuador is an internationally recognized biodiversity hotspot that has been more than 95% deforested for logging and agricultural purposes, which has reduced wildlife habitat and isolated remaining habitat patches. In response to rapid deforestation, the Three Forest Conservation Corridor (TFCC) was established to promote connectivity among local reserves. As managers from these reserves plan to acquire land to expand the TFCC, a better understanding of threatened species' habitat associations, such as two native threatened primates: the Ecuadorian capuchin (Cebus aequatorialis) and the Ecuadorian mantled howler (Alouatta palliata aequatorialis), is required to inform management and acquisition decisions. I recorded activity and distribution of both primate species using twenty acoustic monitoring devices and trail cameras deployed in the forest canopy across the TFCC. I assessed the influence of habitat type (agriculture and 3 forest types [cloud, dry, and wet]), vegetation structure, and landscape composition on occupancy and activity using single-season occupancy models. I also mapped total detections of both primate species to identify areas of frequent use. Models that included covariates were compared to null models using AICc and goodness-of-fit-tests. Although the 90% confidence intervals overlapped '0', the model that included a positive relationship with station height was the best model for Ecuadorian mantled howlers and the model that included a positive relationship with distance from habitat edge created by human activities was the best model for Ecuadorian capuchins. The lack of significance likely was due to small sample sizes, a common issue when studying threatened species. Maps indicated that cloud forest on the northeastern edge of the TFCC were frequently used by both species. I suggest preserving the remaining intact forests with tall trees to aid in both species' conservation. Results will guide future land acquisition and restoration for TFCC expansion.

Bio: Jacquelyn first discovered her passion for research in the tropics during the Ecuador study abroad trip at Texas State University, where she overcame her fear of bugs to study beetle diversity at different tree heights. She graduated with her B.S. in Wildlife Biology in 2017 and started in the Fritts lab in Fall 2018. Her interests are tropical ecology and disease ecology. She will start her Ph.D. at Texas A&M – Corpus Christi in Fall 2021 with Dr. McCracken studying Mycoplasma in the Texas Tortoise as well as continuing to help with the canopy monitoring project.

Thesis Defense

IMPACTS OF INVASIVE WOODY VEGETATION ON SURVIVAL, NEST, AND BROOD ECOLOGY OF SCALED QUAIL (CALLIPEPLA SQUAMATA) IN THE SOUTHERN HIGH PLAINS OF TEXAS

Charlotte Wilson

Major Advisor: Dr. Sarah R. Fritts
Committee Members: Dr. Blake Grisham, Dr. Jennifer Jensen

Tuesday, May 25, 2021 1:00 PM
Meeting ID: 972 4018 2724
Passcode: 742671
Join Zoom Meeting
https://txstate.zoom.us/j/97240182724?pwd=WmFIaDBEQkZQeHg3T29FejZCcUFWZz09

Scaled quail (Callipepla squamata) populations have been declining in Texas since the 1980s due to a number of factors including climate change, human development, and landscape changes such as woody vegetation encroachment. Encroachment of woody vegetation such as mesquite (Prosopis sp.) has been a long-standing problem in west Texas rangelands since the early 1900s. However, the long-term consequences are only recently being reflected in Texas upland game bird populations, specifically scaled quail. The objectives of my study were to estimate hen, nest, and brood survival, assess nest and brood site selection characteristics, and determine woody vegetation usage in hen and brood core use areas and home ranges. From April – August 2019 and 2020, I equipped hens with VHF (6 g) and GPS (5.5 g) transmitters to track survival and record locations, and glued small VHF (2 g) transmitters to chicks. I conducted vegetation surveys and deployed Ibutton dataloggers at nest and brood sites that recorded temperature at 30-minute intervals. I collected aerial images using a Sensefly Ebee drone over GPS-collected locations to create orthomosaics and classified landscape metrics in ArcMap and Fragstats. I used the nest survival model in Program MARK to calculate hen, brood, and nest survival. Hen survival (n=37) varied between years, 51% in 2019 and 1% in 2020. Nest survival (n=38) was greater in 2019, at 5%, and <1% in 2020. Brood survival (n=12) was <1% for the 2020 season. I examined nest and brood site characteristics using logistic regression in Program R which suggested that scaled quail hens selected for grassland and succulent habitats. Nest sites (n=38) had less bare ground and cooler locations than available habitat. Broods (n=27) selected for succulent species and less grass cover, likely due to the difficulties of moving through grass. There was a negative relationship between scaled quail hen survival and woody vegetation in core use areas. Overall, low levels of woody vegetation encroachment did not negatively affect scaled quail survival; however, other impacts woody vegetation has on the landscape in the Southern High Plains may increase with further encroachment. For example, mesquite has a high water demand and frequently competes with already strained vegetation communities. As habitat fragmentation in this ecoregion continues, more adaptive management practices including prescribed fire and grazing could be implemented to conserve future scaled quail populations.

Bio: Charlotte Wilson was born and raised near Weatherford, Texas. She graduated with a bachelor's degree in wildlife biology from Texas Tech University in 2018. During her undergraduate career she developed a love for birds specifically, while working on multiple bird research projects including a lesser prairie-chicken project, purple martin nest box project, and songbird and raptor survey project in the Big Bend Region of Texas. Her research interests include population dynamics and habitat ecology.

Thesis Defense

Consequences of environmental alterations on the gut microbial communities of Rana berlandieri tadpoles

Melissa Villatoro Castañeda

Major Advisor: Dr. Caitlin Gabor & Dr. Camila Carlos-Shanley
Committee Members: Dr. Sarah Fritts

Thursday, May 20, 2021, 2:00 PM
Join Zoom meeting: https://txstate.zoom.us/j/94807239638?pwd=bzF3anJrc3VUZzIvSUJuK3pzTDI5dz09
Meeting ID: 948 0723 9638
Passcode: 869161

The gut microbiome plays an important role in digestion, energy mediation, host fitness, and defense against pathogens, indicating that host health can be assessed through the gut microbiome. Amphibians and their microbiome are highly susceptible to environmental contaminants. Glyphosate, the most widely used herbicide in the United States, is toxic for amphibian larvae and studies suggest that this herbicide also modifies their skin microbiome. I explored the gut microbial composition of Rana berlandieri tadpoles and water samples exposed to a non-lethal concentration of Roundup® (0.74 mg a.e./L) compared to an unexposed control group. Because I found differences in gut microbial communities, dorsal body area, and tail depth between both groups, but no differences in baseline corticosterone (a stress hormone) release rates; I further explored the role of a healthy gut microbiome in anuran larvae fitness and phenotype by comparing tadpoles in a control group to tadpoles exposed to: (1) an environmentally relevant, but non-lethal, glyphosate concentration (1.47 mg a.e/L), (2) an antibiotic cocktail to excise tadpoles of their natural microbiome, (3) and a combination treatment of both glyphosate and antibiotics. I found differences in dorsal body area, activity, and gut microbial community composition across all treatments. Specifically, antibiotic and combination treatments had the smallest dorsal body area and were the least active; and glyphosate exposed tadpoles were less active than control tadpoles. However, I did not find significant differences between antibiotic and combination exposed tadpoles at any measurement level, suggesting that antibiotic alone is enough to suppress growth, change behavior and change the gut microbiome composition. I hypothesize that the changes observed in glyphosate exposed tadpoles, are due the differences in gut microbiome composition and presence of pathogenic bacteria in this group. My results suggest that there is a link between a disturbed microbiome and the host phenotype and fitness during tadpole development, further highlighting the importance of a healthy microbiome in anuran development.

Melissa Villatoro Castañeda is a Guatemalan biologist who moved to San Marcos, TX to pursue her Master's degree. She graduated with high honors from Universidad del Valle de Guatemala where she received her Bachelor in Science and Licenciate degree in Biology. Melissa is also a published scientific author and artist with expertise in amphibian drawings. Melissa has always strived to inspire others with how she perceives and studies nature, and one of her goals is to continue her outreach with communities to share the importance of conservation.

Thesis Defense

IMPACTS OF ZEBRA MUSSELS ON TEXAS UNIONID MUSSELS

Ericah Beason

Major Advisor: Dr. Astrid Schwalb
Committee Members: Dr. Ben Hutchins and Clint Robertson

Tuesday, May 18, 2021, 9AM
Join Zoom Meeting: https://txstate.zoom.us/j/97193026402
Meeting ID: 971 9302 6402; Passcode: Dreissena

Zebra mussels (Dreissena polymorpha) are an invasive species known to detrimentally affect native unionid mussels, a highly imperiled group of organisms. Zebra mussels infest the shells of unionid mussels and compete with them for food as both unionid and zebra mussels are filter feeders. Previous studies, mostly from the northeastern US, have shown that both competition for food and infestation can affect the body condition of mussels. However, no study has examined this in Central Texas, the southern edge of zebra mussel distribution nor compared the impact of zebra mussel presence and infestation on glycogen storage under controlled conditions. Hence, the objectives of this study were to 1) examine the impact of infestation versus presence of zebra mussels with experiments in the laboratory and 2) collect data on glycogen concentrations of unionid mussels at different field sites with and without zebra mussels. In the experiment, tissue samples were collected after 30 days from treatment tanks where 1) Threeridge (Amblema plicata) were artificially infested with zebra mussels, 2) zebra mussels were present in comparable biomass (44 ± 14 g wet biomass) with the first treatment, but shells of A. plicata were not infested, and 3) control tanks where no zebra mussels were present. Tissue samples from A. plicata were collected from 20 individuals at each of the 10 field sites. Results from the experiments showed zebra mussel infestation reduced glycogen about 66% and zebra mussel presence about 38%. Tissue samples from the field supported these findings. Variation in glycogen concentrations of mussels collected in the field was best explained by chlorophyll-a concentrations (coarse measure of food resource) and zebra mussel density. Depletion of glycogen stores from zebra mussels can reduce short and long term fitness of unionid mussels which needs to be considered when creating and implementing management practices.

Ericah Beason was born and raised in Shelby, NC where she grew up playing in rivers and creeks. She received her Bachelor's in Wildlife Biology at Lees-McRae College in the mountains of North Carolina and then moved to Texas to join Dr. Schwalb's stream ecology lab to work with freshwater mussels. After graduation, Ericah plans to continue working on projects to help preserve some of her favorite invertebrates, freshwater unionid mussels.

Thesis Defense

DOES URBANIZATION FACILITATE THE ESTABLISHMENT OF INTRODUCED MONK PARAKEET (MYIOPSITTA MONACHUS) POPULATIONS?

Nicholas Johns

Major Advisor: Dr. Joseph Veech
Committee Members: Dr. Butch Weckerly, Dr. Clay Green

Friday, June 4, 2021, 10 AM
Meeting ID: 985 2411 8139
Join the Zoom meeting with passcode: 259242
Zoom link: https://txstate.zoom.us/j/98524118139?pwd=cE80ME5oUDhOWlU2VHZKcWwxN2QzQT09

Due to increased human presence and activities, urban environments tend to facilitate the introduction and establishment of some non-native species. Because of habitat heterogeneity, resource irregularity, and an overall depauperate ecological community, urban environments may provide multiple underexploited niches for colonization by novel species. The Monk Parakeet (Myiopsitta monachus) is a prime example of an introduced species that has gone through the colonization process and successfully established breeding populations in urban environments. While much of this is due to urban areas being a common point of introduction (release) for exotic species, Monk Parakeets have not spread out beyond these urban environments. My two objectives were to determine the landscape features that Monk Parakeet nests might be associated with and to further our understanding of why Monk Parakeets have so far remained in urban environments. I also examined whether there were any differences in these habitat associations across the United States. I used tree canopy cover and percent impervious surface data from the 2016 National Land Cover Database, surface water features from the National Hydrography Dataset, and observations and location data from eBird to find nest locations that were then confirmed by Google Street View. In ArcGIS I created buffered areas around each of 280 nest locations and random points (presumed absence locations) at three different radii: 100 m, 250 m, and 500 m. I found that Monk Parakeet nests are more likely to occur in areas with low tree canopy cover and greater heterogeneity of canopy cover. This pattern of nest site selection is roughly similar to that in their native range habitat of savannas with scattered tall trees for nesting. However, I also found that the probability of Monk Parakeet nests being present increased as the percent cover of impervious surface in the landscape increased. Even more revealing, average percent of impervious surface cover was greater around the confirmed nest sites than the absence sites, even though the absence sites were constrained to be 2 km from the nearest nest location. This shows that even within an urbanized or metropolitan area, Monk Parakeets seem to be more associated with areas that have the greatest cover of impervious surface. Availability of surface water features appeared to have very little effect on the presence of Monk Parakeets, although the data only included permanent water sources such as rivers, ponds, and lakes, not the smaller more ephemeral sources of water such as birdbaths or backyard swimming pools. I did not find a significant effect of either latitude or longitude on the relationship between any of the five environmental variables and the presence of Monk Parakeet nests, however, there was latitudinal and longitudinal- based variation in some of the five environmental variables that characterized landscapes surrounding Monk Parakeet nests. The results of my study increase our understanding of Monk Parakeet ecology in non-native urban environments.

Bio: Nick Johns was born and raised in Austin, TX. In 2013, he graduated from Austin College in Sherman, TX with a B.A. in Environmental Studies. During his studies, he took a January term course in Everglades National Park, which ignited his passion for studying birds. After graduating, he spent some time in the Texas Conservation Corps and working in environmental consulting. Nick joined Dr. Veech's lab in 2018 to pursue a master's degree in Wildlife Ecology. His research interests include birds, threatened and endangered species, and invasive/introduced species.

Thesis Defense

The Effect of Debaryomyces hansenii on Clostridioides (Clostridium) difficile Sporulation

Julia R. Widmer

Major Advisors: Dr. Robert J.C. McLean, Dr. Manish Kumar
Committee Member: Dr. Jennifer K. Spinler

Wednesday, 14 April 2021, 3:00 PM
Zoom link: https://txstate.zoom.us/j/97428675410?pwd=ZFd1YkYzSjZ4TVVqcTRYZTNWcTIwdz09
Passcode: 498331

Abstract: Clostridioides (Clostridium) difficile is a gram-positive, spore-forming, opportunistic pathogen. This obligate anaerobe is naturally present in low abundance in the gastrointestinal (GI) microbiome. At low levels, the bacterium does not pose a threat to the health of the host, but when a stressor is introduced to the environment the bacteria can cause an infection. A common stressor associated with an C. difficile infection (CDI) is antibiotics; certain antibiotics used to treat other bacterial infections can alter the composition of the GI microflora and result in an overgrowth of C. difficile and toxin production. In response to antibiotics, C. difficile forms spores, which not only aid in the colonization of the GI tract but are also the primary cause of nosocomial transmission. One of the treatment options for a CDI is Probiotics. Probiotics can help to restore the balance of the GI microflora and can decrease the chance of developing a relapse infection. There are some probiotics, termed next generation probiotics (NGPs) that produce secondary metabolites which have broad-spectrum antimicrobial properties. The research presented here investigates the effect of a potential NGP, Debaryomyces hanseni, on the growth and sporulation of C. difficile.

BIO: Julia Widmer was born and raised in the San Marcos area. She came to Texas State already knowing that she was going to major in Biology with the plan to attend Medical School after. She received her BS in Biology with a double minor in Psychology and Biochemistry from Texas State University in 2018. During her last year as an undergraduate, she discovered her love for research and decided to obtain her MS in Biology instead of applying to Medical School. Since then, her love of Biology and Research has continued to grow, but her desire to go to Medical School has not disappeared and she is currently studying to apply to Medical School.

Thesis Defense

Synergistic effects of monoculture biofilm dispersion and antibiotic treatment

Shelbie Powers

Major Advisor: Dr. Robert McLean
Committee Members: Dr. Kavita Kakirde and Dr. Karen Lewis

Wednesday April 14, 2021, 8:30 AM
Zoom link: https://txstate.zoom.us/j/95985886077?pwd=R1QzYmZYMjBBb0VUWWozcGZiZUlKdz09
Passcode: 316963

Abstract: Bacterial biofilms have been identified as the causative agent of many infections, including catheter associated urinary tract infections (CAUTIs). While in a biofilm state, bacterial cells are less susceptible to antibiotic therapy however, once released bacterial susceptibility returns. In an aim to increase antibiotic efficacy of CAUTI treatment, uropathogenic Pseudomonas aeruginosa PAO1 and Escherichia coli F11 biofilms were cultured on silicone disks, modeling the surface of urinary catheters. These biofilms were then treated with two potential dispersal agents and challenged with antibiotics. Antibiotics selected were tobramycin and nitrofurantoin due to their clinical use against urinary tract infections. Both potential dispersal agents tested showed the most effect when used to treat P. aeruginosa biofilms cultured in LB however, no effect was noted with treatment of mAUM-cultured P. aeruginosa biofilms. There was no significant dispersal or increased susceptibility of E. coli biofilms to nitrofurantoin. The findings of this study showed antibiotic efficacy to improve with induced dispersal, supporting the potential of combination therapy in treatment of bacterial biofilms.

Bio: Shelbie Powers is a first-generation student from rural Tennessee. She received her Bachelor of Science in Biology at Texas State University in May 2019 and joined the Masters' Biology program in the following semester. She has plans to continue her education at Texas College of Osteopathic Medicine in Fort Worth Texas. She aspires be a family medicine physician.

Thesis Defense

Analysis of Drivers of Spring Alligator Hunting in Texas and Policy Implications

Elizabeth N. Pratt

Major Advisor: Dr. Christopher Serenari, Department of Biology, Texas State University
Committee Members:
Dr. Kristy L. Daniel, Department of Biology, Texas State University
Dr. Joseph Veech, Department of Biology, Texas State University

Thursday, April 15, 1:00 PM, Join Zoom Meeting with password: alligators
https://txstate.zoom.us/j/99737768571?pwd=VENXWUdrS3BwWXMzanZTR0FHeDhMZz0

Abstract: Human- large carnivore (carnivore) interactions are a matter of particular salience among wildlife decision-makers and the public. When negative interactions occur, particularly as a result of habitat loss and human population increases, managers are tasked with finding the balance between carnivore and human wellbeing. Hunters are an influential carnivore policy coalition in this arena, and understanding their views, motivations, and support for management can inform agencies and managers to develop more effective policy. However, few researchers have preemptively investigated carnivore hunter response to potential termination of a hunting season for the betterment of a carnivore population. With the Texas spring alligator (Alligator mississippiensis) season in question, 318 hunters were surveyed to further our understandings of the likelihood of policy conflict. This study had two aims: determine the potential for conflict among Texas alligator hunters and b) estimate the drivers and likelihood of opposition to canceling the spring hunting season. Findings suggest that a principle-policy paradox exists, where hunters see the ecological role of alligators, but want to harvest them year-round despite negative consequences. Additionally, results indicate that hunters are strongly in opposition to the removal of the spring hunting season, but alternative policy options divided hunters. Finally, this study suggests that hunters who considered themselves knowledgeable about alligators were motivated by using their hunting skills and placed a high level of importance on hunting for alligator management were more likely to oppose termination. This study demonstrates that managers of crocodilians have a unique opportunity to tailor policy narratives when they proactively evaluate outcomes associated with major policy changes that affect constituencies.

Bio: Libby was raised in Huntersville, North Carolina. She earned a B.S. in Zoology with a Minor in Wildlife Science from North Carolina State University in 2019. Libby joined Dr. Christopher Serenari's lab in 2019 to pursue a Master's in Wildlife Ecology. She grew up with a love for alligators from watching Steve Irwin as the Crocodile Hunter.

Thesis Defense

REPRODUCTION, LIFE HISTORY, AND DIETS OF THE GREENTHROAT DARTER ETHEOSTOMA LEPIDUM IN LOW FLOW AND HIGH FLOW ENVIRONMENTS

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

Committee Members:
Dr. David G. Huffman, Department of Biology, Texas State University
Dr. Caitlin R. Gabor, Department of Biology, Texas State University

Tuesday, April 13, 2021, 9:30 AM
Zoom meeting link: https://txstate.zoom.us/j/97319309065

The Greenthroat Darter Etheostoma lepidum (Class Actinopterygii) is a member of the Austroperca complex, along with five other darters found primarily in the Rio Grande drainage of USA and Mexico. Greenthroat Darter, however, is the most widely distributed Austroperca and found east of the Rio Grande drainage into the Edwards Plateau region of central Texas. Threats, as with other aquatic organisms found in arid and semi-arid environments, include natural and anthropogenic modifications to stream flow and water permanency. Purpose of this study was to gain a better understanding of the mechanisms related to low flows and population viability of stream fishes. Using Greenthroat Darters as a representative of the understudied Austroperca complex, study objectives were to quantify life history traits, reproduction, and diets of the Greenthroat Darter and to assess the effects of low flow on their reproduction and diets. Greenthroat Darters were sampled monthly for one year from two environments within the Comal River (Comal County, TX): a low flow environment, where stream flows were reduced because of a downstream dam and consisted of a persistent low-flowing (0.1 m3/s) pool mesohabitat; and a high flow environment, where stream flows are sufficient (2.6 m3/s) to maintain a typical riffle mesohabitat for Greenthroat Darters. Study results demonstrated Greenthroat Darters had an 11-month spawning season from October through August, produced multiple batches of ova during the spawning season, lived up to 2 years, and consumed primarily aquatic insects. Differences between flow environments consisted of greater parasite prevalence, lower fish condition, and fewer food items consumed in the low flow environment compared to the high flow environment. However, energy invested into reproduction (i.e., gonadosomatic index, batch fecundity) was not detected between the low flow and high flow environments. Despite greater number of parasites and lower condition, Greenthroat Darters have persisted in the low flow environment since the construction of the dam (late 1800s). Therefore, there is uncertainty among the linkages between typical measures of fish health (e.g., number of parasites, condition) and population viability.

Bio: Sabrina is from Otis, Louisiana. She graduated with his B.S.-Natural Science from Northwestern State University of Louisiana in 2019. She enjoys traveling to the different rivers in Texas, spending time outdoors, and catching new and unique fish species.

Thesis Defense

Decision Modeling and Analysis of Micro-Level Alligator Management: Application and Lessons Learned

Rebecca Cavalier

Major Advisor: Dr. Christopher Serenari

Committee Members:
Dr. Dincer Konur, Texas State University
Dr. Joseph Veech, Texas State University

Tuesday, April 13, 2021, 9am
Join Zoom Meeting with passcode: 272035
https://txstate.zoom.us/j/94196290239?pwd=em9KRUFKRit3MWdMWU93VnRPN2hiUT09

Abstract: The need for legitimate management policies that promotes coexistence becomes critical as interactions between humans and carnivores intensify as a result of human encroachment depleting carnivore habitat and populations. Carnivores most intensely impact those living in their midst, demanding increased attention by local decision makers who are often best suited to catering to the needs of communities most affected, and yet are often overlooked in the decision-making process. Furthermore, the structure of decision-making for carnivore management at the local level is largely unexplored. The purposes of this study were to apply decision analysis to understand how carnivore management decisions are made at the local level, and develop lessons learned based on the results of this application. Multi-criteria decision analysis (MCDA) was applied to a case study of American alligator (Alligator mississippiensis) conservation in 10 coastal North Carolina counties to enhance the socio-political legitimacy of alligator management. Twenty-five local formal and informal decision makers who were or would be responsible for alligator management decisions as a part of their job were surveyed. Results indicate that decision makers placed nearly equal importance on wildlife- and human-specific factors when making alligator management decisions, and were most focused issues concerning public safety, alligator welfare, and public educational opportunities. Survey respondents also favored balanced and highly managed alternative management practices. Additionally, six lessons learned highlighted that investigating the structure of decision-making among local-level decision makers should enhance legitimacy of carnivore management via a concerted effort to include often-overlooked stakeholders' perspectives on the gaps that threaten and trade-offs necessary to enhance the likelihood of humans willingly sharing space with alligators. At its core, this research addresses the potential of governing wildlife entities to develop large-scale governance processes and outcomes that increase the likelihood of coexistence between humans and crocodilian species in fast-growing coastal regions.

Bio: Rebecca was born and raised in south Louisiana. She graduated from Texas A&M with a B.S. in Wildlife & Fisheries Sciences, and joined Dr. Serenari's lab in 2019 to pursue a master's in Wildlife Ecology. She enjoys nature, photography, and exploring new places. She hopes to pursue a career in wildlife/habitat management, working with public and private landowners to achieve their conservation goals.

Thesis Defense

REPRODUCTION, LIFE HISTORY, AND DIETS OF THE GREENTHROAT DARTER ETHEOSTOMA LEPIDUM IN LOW FLOW AND HIGH FLOW ENVIRONMENTS

Sabrina E. Thiels

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

Committee Members:
Dr. David G. Huffman, Department of Biology, Texas State University
Dr. Caitlin R. Gabor, Department of Biology, Texas State University

Tuesday, April 13th, 2021, 9:30 AM
Zoom meeting link: https://txstate.zoom.us/j/97319309065

The Greenthroat Darter Etheostoma lepidum (Class Actinopterygii) is a member of the Austroperca complex, along with five other darters found primarily in the Rio Grande drainage of USA and Mexico. Greenthroat Darter, however, is the most widely distributed Austroperca and found east of the Rio Grande drainage into the Edwards Plateau region of central Texas. Threats, as with other aquatic organisms found in arid and semi-arid environments, include natural and anthropogenic modifications to stream flow and water permanency. Purpose of this study was to gain a better understanding of the mechanisms related to low flows and population viability of stream fishes. Using Greenthroat Darters as a representative of the understudied Austroperca complex, study objectives were to quantify life history traits, reproduction, and diets of the Greenthroat Darter and to assess the effects of low flow on their reproduction and diets. Greenthroat Darters were sampled monthly for one year from two environments within the Comal River (Comal County, TX): a low flow environment, where stream flows were reduced because of a downstream dam and consisted of a persistent low-flowing (0.1 m3/s) pool mesohabitat; and a high flow environment, where stream flows are sufficient (2.6 m3/s) to maintain a typical riffle mesohabitat for Greenthroat Darters. Study results demonstrated Greenthroat Darters had an 11-month spawning season from October through August, produced multiple batches of ova during the spawning season, lived up to 2 years, and consumed primarily aquatic insects. Differences between flow environments consisted of greater parasite prevalence, lower fish condition, and fewer food items consumed in the low flow environment compared to the high flow environment. However, energy invested into reproduction (i.e., gonadosomatic index, batch fecundity) was not detected between the low flow and high flow environments. Despite greater number of parasites and lower condition, Greenthroat Darters have persisted in the low flow environment since the construction of the dam (late 1800s). Therefore, there is uncertainty among the linkages between typical measures of fish health (e.g., number of parasites, condition) and population viability.

BIO: Sabrina is from Otis, Louisiana. She graduated with his B.S.-Natural Science from Northwestern State University of Louisiana in 2019. She enjoys traveling to the different rivers in Texas, spending time outdoors, and catching new and unique fish species.

Thesis Defense

NATURAL HYBRIDIZATION AND INTROGRESSION OF BERBERIS TRIFOLIOLATA AND BERBERIS SWASEYI IN THE EDWARDS PLATEAU.

Chloe Reeves

Major Advisor: Noland Martin PhD

Committee Members:
Chris Nice PhD
Lauren Fuess PhD

Wednesday April 14th 1:00 pm
https://txstate.zoom.us/j/95997579095
Meeting ID: 959 9757 9095

Abstract: Hybridization and hybrid zones can give us a means by which to understand the mechanisms by which biodiversity arises and is maintained through reproductive isolation even in the face of gene flow. Using next generation DNA sequencing techniques, we are now able to ask such questions at a genomic level. Here I used two species in the genus Berberis native to the Edwards Plateau region of central Texas, Berberis trifoliolata and Berberis swaseyi, to determine whether hybridization is occurring between the two species, identify early generation hybrid classes (e.g. F1, F2, backcross, etc.), examine the genomic architecture of reproductive isolation and introgression, and identify any asymmetries of introgression. Hybridization between B. trifoliolata and B. swaseyi has been hypothesized because individuals have been found with morphological intermediacy, but no genetic treatment has been performed on such individuals. Admixture proportions and ancestry were calculated to determine the degree to which hybridization is occurring as well as to describe substructure in the more widespread and common B. trifoliolata. It was found that hybridization was relatively rare and most of the morphologically intermediate individuals were identified as either early hybrids (F1 and F2) or late generation hybrids that appear to have selfed instead of backcrossed with the parental species. Results also showed that B. swaseyi alleles were more favored in B. trifoliolata backgrounds than the other way around. The results largely revealed evidence of early generation hybridization occurring at low frequency, with later generation hybrids largely absent from the populations, indicating that perhaps such hybrids are less fit. This study provides a starting point to ask more questions about this system and the effects of reproductive isolation in closely related plant species.

Bio: Chloe Reeves was born in Charlotte, North Carolina and since then she has grown an immense love for all things in nature. She received her Bachelor of Science in Wildlife Biology from Texas State University- San Marcos. Her current research on hybridization has given her a new love for genetics which she is striving to continue in her budding career in San Diego, California.

Thesis Defense

Impact of nitrite on goldfish (Carassius auratus) microbiomes and probiotic design

Name: Whitney Ortiz
Major Advisor: Dr. Mar Huertas & Dr. Camila Carlos-Shanley
Committee Members: Dr. Robert McLean & Dr. Kelly Woytek

Friday, 9 April 2021, 10:30 AM
Zoom link: https://txstate.zoom.us/j/95725022261?pwd=WmVibmxnOWh4NmFhUWhDUmIvYm1hUT09

Abstract: Nitrite is a common water pollutant that is highly toxic to fish. Aquaculture systems have elevated but sublethal nitrite concentrations which are considered safe. However, it is unknown how sublethal nitrite concentrations impact the tissue microbiomes which may cause additional stress and increase fish's susceptibility to disease. I hypothesize that increased nitrite concentrations will cause dysbiosis of the microbiome resulting in changing abundance and diversity. This dysbiosis could then be combated using bacteria isolated from healthy goldfish as a probiotic. For 2 months goldfish (10 fish/30L tank) were treated using 0.0mM (control), 0.01mM, 0.1mM, and 1.0mM nitrite concentrations. Tissue samples (nose, gut, gill, and skin) were then collected from each fish with water collected as a control to determine the host-specific microbiome. The bacterial DNA was analyzed to determine the composition and identify of the tissue microbiomes. Nitrite was determined to significantly impact the microbial composition of all the tissues tested. The 0.01 mM treatment changed the composition of the gut and gill microbiomes more than the higher treatments and the nose and skin microbiomes were increasingly disrupted as nitrite concentrations increased. Probiotic candidates were then isolated from the microbiomes of healthy goldfish and tested for antimicrobial properties against 4 common fish pathogens. Most of the candidates inhibited at least one of the pathogens and two, a Pseudomonas and Pseudoxanthomonas species, were selected as good probiotic candidates. This study shows that sublethal nitrite concentrations cause dysbiosis and has the potential to cause disease at concentrations considered safe. I identified bacterial strains with the potential to relieve the effects of nitrite on the microbiome when it is impossible to remove nitrite from the environment. These results are critical to inform aquaculture practices and set guidelines for the development of natural preventative treatments against disease in fish.

Bio: Whitney Ortiz is a Hispanic woman born in Los Fresnos, Texas and has been developing her love of biology from a very young age. She received her Bachelor of Science in Microbiology at Texas State University before joining the Aquatic Resources Master's Program. She plans to join a PhD program to study the spread of zoonotic viruses from wildlife into human populations.

Thesis Defense

Distribution mapping and niche characterization of the endemic African storks

Name: Jonah Gula

Major Advisor: Dr. Clay Green
Committee Members: Dr. K.S. Gopi Sundar & Dr. Sarah Fritts

Thursday, April 1, 2021, 6:00 PM
Zoom link: https://txstate.zoom.us/j/95508903131

Abstract: The endemic African storks–African Openbill Anastomus lamelligerus, Abdim's Stork Ciconia abdimii, African WoollyneckCiconia microscelis, Saddlebill Stork Ephippiorhynchus senegalensis, Marabou Stork Leptoptilos crumeniferus, and Yellow-billed Stork Mycteria ibis–are poorly studied and their conservation status assessments have been created using mixed methods that are neither transparent nor replicable. Besides standardized population surveys, empirical distributions and environmental requirements are two of the most fundamental knowledge gaps that can contribute to the development of a data-driven status assessment for each species. I employed distribution mapping and environmental niche modeling to evaluate current distribution and environmental requirements of African storks at two spatial scales, range-wide and regionally. The six species varied in their degree of change in distribution in East and Southern Africa between the historic (pre-1990) and recent (1990–2020) time periods. The African Openbill, African Woollyneck, Saddlebill Stork, Marabou Stork, and Yellow-billed Stork each exhibited a highly fragmented range in West Africa, and all species but the African Woollyneck declined regionally from the historic to the recent period. Environmental niche models had high predictive capacity and stork species had scale-dependent responses to environmental variation. Annual and seasonal precipitation variables as well as land cover were the most important inputs across most models. Niche similarity among species was high in all models, regardless of scale, suggesting similar environmental requirements and susceptibility to environmental changes. The findings of this study represent a significant improvement to the understanding of the ecological needs and primary threats to African storks. While populations in other regions certainly face similar threats, storks in West Africa appear most at risk of extinction and require immediate conservation attention.

Bio: Jonah Gula received his Bachelor's of Science in Wildlife Biology at Unity College in Maine. Jonah's background is primarily in large mammal research, including work with black bears, bighorn sheep, lions, cheetahs, African wild dogs, and river otters. However, in recent years his research interests have shifted to birds, and he has worked with Greater Sage-grouse and Southern Ground-hornbills. Currently, he does wading bird monitoring research in the Everglades for the University of Florida. He has been researching the Saddlebill Stork for four years, and has an ongoing field project in Zambia–the first of its kind on the species. Jonah is interested in research with conservation application, particularly on poorly-studied species, and he plans to continue his effort to fill knowledge gaps about African storks and other waterbirds moving forward. In 2022 he will begin his PhD research at the University of KwaZulu-Natal in South Africa studying range-wide genetic connectivity of the African storks and ecology of the Saddlebill Stork.