TEXAS SOCIETY OF MAMMALOGISTS

PROGRAM, ABSTRACTS, AND NEWSLETTER

38th Annual Meeting

21–23 February 2020

Texas Tech University Center at Junction

#TSM2020

Texas Society of Mammalogists

Cover illustration: Virginia Opossum, *Didelphis virginiana*, by Krysta Demere.

Texas Society of Mammalogists
38th Annual Meeting
21–23 February 2020

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MENU 2020

Friday:
6:00 pm DINNER - BBQ
Brisket, sausage, potato salad, coleslaw, beans, bread, cobbler

Saturday:
7:00 am BREAKFAST
Breakfast tacos, hash browns, cinnamon rolls, assorted cereal and fruit

9:35 am Break
Coffee, tea, water, scones, muffins, granola bars, fruit

Saturday:
12:15 pm LUNCH
Potato bar, corn salad, taco salad, salad bar, broccoli spears, cornbread, brownies and ice cream

3:15 pm Break (in Packard Building)
Coffee, tea, water, cookies, trail mix, fruit

Saturday:
5:30 pm BANQUET DINNER
Chicken fried steak, mashed potatoes, cream gravy, green beans, salad bar, wheat dinner rolls, chocolate pie

Sunday:
7:30 am BREAKFAST
Pancakes, bacon, hash browns, blueberry muffins, English muffins, assorted cereals and fruit

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TSM Members – Test your mammal knowledge and participate in our Annual Mammal Challenge

The challenge begins Friday evening at 6 pm and continues through Saturday, ending at lunch time. Winners (one faculty member and one student) are announced during the banquet and receive prizes, as well as the privilege of creating the mammal challenge for the next annual meeting! The 2019 Mammal Challenge winners, and this year's Challenge coordinators, were Jessica Healy-La Price (faculty, Austin College) and Taylor Soniat (student, Texas Tech University).

NEW in 2020: Animal Tracks Challenge by Jonah Evans

The challenge begins Friday evening at 6 pm and continues through Saturday, ending at lunch time. Winners (one faculty member and one student) are announced during the banquet. Thanks to Jonah Evans for bringing a different type of mammal challenge to TSM.

RULES FOR USE OF THE TEXAS TECH UNIVERSITY CENTER AT JUNCTION'S LLANO RIVER FIELD STATION

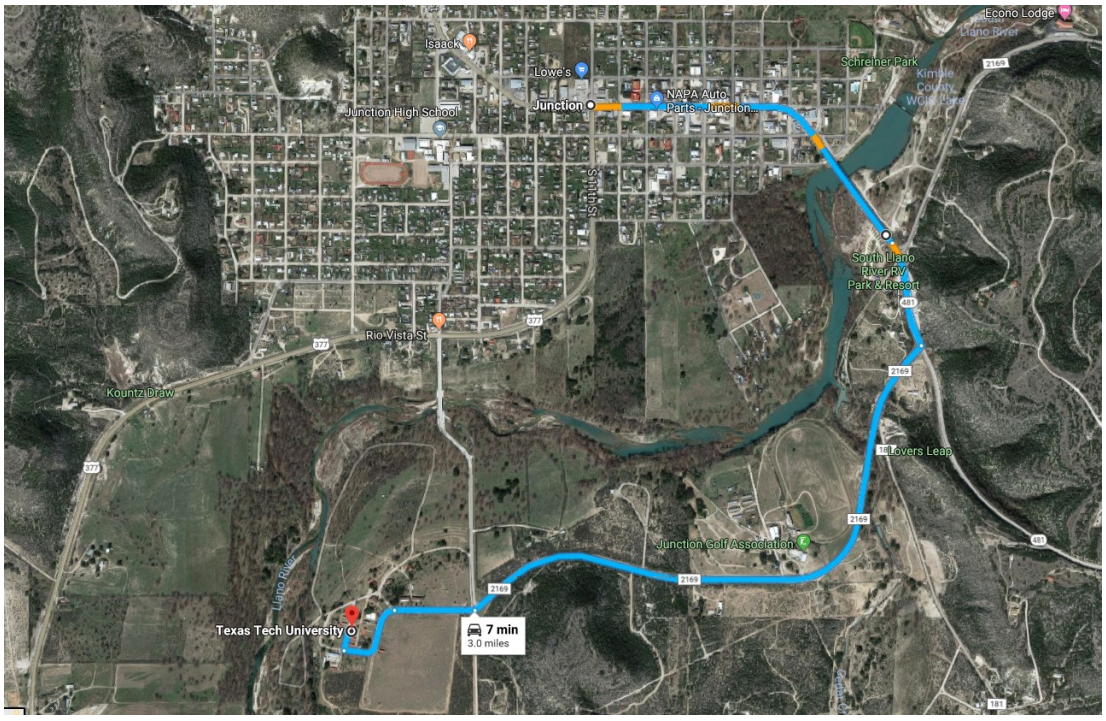
- Drugs and alcohol are strictly prohibited at the center*. Unauthorized use of either will result in immediate eviction with no refund. (*see exception below for TSM social hours)
- Do NOT drive on the grass. Stay on designated roads and out of unauthorized areas.
- Do NOT secure any items to the walls and/or doors without prior approval. This includes the use of tape, nails or screws.
- Do NOT remove or dismantle ANY furniture in the buildings, including beds and mattresses, clocks, other wall hangings or fixtures. DO NOT sit or stand on tables.
- Please remove all your event signs and/or posters before you depart.
- Pets, firearms, and camping are not allowed on campus.
- Fires are allowed ONLY with prior permission and ONLY in designated fire pit areas. The field station adheres to the Kimble County Burn Bans.
- Use of electric skillets, hot plates and other electrical cooking appliances is prohibited in all lodging areas. This also applies to electric heaters.
- Smoking is strictly prohibited inside **any** building.
- All plants and wildlife are protected at the field station and are not to be harvested or removed.
- Use of recreational vehicles is strictly prohibited on center.
- Do not prop open doors in ANY building

Any infractions, disregard, and/or negligent behavior resulting in the damage to the facilities, furniture, or equipment will be assessed a fee of no less than $500.00. This includes outside areas as well as tampering with thermostats in locked boxes. This damage/tampering fee will to be added to the Society's final bill.

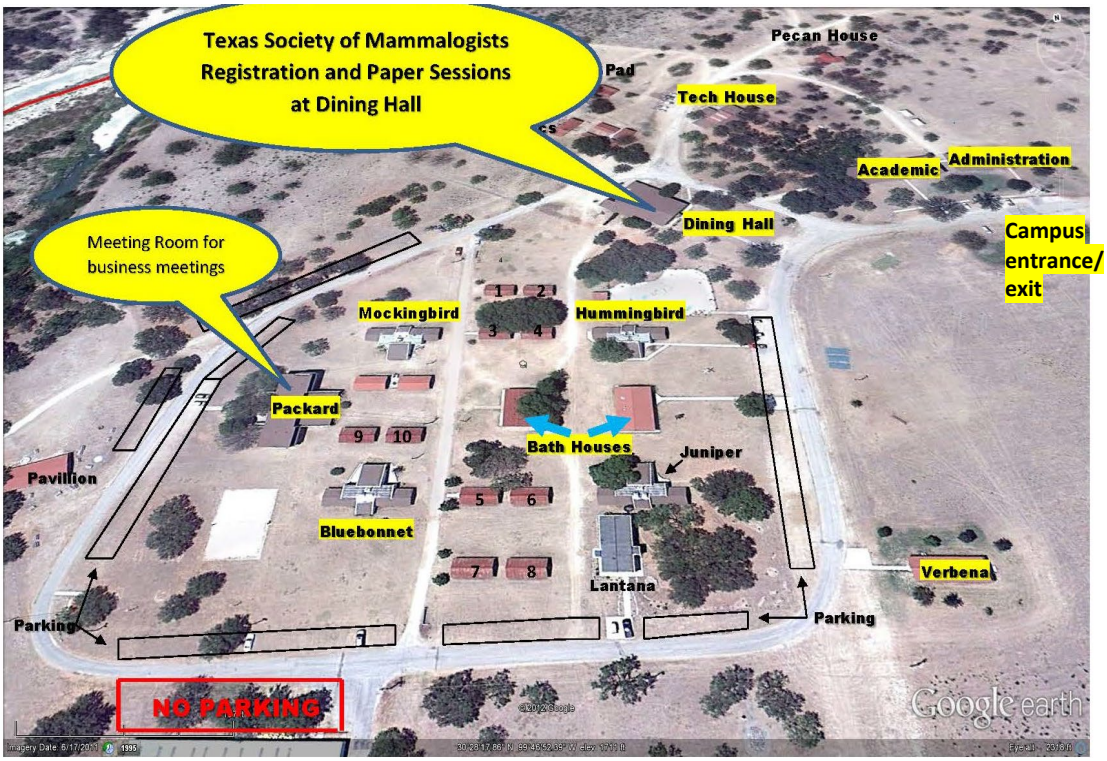
***Alcohol Rules for Texas Society of Mammalogists: Consumption of alcohol by persons over 21 years of age is permitted only in the Dining Hall from 7 pm to 12 midnight Friday and Saturday night. Attendees must show their ID at registration to receive a wrist band that will verify their legal age and two drink tickets. A licensed bartender will be present to distribute up to two alcoholic beverages per attendee wearing a wrist band. A Security Officer will be present on campus to monitor and respond to any illegal activities or safety concerns. Please follow the rules and behave yourselves so TSM can continue to meet at the Junction Center each year! Thank you!**

DIRECTIONS TO TTU LLANO RIVER FIELD STATION FROM JUNCTION

The bridge via the "back way" to campus has not been replaced. Please use the route shown below.



CAMPUS MAP



Note: There are two single-stall restrooms available in the Dining Hall. In the case of long lines, or the restrooms being out of order, the Bath House restrooms are available for use.

2020 Program Schedule

Friday, 21 February

3:00–7:30 pm	Registration	Dining Hall
4:30–6:00 pm	Meeting of the Executive Committee	Packard Building
6:00 pm	Dinner (serving line open 6:00–6:30pm)	Dining Hall
7:00 pm	Announcements/Welcome Address TSM President Jessica Light	Dining Hall
7:30–9:30 pm	Poster Presentations	Dining Hall

Saturday, 22 February

7:00 am	Breakfast and Registration (serving line open 7:00–7:30am)	Dining Hall
8:00 am	Introduction and Announcements TSM President Jessica Light	Dining Hall

PAPER SESSION 1 – Dining Hall

(Presenters' names are underlined)

Chair: Joel Brant, McMurry University

Papers 1–8 are to be considered for the William B. Davis Award.

8:05 Paper 1 – **OCCUPANCY MODELING AND CONSERVATION STRATEGIES FOR THE LOWLAND TAPIR IN THE COLOMBIAN ORINOCO** Angela Alviz and Richard D. Stevens, Department of Natural Resources Management, Texas Tech University

8:20 Paper 2 – **LANDSCAPE PATTERNS OF OCELOT-VEHICLE COLLISION SITES** AnnMarie Blackburn[1], C. Jane Anderson[1], Amanda M. Veals[1], Michael E. Tewes[1], David B. Wester[1], John H. Young Jr.[2], and Humberto L. Perotto-Baldivieso[1], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University–Kingsville, [2]Texas Department of Transportation, Environmental Affairs Division

8:35 Paper 3 – **PREDICTING HABTIAT PREFERENCES IN THREATENED SPECIES USING THE TOWSEND'S BIG-EARED BAT, *CORYNORHINUS TOWNSENDII***

***TOWNSENDII* AS AN EXAMPLE ORGANISM** Natalie Hamilton, Alexis Pence, and Michael Morrison, Department of Wildlife and Fishery Sciences, Texas A&M University

8:50 Paper 4 – **SOME LIKE IT COLD: ECOLOGY AND ENERGETICS OF WINTER RESIDENT MEXICAN FREE-TAILED BATS (*TADARIDA BRASILIENSIS MEXICANA*)** Emma L. Kunkel, Adrienne S. Dale, Nathan W. Fuller, and Liam P. McGuire, Department of Biological Sciences, Texas Tech University

9:05 Paper 5* – **CO-OCCURRENCE OF BOBCATS, COYOTES, AND OCELOTS IN TEXAS** Jason V. Lombardi[1], Darryl I. MacKenzie[2], Michael E. Tewes[1], Humberto L. Perotto-Baldivieso[1], Jose M. Mata[1], and Tyler A. Campbell[3], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, [2]Proteus, [3]East Foundation, San Antonio
** this paper is not eligible for the Davis Award but is competing for the Packard Award*

9:20 Paper 6 – **TRASH PANDAS AND ANTIBIOTIC RESISTANCE: WHY RACCOONS MAKE DANGEROUS NEIGHBORS** Molly McClurg[1], Jing Wu[2], Sarah D. Garza[1], Amee Boudreaux[1], Clarissa Gonzalez[1], Sara D. Lawhon[2], Scott E. Henke[3], and Richard C. Laughlin[1], [1]Department of Biological and Health Sciences, Texas A&M University-Kingsville, [2]College of Veterinary Medicine, Texas A&M University, [3]Department of Animal and Wildlife Sciences, Texas A&M University-Kingsville

9:35 **15 Minute Break**

PAPER SESSION 2 – Dining Hall

Chair: Dara Orbach, Texas A&M University – Corpus Christi

9:50 Paper 7 – **INFLUENCE OF MOON-PHASE ON HABITAT SELECTION AND DAILY MOVEMENT OF OCELOTS AND BOBCATS** Maksim Sergeyev[1,2], Jason V. Lombardi[1,2], Michael E. Tewes[1], Tyler A. Campbell[2], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, [2]East Foundation, San Antonio

10:05 Paper 8 – **FUNCTIONAL RESPONSES IN RESOURCE SELECTION BY OCELOTS (*LEOPARDUS PARDALIS*) IN SOUTH TEXAS** Amanda M. Veals[1], AnnMarie Blackburn[1], Michael E. Tewes[1], Joseph D. Holbrook[2], Humberto L. Perotto-Baldivieso[1], C. Jane Anderson[1], Randy W. DeYoung[1], Tyler Campbell[3], and John H. Young Jr.[4], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, [2]University of Wyoming, [3]East Foundation, San Antonio, [4]Texas Department of Transportation

Papers 9–13 are to be considered for the TSM Award.

10:20 Paper 9 – **MORPHOLOGY AND GENETICS OF *SIGMODON FULVIVENTER DALQUESTI* IN THE CHIHUAHUAN DESERT ECOREGION** Preston J. McDonald and Caleb D. Phillips, Department of Biological Sciences, Texas Tech University

10:35 Paper 10 – **INSIGHTS INTO THE SYSTEMATICS OF THE GENUS *ZYGODONTOMYS* (RODENTIA; CRICETIDAE; SIGMODONTINAE)** Connor J. Burgin[1,3] and John D. Hanson[2,3], [1]Department of Biology, Columbus State University, [2]RTLGenomics, [3]Institute for Biodiversity Research and Education

10:50 Paper 11 – **PHYLOGENETIC PLACEMENT AND POPULATION GENETICS OF *THOMOMYS BOTTAE* SUBSPECIES IN TEXAS AND SOUTHEASTERN NEW MEXICO USING SINGLE NUCLEOTIDE POLYMORPHISMS** Michaela K. Halsey[1,2], Laramie L. Lindsay[1]*, Taylor J. Soniat[1]*, Richard D. Stevens[2,3], Robert D. Bradley[1,3,] and David A. Ray[1], [1]Department of Biological Sciences, Texas Tech University, [2]Department of Natural Resources Management, Texas Tech University, [3]Museum of Texas Tech University (* indicates previous affiliation)

11:05 Paper 12 – **TRANSPOSABLE ELEMENT EVALUATION ACROSS MAMMALIA** Austin B. Osmanski, Jenny Korstian, Kevin Sullivan, Jenna Grimshaw, Michaela Halsey, Nicole Paulat, Diana Moreno-Santillán, Carlos Garcia, and David Ray, Department of Biological Sciences, Texas Tech University

11:20 Paper 13 – **EVIDENCE FOR HERITABLE VARIATION IN THE SONGS OF ALSTON'S SINGING MOUSE** Tracy T. Burkhard and Steven M. Phelps, Department of Integrative Biology, University of Texas at Austin

Papers 14–16 are to be considered for the Rollin Baker Award.

11:35 Paper 14 – **SMALL MAMMALS OF THE XISHUANGBANNA REGION OF YUNNAN PROVINCE, CHINA** Jonathan G. Jasper[1], Thomas E. Lee, Jr.[1], Brooke N. Riley[1], Caleb H. Horne[1], Brian R. Chapman[2], and Arthur G. Cleveland, [1]Department of Biology, Abilene Christian University, [2]Department of Biological Sciences, Sam Houston State University

12:15 **Lunch** (serving line open 12:15–12:45pm)

1:15 **Group Photo** behind the Packard Building – All members, please attend and please be on time! ☺

PAPER SESSION 3 – Dining Hall

Chair: Tom Lee, Abilene Christian University

1:45 Paper 15 – **PRELIMINARY TRENDS IN SMALL MAMMAL POPULATIONS AFTER TWO YEARS OF MARK-RECAPTURE RESEARCH IN THE GYPSUM HILLS OF WESTERN OKLAHOMA** C. Claire Smith[1], Francisca M. Mendez-Harclerode[2], Gloria M. Caddell[1], Chad B. King[1], and Michelle L. Haynie[1], [1]Department of Biology, University of Central Oklahoma, [2]Department of Biology, Bethel College

2:00 Paper 16 – **BAT DIVERSITY AND THE IMPACT OF WIND TURBINES ON THE BAT COMMUNITIES IN THE BIG COUNTRY** Rebecca Harris and Joel G. Brant, Department of Biological Sciences, McMurry University

Papers 17–20 are to be considered for the Bobby Baker Award.

2:15 Paper 17 – **VERIFYING LOW MITOCHONDRIAL DIVERSITY OF THE TEXAS KANGAROO RAT, *DIPODOMYS ELATOR*, USING ROLLING CIRCLE AMPLIFICATION AND ILLUMINA SEQUENCING** David A. Kiker and Russell S. Pfau, Department of Biological Sciences, Tarleton State University

2:30 Paper 18 – **CONFIRMATION OF EXTREME MITO-NUCLEAR DISCORDANCE IN THE POCKET GOPHER, *GEOMYS BREVICEPS*** Shady A. Kuster[1], Russell S. Pfau[1], and Sam R. Kieschnick[2], [1]Department of Biological Sciences, Tarleton State University, [2]Texas Parks and Wildlife

2:45 Paper 19 – **HISTORICAL BIOGEOGRAPHY IN SOUTH AMERICAN GRASSLAND REGIONS** Ariel Bellatin, Daniela Arenas-Viveros, and Jorge Salazar-Bravo**,** Department of Biological Sciences, Texas Tech University

3:00 Paper 20 – **DIFFERENCES IN CODING SEQUENCE BETWEEN BATS AND HUMANS IN DNA REPAIR GENE RAD50** Erin N. Reynolds, Antony J. Miller, and Dana N. Lee, Department of Agriculture, Biology, and Health Sciences, Cameron University

3:15 **15 Minute Break** – refreshments available in Packard Building

3:30 pm **Members Business Meeting** Packard Building
All members, including students, please attend!

5:30–9:00 pm		**Annual Banquet and Auction**	Dining Hall
	5:30–6:30	Dinner (serving line open 5:30–6:00pm)	
	5:30	Silent Auction opens for bidding	
	6:30–7:00	Award Presentations	
	7:00–8:00	Guest Speaker Address:	

Diversification of Didelphid Marsupials: A Window into South America's "Splendid Isolation"

Dr. Sharon Jansa
University of Minnesota

8:00–9:00	Live Auction Silent Auction ends 10 minutes after Live Auction	
9:00–12:00 pm	Socializing and Dancing	Dining Hall

Sunday, 23 February

7:30 am	Breakfast (serving line open 7:30–8:00am)	Dining Hall

Oral Presentation Abstracts

Paper 1

OCCUPANCY MODELING AND CONSERVATION STRATEGIES FOR THE LOWLAND TAPIR IN THE COLOMBIAN ORINOCO Angela Alviz and Richard D. Stevens, Department of Natural Resources Management, Texas Tech University (angela.alviz@ttu.edu)

The lowland tapir (*Tapirus terrestris*) has the largest geographic range of all existing tapir species, inhabiting 11 countries and 21 different biomes throughout South America. *Tapirus terrestris* inhabit a wide range of habitats consisting of tropical forests in warm and humid climates and water bodies and wetlands, like the gallery forest and floodable savannahs of the Orinoco region. Throughout their range, populations have been declining by an estimated 33% over the last three generations as a result of habitat loss, forest fragmentation, and poaching. Despite the existing information of the species, studies related to the lowland tapir in the Colombian Orinoco are fragmented. In Colombia, most research conducted on *T. terrestris* has been spatially concentrated in the Amazonian forests or in the subspecies *T. terrestris colombianus* due to its endemism. However, aspects related to the distribution of tapirs, habitat use and feeding habits in landscapes of floodable savannahs and high plains in the Orinoquia region is unknown. For that reason, we aim to estimate the occupancy and describe the activity patterns of the lowland tapir in the floodable savannahs and gallery forest in tree main areas through camera traps data. We used a general model of occupancy, and used relative abundance and estimated the influence of temperature fluctuations and moon phases on activity patterns. In general, lowland tapir populations presented a high percentage of occupancy and high abundances, exhibiting a strong relation with the gallery and riparian forest. The high probability of occupation of the species is due to the good state of conservation of ecosystems evaluated and the close relationship that presents the species with gallery forests and water bodies.

Paper 2

LANDSCAPE PATTERNS OF OCELOT-VEHICLE COLLISION SITES AnnMarie Blackburn[1], C. Jane Anderson[1], Amanda M. Veals[1], Michael E. Tewes[1], David B. Wester[1], John H. Young Jr., and Humberto L. Perotto-Baldivieso[1], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University–Kingsville, [2]Texas Department of Transportation, Environmental Affairs Division (annmarie.blackburn@students.tamuk.edu)

Road networks can have widespread negative impacts on wildlife populations such as habitat fragmentation, decreased landscape connectivity, and wildlife-vehicle collisions, which can influence the spatial ecology and population dynamics of imperiled species. The ocelot (*Leopardus pardalis*) is a federally endangered wild felid found in South Texas, with two remnant populations of <80 individuals. Ocelots in this region are habitat specialists selecting areas with ≥75% woody cover. Vehicle collisions are one of the highest sources of mortality for Texas ocelots. This study examined whether land cover spatial structure is related to ocelot road mortality locations. We examined the amount and distribution of three land cover types at multiple spatial scales surrounding ocelot-vehicle collisions (n = 26) from 1986–2017. We found road mortality sites consisted of higher percentages of woody cover ($p<0.0409$), larger patches of woody cover ($p<0.0455$) relatively close to roads (450–600m), and shorter distances between woody patches ($p<0.0382$) relatively further away from roads (1200–1500m) compared to random road locations. Percent land cover was the best indicator of ocelot-vehicle collision sites. This indicates that ocelots were struck in areas similar to those they typically select. These findings suggest that the development of roads in these areas can have negative impacts on ocelots by fragmenting critical habitat and increasing ocelot vulnerability to vehicle collisions. This information will provide conservation planners with a better understanding of the landscape features at ocelot road mortality sites and consequently can be used to guide the placement of future road crossing structures.

Paper 3
PREDICTING HABTIAT PREFERENCES IN THREATENED SPECIES USING THE TOWSEND'S BIG-EARED BAT, *CORYNORHINUS TOWNSENDII TOWNSENDII* AS AN EXAMPLE ORGANISM Natalie Hamilton, Alexis Pence, and Michael Morrison, Department of Wildlife and Fishery Sciences, Texas A&M University (nhamilton@tamu.edu)

Effective management decisions and appropriate conservation efforts depend on knowledge of species distribution and habitat preferences. Distribution maps are especially important in predicting occurrences of endangered or threatened species. The goal of our study was to identify appropriate habitat variables for species distribution modeling on species of special concern, with the Townsend's big-eared bat, *Corynorhinus townsendii townsendii*, as an example species. We applied three modeling techniques (maximum entropy, random forest, and generalized linear model) to predict potential habitats for *C. t. townsendii* in California. Using survey data collected in California from 2014 to 2017, we analyzed presence-absence and presence-only models at four levels to explore how habitat needs vary. The four levels we included as ecologically relevant were: 1) All colonies, 2) Hibernacula, 3) Maternity colonies, and 4) Level 3 ecoregions in California. Models to test species distribution and the potential differences between groups were based on 7 independent variables (elevation, distance to water, annual precipitation, mean temperature of wettest quarter, precipitation seasonality, mean diurnal range, and distance to urban centers). The generated models predicted suitable habitat varied between maternity and hibernacula colonies. For hibernating colonies, elevation and distance to water were the strongest predictors of habitat suitability, while annual precipitation and mean temperature of wettest quarter were the strongest predictors for maternity colonies. Our study highlights how species' habitat needs can vary depending on the seasonal habits of the species. Additionally, our results emphasize that management practices will need to consider separate habitat models for migrating species.

Paper 4
SOME LIKE IT COLD: ECOLOGY AND ENERGETICS OF WINTER RESIDENT MEXICAN FREE-TAILED BATS (*TADARIDA BRASILIENSIS MEXICANA*) Emma L. Kunkel, Adrienne S. Dale, Nathan W. Fuller, and Liam P. McGuire, Department of Biological Sciences, Texas Tech University (emma.kunkel@ttu.edu)

Migration evolves when the benefits of migrating outweigh the costs of remaining sedentary. However, migration is characteristic of individuals and the costs and benefits of migration often vary among individuals. Such inter-individual variations can result in partial migration systems where some individuals migrate while others forego migration. Previous investigations of partial migration have focused on homeothermic species where benefits and costs are driven primarily by energy availability. However, heterothermic species can reduce energy expenditure in response to varying energy availability, providing greater flexibility. To determine how partially migratory heterotherms manage the energetic challenge of winter, we investigated the energetic strategies of overwintering Mexican free-tailed bats (*Tadarida brasiliensis mexicana*). We hypothesized overwintering bats would exhibit flexibility in maintaining energy balance by maximizing energy intake via foraging on warmer nights and reducing energy expenditure by decreasing activity and using torpor while inactive, with torpor bouts extending over multiple days during longer periods of harsh weather. We worked at a Texas roost from September 2018 to May 2019. We captured >1,000 bats and recorded their sex and mass to delineate seasonal demographic shifts. To quantify winter foraging intensity, we collected blood from active bats and assayed for plasma triglyceride concentration. To investigate torpor use, we measured skin temperature with temperature-sensitive radiotransmitters attached to free-living bats in February 2019. Bat activity was strongly affected by weather, with reduced activity on colder nights. Bats regularly used torpor during the day and were able to extend torpor bouts over multiple days during extended periods of harsh weather. Surprisingly, plasma triglyceride levels were extremely low during all winter capture events, indicating bats rarely forage during winter. These bats withstand winter via regular torpor use but despite

being active do not capitalize on winter foraging opportunities, demonstrating the extreme energetic flexibility of this sub-tropical mammal.

Paper 5

CO-OCCURRENCE OF BOBCATS, COYOTES, AND OCELOTS IN TEXAS Jason V. Lombardi[1], Darryl I. MacKenzie[2], Michael E. Tewes[1], Humberto L. Perotto-Baldivieso[1], Jose M. Mata[1], and Tyler A. Campbell[3], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M Unversity-Kingsville, [2] Proteus, [3] East Foundation (lombardijv@gmail.com)

Interspecific competition among carnivores has been linked to differences in behavior, morphology and resource use. Insights into these interactions can enhance understanding of local ecological processes that can have impacts on the recovery of endangered species. Ocelots (*Leopardus pardalis*), bobcats (*Lynx rufus*), and coyotes (*Canis latrans*) share a small range overlap from South Texas to south-central Mexico but relationships among the three are not known. From May 2011 to March 2018, we conducted a camera-trap study to examine co-occurrence patterns among ocelots, bobcats, and coyotes on the East Foundation's El Sauz Ranch in South Texas. We applied a novel multi-season extension to multi-species occupancy models with three interacting species to identify interspecific interactions and examine potential resource partitioning within this carnivore community. We found strong evidence of seasonal mutual coexistence among these species and observed species-specific seasonal trends in detection. Seasonal coexistence patterns were also explained by increasing distance from a high-speed roadway. We were unable to find evidence of resource partitioning, which may indicate the niches of these species may be too discrete for interspecific competition. This study suggests a coexistence among ocelots, bobcats, and coyotes on South Texas rangelands. These results have important ecological implications for planning strategies to benefit ocelot recovery in the region. Further research would provide a better understanding of the ecological mechanisms that facilitate coexistence within this community. As road networks in the region expand overtime, large private working ranches will be needed to provide important habitat for ocelots and other carnivore species.

Paper 6

TRASH PANDAS AND ANTIBIOTIC RESISTANCE: WHY RACCOONS MAKE DANGEROUS NEIGHBORS Molly McClurg[1], Jing Wu[2], Sarah D. Garza[1], Amee Boudreaux[1], Clarissa Gonzalez[1], Sara D. Lawhon[2], Scott E. Henke[3], and Richard C. Laughlin[1], [1]Department of Biological and Health Sciences-Texas A&M University-Kingsville, [2]College of Veterinary Medicine, Texas A&M University, [3]Department of Animal and Wildlife Sciences-Texas A&M University-Kingsville (mcclurgmc85@gmail.com)

We conducted an exploratory investigation into the gastrointestinal tract of feral *Procyon lotor*, the northern raccoon, in search of a reservoir of antibiotic resistance. Identification of a pathogen and how it is transmitted is crucial to the control of infectious outbreaks. The adaptable nature of raccoons, especially their predilection towards urbanization, makes them a unique model for microbial studies. Previous studies have shown raccoons to be an asymptomatic carrier of many zoonotic pathogens, such as *Salmonella* species. Our study focused on three genera of microbes due to their current clinical relevance: *Enterococcus*, *Escherichia*, and *Salmonella*. Samples from the gastrointestinal tract were collected and selectively enriched using differential medias. Preliminary results based on selection were then positively identified to the strain using MALDI-TOF Mass Spectrometry. Further, since a majority of samples contained all three genera, we then screened the isolates for antibiotic resistance. We tested Enterococcus species for Vancomycin resistance, as Vancomycin Resistant Enterococcus (VRE) is a current health concern in clinical settings. *Salmonella* and *Escherichia* isolates were tested against the beta-lactam Ceftiofur. The presence of antibiotic resistance in feral raccoons provides a unique insight into the spread of pathogens through wildlife, and how it might pose potential health risks to both humans and domestic animals that live in close proximity.

Paper 7

INFLUENCE OF MOON-PHASE ON HABITAT SELECTION AND DAILY MOVEMENT OF OCELOTS AND BOBCATS Maksim Sergeyev[1,2], Jason V. Lombardi[1,2], Michael E. Tewes[1], and Tyler A. Campbell[2], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, [2]East Foundation, San Antonio (ecomaksimergeyev@gmail.com)

For nocturnal animals, visibility is greatly influenced by moon phase and, as such, the phase of the moon may influence activity and habitat selection of these species. However, the effects of varying moon stage may differ across taxa. Prey species often reduce activity during highly visible periods of night while predators may increase activity or alter their habitat use. Ocelots (*Leopardus pardalis*) and bobcats (*Lynx rufus*), two nocturnal predatory felids that coexist in southern Texas, may also alter their behavior in response to the phase of the moon. We predicted that ocelots would increase use of dense thornshrub to reduce their visibility during a full moon. However, as bobcats are habitat generalists and are more active during crepuscular periods, we predicted less influence of moon phase on activity. To examine the effect of moon phase on movement and selection preferences, we collected high-frequency GPS data on 8 ocelots and 6 bobcats on the East Foundation's El Sauz Ranch in southern Texas from May 2013 to May 2017. We used logistic regression models to examine differences in daily movement rates. To evaluate habitat selection, we performed resource selection functions to compare land use during periods of high luminosity (±3 days of a full moon) compared to low luminosity (±3 days of a new moon). Movement was highest during full moons for both species. Additionally, use of canopy cover was greatest during waxing/waning moons for both species. Understanding habitat use patterns is instrumental for the conservation of ocelots and similarly threatened species.

Paper 8

FUNCTIONAL RESPONSES IN RESOURCE SELECTION BY OCELOTS (*LEOPARDUS PARDALIS*) IN SOUTH TEXAS Amanda M. Veals[1], AnnMarie Blackburn[1], Michael E. Tewes[1], Joseph D. Holbrook[2], Humberto L. Perotto-Baldivieso[1], C. Jane Anderson[1], Randy W. DeYoung[1], Tyler Campbell[3], and John H. Young Jr.[4], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, [2]University of Wyoming, [3]East Foundation, [4]Texas Department of Transportation (amanda.veals@students.tamuk.edu)

The distribution of animal populations and the factors that influence animal use of the landscape are of key interest to ecologists and managers. Individual animals often experience different environmental conditions and may have different behavioral responses to those environments, termed a functional response in habitat use or selection. Traditional methods to evaluate resource selection by animals do not take functional responses into consideration, which could constrain conservation efforts. We assessed functional responses in habitat use for a federally endangered carnivore, the ocelot (*Leopardus pardalis*). We examined how spatial and temporal variation influenced ocelot-habitat relationships by leveraging a 35-year (1982–2017) telemetry dataset of 83 ocelots (42 males, 41 females) to evaluate how individual behavior changed across a gradient of environmental conditions. We implemented an integrated approach to characterize ocelot-habitat relationships and assess behavioral differences with changing environments across time periods. We paired remotely sensed data with telemetry locations of ocelots and assessed habitat use, resource selection, and functional responses. We tested a second-order selection model that included vegetation cover, road densities, and traffic volumes, then estimated inverse variance-weighted mean coefficients averaged across individuals. Ocelots used areas that were dominated by woody cover but were more heterogenous in landscape structure. Our results show ocelots selected for areas farther from roads across all time periods. Spatial and temporal variation in habitat availability strongly influenced functional responses by ocelots. The insights garnered from our approach can advance habitat conservation efforts and subsequent transportation network planning.

Paper 9
MORPHOLOGY AND GENETICS OF *SIGMODON FULVIVENTER DALQUESTI* IN THE CHIHUAHUAN DESERT ECOREGION Preston J. McDonald and Caleb D. Phillips, Department of Biological Sciences, Texas Tech University (preston.mcdonald@ttu.edu)

The tawny-bellied cotton rat, *Sigmodon fulviventer dalquesti*, is a Texas endemic subspecies reported only from a single sampling near Fort Davis in 1991. The current population, distribution, and evolutionary origin of *S. f. dalquesti* is enigmatic. The Texas Parks and Wildlife Department's Texas Conservation Action Plan designates *S. f. dalquesti* as critically imperiled within the state. Additionally, the relationship between *S. f. dalquesti* and other *S. fulviventer* subspecies in Mexico, Arizona, and New Mexico is not well understood. The current state of knowledge of *S. f. dalquesti* systematics consists of morphological distinction from *S. f. minimus* (New Mexican form), and a finding of mitochondrial cytochrome *b* divergence between *S. f. dalquesti* and *S. f. fulviventer* (Mexican form) roughly equivalent to 100,000 years of divergence. To inform an accurate conservation assessment, a more complete understanding of *S. f. dalquesti* biology is required. Analysis of craniometric characters and mitochondrial cytochrome *b* data presented herein support recognition of *S. f. dalquesti*. Species distribution modeling suggests under-surveyed areas of potential range extension.

Paper 10
INSIGHTS INTO THE SYSTEMATICS OF THE GENUS *ZYGODONTOMYS* (RODENTIA; CRICETIDAE; SIGMODONTINAE) Connor J. Burgin[1,3] and John D. Hanson[2,3], [1]Department of Biology, Columbus State University, [2]RTLGenomics, [3]Institute for Biodiversity Research and Education (connorjburgin@gmail.com)

Zygodontomys currently includes two species found in the Neotropics from Costa Rica to northern Brazil. However, a variety of morphometric, karyotypic, and molecular data suggests that there are a number of unrecognized taxa that are included under what is currently recognized as the widespread *Z. brevicauda*. Here we provide a preliminary phylogenetic analysis of the genus based on cyt b sequences. There may be as many as eight species distributed across the northern Neotropics with endemic species distributed in a number of regions, including Isla Coiba off of southern Panama, the Guianan Shelf, and parts of Amazonian Brazil along the border of the distribution for the genus. Continuing forward, we will investigate the taxonomic status of the genetic lineages predicted here by conducted molecular and morphometric analysis using ultra-conserved elements (UCE's) and craniodental measurements, respectively, to identify species boundaries and define distinct taxa.

Paper 11
PHYLOGENETIC PLACEMENT AND POPULATION GENETICS OF *THOMOMYS BOTTAE* SUBSPECIES IN TEXAS AND SOUTHEASTERN NEW MEXICO USING SINGLE NUCLEOTIDE POLYMORPHISMS Michaela K. Halsey[1,2], Laramie L. Lindsay[1*], Taylor J. Soniat[1*], Richard D. Stevens[2,3], Robert D. Bradley[1,3] and David A. Ray[1], [1]Department of Biological Sciences, Texas Tech University, [2]Department of Natural Resources Management, Texas Tech University, [3]Museum of Texas Tech University ([*]indicates previous affiliation) **(**michaela.halsey@ttu.edu)

Despite the enduring debate of whether subspecies rank is a useful one, identifying relationships within a subspecies complex can be extremely valuable. Subspecies have been defined as geographically disparate populations that differ phenotypically when using morphology-based classification. However, advances in molecular techniques and computing power can further resolve subspecific definitions by identifying genotypes that may represent distinct evolutionary trajectories. Botta's pocket gopher, *Thomomys bottae*, is a species found in a variety of habitat types from coastal California, south to Baja California, and eastward to western Texas. We predict that there is a pattern of phylogenetic placement and geographic

proximity of *T. bottae* pocket gophers in the region. Furthermore, subspecies with a highly restricted distribution (e.g., on a single mountain range, such as *T. b. limpiae*) will have lower levels of genetic diversity and greater levels of inbreeding than those with less restricted distributions (e.g., *T.b. confinalis*). Here, we analyzed approximately 4,200 single-nucleotide polymorphisms generated from restriction-site associated DNA sequencing data of 90 *T. bottae* individuals from contemporary collection efforts and museum specimens. Phylogenetic trees based on Bayesian and maximum likelihood approaches indicated a moderate positive relationship between geographic proximity and phylogenetic placement as expected under a model of isolation-by-distance. Interestingly, subspecies with highly restricted distributions had greater levels of nucleotide diversity than those with larger distributions (e.g., π for *T.b. limpiae* was 0.200 and 0.067 for *T.b. confinalis*). These results can be used to reinforce morphology-based designations of *T. bottae* subspecies in Texas and serve as a needed population genetics update for this group of subterranean rodents.

Paper 12

TRANSPOSABLE ELEMENT EVALUATION ACROSS MAMMALIA Austin B. Osmanski, Jenny Korstian, Kevin Sullivan, Jenna Grimshaw, Michaela Halsey, Nicole Paulat, Diana Moreno-Santillán, Carlos Garcia, and David Ray**,** Department of Biological Sciences, Texas Tech University (austin.osmanski@ttu.edu)

Transposable elements (TEs) are sections of DNA that can replicate and relocate themselves within a genome. They constitute anywhere from a third to a half of most mammalian genomes and their mobilization has impacted mammalian evolution. TE insertions are most often deemed to have neutral or deleterious effects on the genome, but sometimes their presence has been attributed to alterations in gene expression. Over the past two years, the Broad Institute has generated over 200 high quality mammalian genomes. Akin to the endeavors of famous natural history figures like Bailey and Merriam who discovered and described dozens of new mammalian species in unstudied landscapes, we have undergone a molecular scale version of this same research venture in an attempt to more holistically evaluate mammalian TE diversity using the aforementioned unstudied genomes. Here, we present our lab's year-long effort on this project describing historical events of TE accumulation and suppression across Mammalia.

PAPER 13

EVIDENCE FOR HERITABLE VARIATION IN THE SONGS OF ALSTON'S SINGING MOUSE Tracy T. Burkhard and Steven M. Phelps, Department of Integrative Biology, University of Texas at Austin (tburk@utexas.edu)

Advertisement vocalizations can attract mates, deter rivals, and drive reproductive isolation. Because adaptation relies on heritable variation, examining the heritability (h^2) of acoustic variation is critical to understanding the evolution of vocalizations and the species that make them. Alston's singing mouse (*Scotinomys teguina*) is a small and diurnal species living in cloud forests of Mesoamerica. We used a combination of breeding studies and genomics-based methods to test for heritable variation in song structure among these mice both in the lab and field. We first took advantage of geographic variation in song to experimentally examine whether heritable variation contributes to intraspecific differences in song. We caught animals from Costa Rica and Panama, populations that naturally differ in song length. We reared animals from these sites in captivity, and crossed them to produce F_1 and F_2 animals, recording songs from each of these three generations. Population differences in song elaboration were maintained in lab-reared animals, suggesting a heritable basis to population differences. Next, we estimated the heritability of song within a Costa Rican population. We recorded songs and collected DNA from wild-caught mice. We used RAD-seq to generate SNPs from each individual and to calculate a genomewide relatedness matrix (GRM). We fit generalized linear mixed models to calculate h^2 of song. Energetic aspects of song (*e.g.* length, trill rate) had low h^2 (0–0.3) while spectral characteristics (*e.g.* dominant frequency, bandwidth) had high h^2 (0.4–0.6). Finally, we conducted a biogeographical study to examine

whether interpopulation genetic variation predicts acoustic differentiation. Our preliminary results suggest that acoustic distance between populations scales with genetic distance. Together our data support the hypothesis that there is heritable variation in song structure both within and among populations of singing mice.

Paper 14

SMALL MAMMALS OF THE XISHUANGBANNA REGION OF YUNNAN PROVINCE, CHINA Jonathan G. Jasper[1], Thomas E. Lee, Jr. [1], Brooke N. Riley[1], Caleb H. Horne[1], Brian R. Chapman[2], and Arthur G. Cleveland, [1]Department of Biology, Abilene Christian University, [2]Department of Biological Sciences, Sam Houston State University (jgj16a@acu.edu)

During the period 1987–1990, mammal collections were made in the Xishuangbanna region of Yunnan Province, China. These collections were assembled from sites in and near the town of Menglun, in a tropical cloud forest region near the border of China, Myanmar, and Laos. Biological surveys help provide information about this region at a time of rapid industrial growth in China. In the three decades since these specimens were collected, much has changed in this region. This study provides a glimpse into the past for present and future comparisons of mammal diversity in the Xishuangbanna region consisting of tropical and mesic, to extremely hot and moist bioclimatic zones. Species recorded in this study are: *Crocidura fuliginosa*, *Cynopterus sphinx*, *Macroglossus sobrinus*, *Rousettus leschenaultii*, *Rhinolophus macrotis*, *R. sinicus*, *R. thomasi*, *Aselliscus stoliczkanus*, *Hipposideros armiger*, *H. lylei*, *H. pomona*, *Megaderma lyra*, *Taphozous theobaldi*, *Chaerephon plicatus*, *Eptesicus serotinus*, *Scotophilus heathii*, *Pipistrellus abramus*, *Miniopterus schrebersii*, *Herpestes javanicus*, *Callosciurus erythraeus*, *Rhizomys pruinosus*, *R. sumatrensis*, *Niviventer fulvescens*, and *Rattus* sp.

Paper 15

PRELIMINARY TRENDS IN SMALL MAMMAL POPULATIONS AFTER TWO YEARS OF MARK-RECAPTURE RESEARCH IN THE GYPSUM HILLS OF WESTERN OKLAHOMA C. Claire Smith[1], Francisca M. Mendez-Harclerode[2], Gloria M. Caddell[1], Chad B. King[1], and Michelle L. Haynie[1], [1]Department of Biology, University of Central Oklahoma, [2]Department of Biology, Bethel College (csmith230@uco.edu)

The purpose of this project is to monitor changes in small mammal populations and communities over multiple generations to determine what factors affect how the populations and communities change over time. In March of 2018, a permanent trapping web was established at the University of Central Oklahoma's Selman Living Lab (SLL). Two additional permanent webs were established in June of 2018. The SLL is located in the gypsum hills of Woodward County in western Oklahoma. Surveys of the 3 webs are conducted for 3 nights, 4 times a year, and include collection of mammalian and vegetation data. Climate data also is obtained for each day of the trip; monthly and yearly climate data also will be assessed. To date, 7 mammalian and vegetation surveys have been conducted. Based on preliminary data, seasonal and habitat trends have been detected in mammalian populations, with the lowest capture numbers occurring in the summer and reaching peak numbers in the spring. The trapping web located on mixed, slightly disturbed habitat has the most diverse community and the most number of captures/recaptures. In the future, the animal, climate, and vegetation data will be used to build mathematical models that can be used to determine which factors have the largest impact on population and community persistence. Additionally, changes in the genomic make-up of the populations over time will be assessed.

Paper 16

BAT DIVERSITY AND THE IMPACT OF WIND TURBINES ON THE BAT COMMUNITIES IN THE BIG COUNTRY Rebecca Harris and Joel G. Brant**,** Department of Biological Sciences, McMurry University (harris.rebecca@mcm.edu)

An estimated 600,000 bats a year are killed by wind turbines in the US alone and Texas is a leader in wind energy. Nine species of bats have been documented in the Big Country and of those species only a handful of voucher specimens have been collected. The purpose of this study is to document the bat community in the Big Country and to determine what affect, if any, wind turbines have on this community. Two SM4BAT ultrasonic detectors were deployed in the study area, one was set 25 kilometers away from wind turbines and one was placed within 25 kilometers of a wind turbine. Sampling was conducted from May 2019 to December 2019. After applying a 30-minute window to the calls, 6,032 bat calls were recorded over 420 trap nights. All nine previously documented species were present with Lasiurus borealis the most common bat at both locations. Diversity analyses were performed to test Margalef Richness, Berger-Parker Dominance, Simpson Evenness, and Shannon Diversity. All diversity measures were significant which implies that the wind turbines are attracting some species of bats. These results represent only preliminary data in an ongoing research project.

Paper 17

VERIFYING LOW MITOCHONDRIAL DIVERSITY OF THE TEXAS KANGAROO RAT, *DIPODOMYS ELATOR,* USING ROLLING CIRCLE AMPLIFICATION AND ILLUMINA SEQUENCING David A. Kiker and Russell S. Pfau**,** Department of Biological Sciences, Tarleton State University (david.kiker@go.tarleton.edu)

The Texas kangaroo rat, *Dipodomys elator*, is listed as a threatened species by Texas Parks and Wildlife. A better understanding of patterns of genetic diversity in this species will inform future conservation and management decisions. A previous study by our laboratory examined patterns of genetic diversity by sequencing portions of the mitochondrial genome and analyzing the nuclear genome using microsatellites. Results documented lower than expected mitochondrial genetic diversity but typical levels of microsatellite diversity. This pattern of genetic diversity could be explained by a historical population bottleneck. Alternatively, the mitochondrial sequences could be derived from copies of the mitochondrial genome that were inserted into the nucleus (NUMTs). NUMTs accumulate mutations more slowly than mtDNA because of differences in mutational repair mechanisms between the mitochondria and nucleus. Because of this, NUMTs are expected to evolve more slowly and thus exhibit less variation. The objective of our study was to determine whether the low mitochondrial diversity revealed by our study could be explained by having sequenced a NUMT. The entire mitochondrial genome was preferentially amplified by rolling circle amplification (RCA). The amplified genome was then sequenced using Illumina technology, assembled using NOVOplasty, and annotated using MITOS. We compared the resulting mitogenome sequence to the mitochondrial gene sequences generated previously and found that they were identical. This lends support to the validity of our original sequences by ruling out NUMT contamination.

Paper 18

CONFIRMATION OF EXTREME MITO-NUCLEAR DISCORDANCE IN THE POCKET GOPHER, *GEOMYS BREVICEPS* Shady A. Kuster[1], Russell S. Pfau[1], and Sam R. Kieschnick[2], [1]Department of Biological Sciences, Tarleton State University, [2]Texas Parks and Wildlife (shady.kuster@go.tarleton.edu)

The pocket gopher, *Geomys breviceps*, is found in eastern Texas, Oklahoma, Arkansas, and Louisiana. Across its distribution, there are four distinct mitochondrial lineages (4–7% sequence divergence) that are geographically restricted but not geographically isolated. They appear to be parapatric. However, these mitochondrial patterns are not mirrored by those of the nuclear genome, as amplified fragment length polymorphisms show a pattern of isolation-by-distance, without distinct breaks between mtDNA-defined

populations. Nuclear mitochondrial segments (NUMTs) have been documented in *Geomys*. NUMTs are the result of mitochondrial DNA being inserted into the nuclear genome, where they undergo different evolutionary pressures than they would in the mitochondria. Because of this, their preferential amplification can confound phylogeographic studies and could potentially explain the discordance between nuclear and mitochondrial datasets in *G. breviceps*. Our objective was to rule out the possibility of NUMT contamination by amplifying and sequencing entire mitogenomes. Rolling circle amplification (RCA) was used to preferentially amplify the circular mitochondrial DNA of four specimens representing each of the four mtDNA lineages. The RCA product was sequenced using Illumina technology. The resulting sequences were assembled using NOVOPlasty and were aligned and compared to sequences generated using Sanger sequencing of PCR products of the same individuals. Our results demonstrate that previously generated sequences presumed to be mtDNA were indeed sequences derived from the mitochondrial genome. The extreme mito-nuclear discordance documented in *G. breviceps* may be explained by mitonuclear coevolution which describes an interdependency of protein-coding genes within the mitochondrial and nuclear genomes. Mitochondrial and nuclear genes not part of the coadapted complex are allowed to freely flow across contact zones between populations (creating a pattern of isolation by distance) while those that are involved in the coadapted complex cannot flow across the contact zone (maintaining geographically restricted mitochondrial lineages).

Paper 19

HISTORICAL BIOGEOGRAPHY IN SOUTH AMERICAN GRASSLAND REGIONS

Ariel Bellatin, Daniela Arenas-Viveros, and Jorge Salazar-Bravo, Department of Biological Sciences, Texas Tech University (ariel.bellatin@ttu.edu)

Multi-loci phylogenetic analyses was used to investigate patterns of geographic and phylogenetic divergence within two rodent Sigmodontine genera (*Calomys* and *Necromys*). These taxa have occupied grassland and open-forest landscapes throughout South America since the late Tertiary. Phylogenetic analyses suggests that the distribution of these genera was affected by the same Quaternary pluvial-interpluvial climatic fluctuations that have resulted in periodic fragmentation and coalescence of open environments throughout South America. However, these responses were highly idiosyncratic for each genus. The multilocus phylogeny of each genera informs the historical relationships among the five areas of grassland endemism (Northern savannas, Llanos de Moxos, Cerrados, Pampas, and high elevation grasslands) and provides a temporal reconstruction of the historical biogeographic events that resulted on the diversity patterns evident today. Our hypothesized area cladogram can be tested by investigating regional relationships in other taxa with distributions similar to those of *Calomys* and *Necromys*.

Paper 20

DIFFERENCES IN CODING SEQUENCE BETWEEN BATS AND HUMANS IN DNA REPAIR GENE RAD50 Erin N. Reynolds, Antony J. Miller, Dana N. Lee, Department of Agriculture, Biology, and Health Sciences, Cameron University (er933166@cameron.edu)

Bats are known to live longer than other mammals of similar size. Of the 19 species of mammals that live longer than humans relative to their body size, 18 are bats. Thus, bats are optimal organisms for research concerning age-related disease. Over the past century, medicine has extended human life span by treating age-related diseases, but the onset age of these degenerative diseases has stymied. Therefore, the probability of developing age-related diseases, such as cancer, is now increasing. We investigated differences between the nucleotide and amino acid sequence of the RAD50 gene in bats and humans. Rad50 protein is known to play a role in the repair of double-strand DNA breaks (DSB). When left unrepaired, DSBs lead to loss of genetic information, cell death, mutations, or uncontrolled division. We took skin samples from the wings of three bat species (*Myotis velifer, Tadarida brasiliensis*, and *Eptesicus fuscus*). The RNA was separated, converted to cDNA, and the RAD50 gene was isolated using PCR and gel electrophoresis. We obtained 1550 base pairs of DNA sequence representing approximately 1/5 of the coding length. Our results revealed 108 (19.6%) differences in nucleotides among the various

bat species and humans with 34 (6.5%) resulting in an amino acid change. Of those variances, 55 (3.5%) were unique to humans, which altered 19 (3.6%) amino acids. The presence of differences in nucleotide and amino acid sequence in the RAD50 gene between bats and humans was confirmed in this study. However, this gene was found to not be under positive selection. This is a preliminary study that provides direction for future research concerning the role of RAD50 in the DSB repair pathway in bats.

POSTERS AT-A-GLANCE

Competing for the Vernon Bailey Graduate Award (Posters 1 –13):

1 – HOME RANGE ANALYSIS OF STRIPED SKUNKS (*MEPHITIS MEPHITIS*) IN SOUTHEASTERN TEXAS
M. H. Hamilton

2 – REST SITE SELECTION OF PLAINS SPOTTED SKUNKS (*SPILOGALE PUTORIUS INTERRUPTA*) IN SOUTHEASTERN TEXAS
Kamren P. Jefferson

3 – A PRELIMINARY ASSESSMENT OF WEID'S MARMOSET (*CALLITHRIX KUHLII*) IN BRAZILIAN AGROFORESTRY SYSTEMS
Alaya S. Keane

4 – ANALYSIS OF LANDSCAPE LEVEL VARIABLES IMPACTING PATHOGEN PRESENCE IN SMALL AND MEDIUM SIZED MAMMALS
Houston Kimes

5 – ARE BAT ASSEMBLAGES INFLUENCED BY WATER QUALITY IN A DESERT ENVIRONMENT? PROPOSED STUDY FOR BLACK GAP WMA
Macy A. Krishnamoorthy

6 – DIGITIZING THE XERIC ECOSYSTEM RESEARCH CENTER AND CREATING A PUBLICLY ACCESSIBLE NATURAL HISTORY COLLECTION AT MIDWESTERN STATE UNIVERSITY
Camron T. Lynn

7 – MILK COMPOSITION OF THE PALLID BAT (*ANTROZOUS PALLIDUS*)
Miranda Perry

8 – THE INFLUENCE OF STRUCTURAL CHARACTERISTICS AND ENVIRONMENTAL FACTORS ON THE USE OF WILDLIFE CROSSING STRUCTURES
Anna D. Rivera Roy

9 – BEHAVIORAL ANALYSIS OF BATS AT A SOUTH TEXAS WIND ENERGY FACILITY USING THERMAL CAMERAS AND ACOUSTIC DETECTORS
John R. Renshaw

10 – UNDERSTANDING THE ROLE OF BROWN LEMMING (*LEMMUS TRIMUCRONATUS*) ACTIVITIES IN ARCTIC NUTRIENT CYCLING
Austin N. Roy

11 – CONSTRUCTING A SITE-SPECIFIC CALL REFERENCE LIBRARY FOR BATS IN THE DALQUEST DESERT RESEARCH STATION (BREWSTER & PRESIDIO CO., TEXAS) USING THE HAND RELEASE METHOD
Andrew R. Skinner

12 – BRIDGES AS DAY-ROOSTS FOR BATS IN THE TRANS-PECOS REGION OF TEXAS Holly G. Wilson

13 – DIET ANALYSIS OF TWO SYMPATRIC BAT SPECIES IN THE KISATCHIE NATIONAL FOREST OF LOUISIANA
Carlos J. Garcia

Competing for the Vernon Bailey Undergraduate Award (Posters 14–25):

14 – CAMERA TRAPPING SURVEY OF THE MAMMALS OF ABILENE STATE PARK, TAYLOR COUNTY TEXAS.
Seth Crockett and Slaton Souther

15 – EVALUATING LIFE CHARACTERISTICS OF *ICTIDOMYS TRIDECEMLINEATUS* ACROSS A LATITUDINAL RANGE
Emily Davis

16 – PREVALENCE OF HANTAVIRUS IN SMALL MAMMALS IN CLOUD FOREST AND LOWLAND FOREST ENVIRONMENTS IN SANTA CLARA AND BOCA BRAVA
Jaleesa DeJesus

17 – INVESTIGATING THE RANGE OF *PEROMYSCUS MANICULATUS* IN SOUTH TEXAS
Grace Vielleux

18 – PRELIMINARY ASSESSMENT OF THE IMPACT OF VEGETATION AND CLIMATIC FACTORS ON SMALL MAMMAL COMMUNITIES AT SELMAN LIVING LAB
Taylor C. Gray

19 – FINE SCALE ASSESEMENT OF WOODY COVER NEAR WILDLIFE CROSSINGS FOR BOBCATS ON FM 1847, CAMERON COUNTY, TEXAS
John Herschberger

20 – HOTSPOTTER: A MACHINE LEARNING APPROACH TO IDENTIFY OCELOTS AND BOBCATS IN SOUTH TEXAS
Autumn M. Hooker

21 – SURVEY OF MAMMALS IN CHIRIQUI PROVINCE, PANAMA
Jackson Pierce

22 – THE POTENTIAL ADAPTIVE SIGNIFICANCE OF UV REFLECTIVE MORPHOLOGY IN INSECTIVOROUS BATS
Carlie M. Jennings

23 – ANIMAL DIVERSITY OF MEDIUM TO LARGE MAMMALS IN CALLAHAN COUNTY USING CAMERA TRAPS
Hunter B. Lynn

24 – ESTIMATING THE DENSITY OF SMALL RODENTS AT FIREBASE LIBBY, CALLAHAN COUNTY, TEXAS
Alexus M. Scott

25 – IMPLICATION OF CHOICE OF BURROW LOCATION IN THE THIRTEEN-LINED GROUND SQUIRREL (*ICTIDOMYS TRIDECEMLINEATUS*)
Taqwa Armstrong

Competing for the Clyde Jones Graduate Award (Posters 26–31):

26 – GENETIC DIVERSITY OF *MYOTIS SEPTENTRIONALIS*
Jenna R. Grimshaw

27 – MYOMORPH PHYLOGENY INFERRED FROM ZONADHESIN VWD TANDEM REPEAT EXON EXPANSIONS
Emma K. Roberts

28 – GENETIC STRUCTURE AND THE POTENTIAL FOR HYBRIDIZATION IN POPULATIONS OF *PEROMYSCUS SPP.* OF PLATEAU REGIONS IN WESTERN OKLAHOMA
Sarah C. Vrla

29 – MICROBIOMES ACROSS THE GUT-LUNG AXIS IN DESERT BIGHORN SHEEP AND AOUDAD IN TEXAS
Rachael C. Wiedmeier

30 – USE OF DNA FROM MUSEUM SPECIMENS AND TROPHY MOUNTS TO RECONSTRUCT THE GENETIC PROFILE OF TEXAS BIGHORN SHEEP
Emily A. Wright

31 – COMPARATIVE MITOGENOMICS OF THE GENUS *GEOMYS*
Haley Greenia

Competing for the Clyde Jones Undergraduate Award (Posters 32–37):

32 – GENETIC VARIATION WITHIN A SPECIES OF PARASITIC NEMATODE, *SKRJABINGYLUS CHITWOODORUM*, IN SKUNKS
Allie N. Denham

33 – DIFFERENCES IN CODING SEQUENCE BETWEEN BATS AND HUMANS IN THE TUMOR SUPPRESSOR GENE PTEN
Madelyn G. Goodman

34 – STATUS AND BIOGEOGRAPHY OF BOLIVIAN *THRICHOMYS*
Trey Graham

35 – ORAL BACTERIA ACROSS SPECIES OF CRICETID RODENTS WITH VARYING DIETS IN GEORGIA AND ALABAMA
Camilla V. L. Parker

36 – DIFFERENCES IN CODING SEQUENCE BETWEEN BATS AND HUMANS IN THE TUMOR SUPPRESSOR GENE TP53
Aspen N. Wright

37 – PHYLOGENY OF *PEROMYSCUS MANICULATUS* SPECIES GROUP USING NOVEL NUCLEAR MARKERS, DHPS AND SYCE1
Daysi Alvarez

Not competing for a poster award:

38 – COMPARATIVE LANDSCAPE ANALYSIS OF WILDLIFE CROSSING STRUCTURES AND VEHICLE COLLISION SITES OF THE ENDANGERED OCELOT (*LEOPARDUS PARDALIS*)
AnnMarie Blackburn

39 – TRANSPOSON ACTIVITY AND ASSOCIATED MUTATIONS IN *MYOTIS* BATS
Nicole S. Paulat

40 - HOW MANY LOCATIONS ARE NEEDED TO DETERMINE THE HOME RANGE OF OCELOTS AND BOBCATS?
Maksim Sergeyev

41 – CIRCUIT THEORY TO ESTIMATE ROAD CROSSINGS FOR THE ENDANGERED OCELOT (*LEOPARDUS PARDALIS*)
Amanda M. Veals

Poster Presentation Abstracts

The following posters (1–13) are to be considered for the Vernon Bailey Graduate Award.

Poster 1
HOME RANGE ANALYSIS OF STRIPED SKUNKS (*MEPHITIS MEPHITIS*) IN SOUTHEASTERN TEXAS M. H. Hamilton[1], J. C. Perkins[2], K. P. Jefferson[1], and R. C. Dowler[1], [1]Department of Biology, Angelo State University, [2]Department of Natural Resources Management, Texas Tech University (mhamilton13@angelo.edu)

Striped skunks (*Mephitis mephitis*) are one of the most common mesocarnivore species, occurring throughout the United States, southern Canada, and northern Mexico. In parts of eastern Texas, striped skunks occur sympatrically with the plains spotted skunk (*Spilogale putorius interrupta*), a smaller-bodied mesocarnivore that is facing population decline due to habitat loss and urbanization. Understanding the selection of local-scale habitat features as well as home range sizes and distributions of both species in an area of sympatry may be important in conservation efforts to manage the plains spotted skunk. Our study focuses on the habitat selection and home range of striped skunks occurring on Katy Prairie, a portion of the West Gulf Coast ecoregion in southeastern Texas. Our study site, Warren Ranch, is managed for both cattle production and prairie conservation and comprises a mosaic of native prairie, minimally managed pastures, and heavily grazed pastures. From August to December 2019, 6 striped skunks (3 male and 3 female) were fitted with GPS-collars and tracked on a weekly basis to their diurnal resting sites. We programmed the GPS transmitters to record spatial locations 4 times per 24-hour period. During the fall, we recorded 650 locations ($\bar{x}$ = 108.33, range = 30–208). Using concave hull polygons in QGIS, we determined mean seasonal home range of the 6 striped skunks as 69.4 ha (s = 40.53). Our results suggest females have a larger mean home range (81.1 ha) compared to males (57.7 ha). Our preliminary results indicate a preferential selection of heavily grazed pastures and anthropogenic corridors, such as roads and fence lines by striped skunks. This is in direct contrast to what we have observed for plains spotted skunks, which use Macartney rose and dense vegetation.

Poster 2
REST SITE SELECTION OF PLAINS SPOTTED SKUNKS (*SPILOGALE PUTORIUS INTERRUPTA*) IN SOUTHEASTERN TEXAS Kamren P. Jefferson[1], James C. Perkins[2], Matt H. Hamilton[1], and Robert C. Dowler[1], [1]Department of Biology, Angelo State University, [2]Department of Natural Resources Management, Texas Tech University (kjefferson3@angelo.edu)

The plains spotted skunk (*Spilogale putorius interrupta*) is a subspecies of the eastern spotted skunk and is distributed from south-central Canada through the central United States to northeastern Mexico. The species faces population decline from habitat loss and expanding urbanization. Understanding habitat selection at the local scale of diurnal rest sites is important in determining conservation and management strategies for plains spotted skunks and their habitat. Our study focuses on a population of plains spotted skunks occurring on Katy Prairie, an undeveloped, though heavily altered peninsular portion of the West Gulf Coastal Plains ecoregion of southeastern Texas. From May to December 2019, we fitted eleven skunks with a GPS-collar and tracked them on a weekly basis to their diurnal rest site. We conducted habitat surveys at 85 daytime rest sites and recorded skunks using Macartney rose (*Rosa bracteata*), an aggressively invasive shrub species, as an overhead vegetative substrate at 77.6% of the rest sites. We observed a difference between the sexes in the selection of an overhead vegetative substrate at a rest site (chi-square = 17.76, p = 0.0005). Our preliminary results indicate that females are more likely to have grass or litter as a significant part of the overhead cover than males. Our results support early findings indicating that the presence of Macartney rose is significant to diurnal rest site selection of plains spotted skunks within the Katy Prairie.

Poster 3

A PRELIMINARY ASSESSMENT OF WEID'S MARMOSET (*CALLITHRIX KUHLII)* IN BRAZILIAN AGROFORESTRY SYSTEMS Alaya S. Keane[1], Thomas E. Lacher[1], [1]Department of Wildlife and Fisheries Sciences, Texas A&M University (layak.97@tamu.edu)

Weid's marmoset (*Callithrix kuhlii*) are intermediate-sized arboreal gougers that are classified as near-threatened by the IUCN and endemic to the Atlantic Forests of Southern Bahia in Brazil. In response to growing environmental concern, Brazilian farmers can participate in the adoption of farming in cabrucas. Cabrucas are agroforestry systems in which agricultural crops, such as cacao, are grown under native shade vegetation. Studies show that arboreal primates, and more specifically Weid's marmosets, are less common in the cabrucas than in natural forest fragments, indicating that these agroforestry systems may not be favorable habitat for the primates. Little has been explored as to why this is the case. My objective for this study is to document and communicate the conservation value of the cabruca systems by analyzing the behavior and ecology of the near-threatened primate, *C. kuhlii*. A preliminary assessment of marmoset behavior and ecology was conducted where marmosets were located and tracked within cabrucas over the course of a 15-day observational study and their behavior recorded. Feeding behavior will then be examined to understand pieces of the marmoset's ecology within cabruca systems.

Poster 4

ANALYSIS OF LANDSCAPE LEVEL VARIABLES IMPACTING PATHOGEN PRESENCE IN SMALL AND MEDIUM SIZED MAMMALS Houston Kimes[1], Ivan Castro-Arellano[1], Matt Milholland[2], Bradford Westrich[3], and Maria Esteve-Gassent[4], [1]Department of Biology, Texas State University, [2]University of Maryland, [3]Indiana Division of Fish and Wildlife, [4]Department of Veterinary Pathobiology, Texas A&M University (hlk32@txstate.edu)

Disease ecology is a complex multispecies, multiscale system that involves interactions across various biological levels. In view of the widespread anthropogenic habitat changes, zoonotic diseases are gaining awareness because of the potential risk of increased pathogen transmission from wildlife to humans. Studies have found that a reduction in biodiversity from human induced conversions can alter landscapes and species interactions, thus possibly effecting disease transmission. This reduction in biodiversity can cause more ubiquitous and generalist species to dominate in these now homogenous landscapes, allowing pathogens to infect the appropriate reservoir species more often resulting in high disease risk or "amplification". The two pathogens addressed in this study are responsible for Hantavirus Pulmonary Syndrome (family Bunyaviridae, genus *Hantavirus*) and Lyme Disease (family Spirochaetaceae, species *Borrelia burgdorferi).* Data from fieldwork from 2013 to 2017, of small and medium sized mammal trappings within seven ecoregions of Texas, have been used to create a database of pathogen presence in captured mammals. Laboratory analysis using serological and molecular methods were used to detect positives within those mammals. ArcGIS and statistical analyses will be used to answer three competing questions: (1) is landscape heterogeneity associated with the presence of pathogens in small/medium sized mammals, (2) do biodiversity levels play a role in pathogen presence, and (3) is there an association with tree canopy cover with presence of pathogens in small/medium sized mammals?

Poster 5

ARE BAT ASSEMBLAGES INFLUENCED BY WATER QUALITY IN A DESERT ENVIRONMENT? PROPOSED STUDY FOR BLACK GAP WMA Macy A. Krishnamoorthy[1], Robert D. Bradley[1,2], Richard D. Stevens[2,3], [1]Department of Biological Sciences, Texas Tech University, [2]National Research Science Laboratory, Museum of Texas Tech University, [3]Department of Natural Resources Management, Texas Tech University
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Water bodies are crucial life-sustaining resources that are limited in arid and semi-arid environments. Bat activity has been shown to differ between natural and artificial ponds, and some species prefer natural

water sources. Due to the changing water quality (e.g., salinity, calcium, pH, nitrogen) between available water sources (e.g., man-made ponds at the study site), bat activity will likely vary between sources. As a result, I hypothesize that i) there will be differences in water quality between ponds, ii) that due to water quality differences, the bat assemblage at each pond will differ, and iii) that the responses by bat species may be species-specific (i.e., presence or absence related to particular water qualities). Black Gap Wildlife Management Area (WMA) is an ideal study site as there are 31 man-made dirt tanks, or ponds spread across 177 km^2 along with 21 possible bat species. Some ponds are ephemeral, while others are permanent, which may lead to water quality differences between them. In order to quantify bat species presence/absence and diversity at each pond, we will use bat detectors to identify species via echolocation calls over one-week periods from March to September 2020. Bat species will be confirmed with mist-netting efforts. For each pond, we will deploy bat detectors and measure water quality at the beginning of each week. Water quality parameters include pH, salinity, calcium, nitrogen, and dissolved oxygen. Preliminary measurements of pH and salinity demonstrate that there is substantive variation among ponds. Some ponds at Black Gap WMA also appear to be ephemeral while others are permanent across the landscape, which may lead to differences in assemblage between ponds.

Poster 6
DIGITIZING THE XERIC ECOSYSTEM RESEARCH CENTER AND CREATING A PUBLICLY ACCESSIBLE NATURAL HISTORY COLLECTION AT MIDWESTERN STATE UNIVERSITY Camron T. Lynn, Charles M. Watson, Ray E. Willis, Department of Biology, Midwestern State University (ctlynn0701@my.msutexas.edu)

Principle Investigator (PI) Dr. Ray Willis and Co-PI Dr. Charles Watson have been awarded $474,000 by the National Science Foundation (NSF) to digitize the newly consolidated Xeric Ecosystem Research Center (XERC) through Midwestern State University's Natural History Collection. This project is being conducted over a three-year period (2019-2022) with the goal to publish the digitized collection online by 2020. The XERC at Midwestern State University (MSU) is mainly comprised of approximately 23,000 mammal specimens and a large teaching collection of other vertebrates. Vertnet will host the digitally imaged specimens and their associated data. The XERC at MSU will also be a member of the Texas Oklahoma Regional Consortium of Herbaria (TORCH) that will host the herbarium collection, which constitutes 6,000 digitally imaged plant specimens. Digitizing and publishing XERC data allows scientists around the globe to analyze the collection and it also preserves the information for future research to be conducted. The collection spans 95 years of collecting representing 29 countries and 42 states of North America.

Poster 7
MILK COMPOSITION OF THE PALLID BAT (*ANTROZOUS PALLIDUS*) Miranda Perry and Loren K. Ammerman, Department of Biology, Angelo State University (mperry11@angelo.edu)

Chiroptera constitute over twenty percent of the class Mammalia, but limited research has been conducted with regard to their lactation and milk composition and even fewer reports have been published for those species within the family Vespertilionidae, the largest family in order Chiroptera. Expanding taxonomic representation is essential for understanding the drivers of milk composition and recognizing factors that affect growth and development of young. The objective of our study was to describe the milk composition of the vespertilionid *Antrozous pallidus*, a species of bat whose milk composition has yet to be studied. The values obtained from our study enhance milk composition data among chiropteran species, as well as provide more representation for understudied families. The composition of milk of *A. pallidus* was described using milk samples collected from females of unknown stages of lactation captured at two time periods: 27–30 May and 21–24 June 2019. Samples were collected in Brewster and Presidio County, Texas from 13 lactating females and pooled for analysis due to limited sample volume,

resulting in a total of 4 samples used for this study. Samples were sent to the Smithsonian's National Zoological Park Nutrition Lab, where they were assayed to determine percentages of dry matter, protein, sugar, and fat. We found the milk composition to be an average of 24.1% dry matter, composed primarily of fat and protein in almost equal proportions. The average fat makeup was 10.3% and protein was 9.7%, while sugar made up a smaller proportion of the milk at only 3.4%. These results are similar to those reported for other insectivorous vespertilionid species, which suggests that phylogeny and/or diet may be influencing the milk composition described in this study.

Poster 8

THE INFLUENCE OF STRUCTURAL CHARACTERISTICS AND ENVIRONMENTAL FACTORS ON THE USE OF WILDLIFE CROSSING STRUCTURES Anna D. Rivera Roy[1], T. Miles Hopkins[1], Thomas J. Yamashita[1], Kevin W. Ryer[1], John Young, Jr.[2], Richard J. Kline[1], [1] School of Earth, Environmental, and Marine Sciences, University of Texas Rio Grande Valley, [2] Environmental Affairs Division, Texas Department of Transportation (anna.rivera01@utrgv.edu)

Roads have long been known to influence wildlife movements and survival. They can have detrimental effects on populations and in time, biodiversity. To facilitate movement and prevent vehicle-caused mortalities, mitigation structures, such as fencing and wildlife crossing structures (WCS), including underpasses, have been developed. Structural characteristics and environmental variables are important factors to include when comparing crossing structure effectiveness. Along State Highway 100 in Cameron County, Texas, 11.9 km of exclusionary fencing and five WCS have been constructed or modified to mitigate wildlife road mortalities. To understand the effectiveness of these WCS, camera trap arrays were placed at the openings to monitor wildlife use. We examined differences in numbers of successful crossings of wildlife through WCS in relation to structural dimensions, distance to nearest vegetative cover, precipitation, daily minimum temperature, time of day, and direction of travel using a Poisson generalized linear model. Additionally, the temporary water inundation of one WCS was examined to determine the event's effect on wildlife crossing at this location. Number of crossings for all species combined increased with movements from south to north and with the increase of distance to nearest vegetation; number of crossings decreased with WCS openness, precipitation, and increases in daily low temperatures. Where water inundation altered one WCS, wildlife crossing rates differed significantly while water was at its highest level compared to those during dry or partially flooded conditions ($p<0.0001$). This research will aid in informing optimal placement and design of future wildlife crossing structures.

Poster 9

BEHAVIORAL ANALYSIS OF BATS AT A SOUTH TEXAS WIND ENERGY FACILITY USING THERMAL CAMERAS AND ACOUSTIC DETECTORS John R. Renshaw[1], Sara P. Weaver[2], Michael R. Schirmacher[3], Aaron J. Corcoran[4], and Ivan Castro-Arellano[1], [1]Department of Biology, Texas State University, [2]Bowman Consulting Group, [3]Bat Conservation International, [4]Department of Biology, University of Colorado- Colorado Springs (jrr149@txstate.edu)

Wind energy will play an important role in the future of renewable energy production and climate change mitigation. However, it is not free of environmental impacts. Every year, hundreds of thousands of bats are killed by wind turbine blades in the U.S. alone, with evidence for their attraction to the structures. Many studies have assessed turbine-caused bat fatalities, but behavioral factors attributing to wind turbine attraction are not well understood. The goal of this project is to elucidate species-specific behaviors by using thermal cameras paired with ultrasonic acoustic detectors. Pairing these technologies will provide more detailed knowledge of species-specific flight and echolocation behaviors at wind turbines, and why some bats might be more susceptible to fatality than others. This study has three objectives: (1) determine if bats are using social calls near turbines, (2) detect if bats are using reduced forms of echolocation around turbines (e.g. micro calls), and (3) identify if bats are emitting calls associated with foraging

activity (e.g. feeding buzzes) near turbines. Our study occurred at the Los Vientos Wind Energy Facilities in Starr County, Texas between August 15 and October 19, 2017. These dates correspond with the fall migration period when an increase in bat fatalities typically occurs. A single thermal camera was mounted to the tower of three wind turbines and oriented to capture as much of the nacelle and rotor swept area as possible. Acoustic detectors were mounted in the nacelle with two microphones per turbine, one positioned on the rear and one on the bottom of the nacelle. We collected 144 nights of both acoustic and thermal camera recordings and analyses are ongoing. Results of this project could help guide operational mitigation strategies at wind energy facilities and further reduce bat fatalities.

Poster 10

UNDERSTANDING THE ROLE OF BROWN LEMMING (*LEMMUS TRIMUCRONATUS*) ACTIVITIES IN ARCTIC NUTRIENT CYCLING Austin N. Roy[1,2] and Jennie R. McLaren[1,2], [1]Department of Biology, University of Texas at El Paso, [2]Team Vole Collaborative Research Group (aroy3@miners.utep.edu)

Arctic herbivorous rodents play an important role in determining ecosystem function and productivity through acting as ecosystem engineers and altering soil nutrients. The degree of impacts of these herbivores likely varies by the type of activity displayed by the herbivore. Our aim was to determine how rodents, the dominant resident mammalian herbivores, affect arctic nutrient cycling. We examined the impact of brown lemming (*Lemmus trimucronatus*) activity types (nests, latrines, runways, and burrows) on soil nutrient pools. We collected organic soils beneath each activity type and analyzed them for inorganic nutrients, extractable nutrients, microbial biomass, and exoenzyme activity. We found that lemming activities influenced soil nutrient pools, particularly nitrogen (N) pools. Nests and burrows had increased N pool concentrations compared to control plots. Additionally, nests and runways showed higher soil C pools compared to controls. We conclude that the activities of lemmings alter nutrient availability and may regulate nutrient limitation at different scales, from local impacts (burrows) to nutrient transport and concentration on the landscape (runways, nests). Furthermore, while lemmings did not influence the size of the microbial community, they did alter the stoichiometry of the microbial community. The importance of arctic rodents on ecosystem function is likely to vary during different phases of their population cycle. Additionally, their indirect effects on the environment may influence ecosystem processes across seasons and years.

Poster 11

CONSTRUCTING A SITE-SPECIFIC CALL REFERENCE LIBRARY FOR BATS IN THE DALQUEST DESERT RESEARCH STATION (BREWSTER & PRESIDIO CO., TEXAS) USING THE HAND RELEASE METHOD Andrew R. Skinner and Ray E. Willis, Department of Biology, Midwestern State University (arskinner0304@my.msutexas.edu)

Bats are known to alter the structures of their calls according to behavior and habitat. Reliable trends in intraspecific and geographic variations of species-specific call parameters have not been well established, making quantitative automated identification techniques imperfect. Several bat species exhibit similar call features and cannot be easily identified without contextual information regarding activity or recording habitat. Differences in recording equipment conditions such as the model of the recorder used, orientation of microphone, and distance from sound source can further confound standards used to train automated identification software. Dalquest Desert Research Station (DDRS) is a 3000-acre property bordering the northeastern boundary of Big Bend Ranch State park in the Trans-Pecos region of Texas. A system of canyons and ravines winds for miles across the property's eastern side, comprising a large portion of the research site. Mist nets were used to catch bats visiting a permanent canyon spring in the DDRS from April of 2017 to July of 2019. A total of 107 individuals representing at least 10 species from the families Vespertilionidae, Mormoopidae, and Molossidae were captured. Identified bats were released by hand near the spring and recorded with an Anabat SD2 acoustic recorder. Behavior and flight patterns were noted. Calls from individual bats of the same species exhibited high variability. The behavior of the bat,

location in relationship to canyon walls, and the distance from the recording device were the largest sources of variation. Long-term passive monitoring will be conducted near the spring in coming seasons with the goal of replicating the hand release monitoring variables. Continued mist netting and call library building will allow for higher confidence in the qualitative identification of bats recorded at the site through recognition of site-specific call patterns with hopes to build reliable quantitative models when sample size allows.

Poster 12

BRIDGES AS DAY-ROOSTS FOR BATS IN THE TRANS-PECOS REGION OF TEXAS Holly G. Wilson[1], Stirling J. Roberston[2], and Richard D. Stevens[1,3], [1]Department of Natural Resources Management, Texas Tech University, [2]Texas Department of Transportation, [3]Museum of Texas Tech (holly.wilson@ttu.edu)

Anthropogenic effects on wildlife are typically thought to be negative, but some anthropogenic structures, such as bridges and culverts, can provide key habitat components. Roosts are crucial components of bat habitat, in that a roost can affect bat survival and fitness. However, it remains unclear what characteristics of highway structures bats seek when selecting these as roosts. We predicted that bats non-randomly select for characteristics of bridges and that species differ in their selection. To determine which characteristics (e.g. bridge type, road type, surrounding vegetation) were most related to bat presence or absence, we systematically surveyed 204 bridges across 10 counties of the Trans-Pecos region of Texas during the summers of 2018 and 2019. Using Principal Components Analysis and Logistic Regression, we determined that bridge, road, and habitat types were all related to bat presence at bridges. *Antrozous pallidus* presence was influenced by bridge type while *Myotis velifer* was influenced by bridge, road, and habitat types. This information, along with continued study, can aid conservation efforts by TxDOT when planning maintenance and construction of structures, as well as provide a better understanding of the role anthropogenic effects play in bat ecology.

Poster 13

DIET ANALYSIS OF TWO SYMPATRIC BAT SPECIES IN THE KISATCHIE NATIONAL FOREST OF LOUISIANA Carlos J. Garcia[1], Roger W. Perry[2], David A. Ray[3] and Richard D. Stevens[1,4], [1]Department of Natural Resources Management, Texas Tech University, [2]Southern Research Station, USDA Forest Service, Hot Springs, Arkansas, [3]Department of Biological Sciences, Texas Tech University, [4]Museum of Texas Tech University (carlos.j.garcia@ttu.edu)

Foraging strategies are important for insectivorous bats in North America, especially when two species are sympatric. Competition for food among bats may be avoided if species utilize different foraging strategies such as consuming different taxa, or size of insects. Partitioning of food resources among different species of bats may also be due to differences in temporal and spatial foraging patterns, flight characteristics, and prey size. There is no previous research on prey consumption by bats in Louisiana, especially related to sympatric species Northern long-eared myotis (*Myotis septentrionalis*) and South-eastern myotis (*Myotis austroriparius*). We predicted that because these species overlap in distribution and are closely related, and because previous studies have shown that bats segregate food sources when in close proximity, they will exhibit resource partitioning by consuming different types/species/order of insect. We collected fecal samples from 20 individuals each of *M. austroriparius* and *M. septentrionalis*, examined diet composition by molecular fecal analysis, and used a logistic regression to determine if the two species significantly differed in their diets. The most consumed insects of *M. septentrionalis* were from the order Lepidoptera, family Cosmopterigidae. *M. austroriparius* most consumed insect was from the order Lepidoptera, family Notodontidae. Results from our logistic regression analysis suggest that there was no difference in prey consumption at the level of Order, but there was a difference at the Family level for these closely related bats. These results improve our understanding of prey consumption by a threatened bat species *M. septentrionalis* and its congener *M. austroriparius*.

The following posters (14–25) are to be considered for the Vernon Bailey Undergraduate Award.

Poster 14

CAMERA TRAPPING SURVEY OF THE MAMMALS OF ABILENE STATE PARK, TAYLOR COUNTY TEXAS Seth Crockett, Slaton Souther, Jax Hernandez, and Thomas E. Lee, Jr., Department of Biology, ACU Box 27868, Abilene Christian University (scc17a@acu.edu)

A camera trapping survey of large to medium sized mammals was conducted from early September to early November 2019. Our camera trapping survey was part of a national effort in the snapshot program run by the Smithsonian. In this study, we used nine browning strike force HD cameras. Locations were chosen to avoid human interference, maximize habitat diversity and wildlife encounters. In this survey we recorded eleven species of mammals. The species encountered include *Canis latrans*, *Dasypus novemcinctus*, *Felis catus*, *Lynx rufus*, *Mephitis mephitis*, *Odocoileus virginianus*, *Procyon lotor*, *Sciurus niger*, *Sus scrofa*, *Sylvilagus sp.*, and *Urocyon cinereoargenteus.* The three most commonly photographed animals were *Odocoileus virginianus*, *Sus scrofa*, and *Canis latrans*. These data indicate that like the rest of Texas a large *Sus scrofa* population is affecting Abilene State Park and causing conservation problems such as degradation of habitat and threats to ground dwelling animals.

Poster 15

EVALUATING LIFE CHARACTERISTICS OF *ICTIDOMYS TRIDECEMLINEATUS* ACROSS A LATITUDINAL RANGE Emily Davis, Hallie Dickerson, Taqwa Armstrong, and Jessica Healy, Department of Biology, Austin College (edavis18@austincollege.edu)

Animals at different latitudes experience different environmental conditions, from hot dry summers in the south to long cold winters in the north. One species that exists over a wide latitudinal gradient is the 13-lined ground squirrel (TLGS). This species experiences very different climates across its species range, however it approaches survival with the same tactic: hibernation. This strategy is used to avoid seasons of low food availability by slowing metabolism to decrease body temperature, decreasing energy costs. In order to measure morphological and physiological characteristics across their species range we live-trapped adult TLGS, measured length, girth, mass, and sampled blood and white adipose tissue (WAT). Temperature data loggers were implanted (to be retrieved next summer) in order to record hibernation patterns. Blood was tested for the hunger hormone ghrelin and the sex hormone estradiol. WAT was tested for the energy balance regulatory enzyme pAMPK. Kansas squirrels had significantly more ghrelin. The Kansas squirrels were also the smallest squirrels with a more dense population. This may indicate that ghrelin is influenced by intraspecies resource competition in addition to the hibernation cycle. Estradiol was highest in Oklahoma squirrels. These individuals were captured first and during their reproductive season, unlike the rest of the states. There were also no significant differences in pAMPK by sex or state. There was no gradient change observed in any of the samples taken, indicating that these physiological and morphological aspects are not strictly tied to latitudinal range. However, when temperature data loggers are retrieved were expect to observe differences in the hibernation patterns because these are more likely to be tied to external temperatures.

Poster 16

PREVALENCE OF HANTAVIRUS IN SMALL MAMMALS IN CLOUD FOREST AND LOWLAND FOREST ENVIRONMENTS IN SANTA CLARA AND BOCA BRAVA Jaleesa DeJesus[1], Lauren King[1], Michael Newbrey[1], and John Hanson[2,3], [1]Department of Biology, Columbus State University, [2]RTLGenomics, [3]Institue for Biodiversity Research and Education (dejesus_jaleesa@columbusstate.edu)

A variety of rodent species are found in agricultural and urban settings and often come in contact with human settlements, which can lead to the transfer of zoonotic disease like Hantavirus. Hantavirus is a common virus found in a number of New World rodent species, particularly in mouse-like rodents such as

those in Cricetidae and Muridae. The virus is also a prime example of a zoonotic disease since a few different hantaviruses have been recorded to cause Hantavirus Pulmonary Syndrome (HPS) in humans. The virus is transmitted in the feces of the rodents when the feces are moved, and dust particles are inhaled. Hantavirus has been observed in a number of species over a wide geographic range with human outbreaks in a number of these areas, such as the Southwestern United States and Panama based on previous screening studies. In this study, we screened for hantavirus in rodent blood samples from two sites in Chiriqui, Panama. Rodent specimens were collected in July 2018 and January 2019 from Santa Clara (highland) and Boca Brava (lowland) using Sherman traps. All specimens were handled following IACUC protocol. Before euthanizing the individuals, blood samples were taken from behind the eye using a nobuto strip while the animals were unconscious. Blood samples were dried and stored and we were able to isolate the Hantavirus IgG (HV IgG) antibodies that would indicate that the animals have been infected by a hantavirus. We used a Mouse HV IgG ELISA kit to dye the antibodies in order to detect them as well as calculate the optical density of each sample. Once this data was collected, we compared the optical density across multiple species and between the two regions.

Poster 17

INVESTIGATING THE RANGE OF *PEROMYSCUS MANICULATUS* IN SOUTH TEXAS

Grace Vielleux[1], Emma G. Dohnalik[1], Leila Siciliano-Martina[2], Ira F. Greenbaum[3], and Jessica E. Light[1], [1]Department of Wildlife & Fisheries Sciences, Texas A&M University, [2]Ecology & Evolutionary Biology Program, Texas A&M University, [3]Department of Biology, Texas A&M University (Gracevielleux@gmail.com)

The North American deermouse (*Peromyscus maniculatus*) and the white-footed deermouse (*P. leucopus*) are widespread throughout Texas, overlapping in distribution across the state. Although *P. maniculatus* is reported to occur in the southernmost regions of Texas, there are few specimens in natural history collections from this region. In contrast, there are numerous specimens of *P. leucopus* from south Texas. Given that these two species are similar in morphology and difficult to distinguish, it is possible that *P. maniculatus* may not actually extend into south Texas. Both 2D geometric and traditional morphometric methods were used to identify deermouse specimens from south Texas. Specimens from natural history collections were imaged and measured for 13 standard cranial characters. For 2D geometric analyses, eighteen ventral landmarks were placed on imaged specimens. Prior to morphometric analyses, a subset of specimens were genetically identified (mitochondrial *cytb* sequences) to species. Genetically and non-genetically identified specimens of *P. maniculatus* and *P. leucopus* overlapped in morphospace in the 2D geometric and traditional morphometric analyses. These results warrant additional investigation into the actual distribution of *P. maniculatus* in south Texas.

Poster 18

PRELIMINARY ASSESSMENT OF THE IMPACT OF VEGETATION AND CLIMATIC FACTORS ON SMALL MAMMAL COMMUNITIES AT SELMAN LIVING LAB

Taylor C. Gray[1], Francisca M. Mendez-Harclerode[2], Gloria M. Caddell[1], Chad B. King[1], and Michelle L. Haynie[1], [1]Department of Biology, University of Central Oklahoma, [2]Department of Biology, Bethel College (Gracevielleux@gmail.com)

The purpose of this project is to monitor changes in small mammal populations and communities over multiple generations to determine what factors affect how the populations and communities change over time. In March of 2018, a permanent trapping web was established at the University of Central Oklahoma's Selman Living Lab (SLL). Two additional permanent webs were established in June of 2018. The SLL is located in the gypsum hills of Woodward County in western Oklahoma. Surveys of the 3 webs are conducted for 3 nights, 4 times a year, and include collection of mammalian and vegetation data. Climate data also is obtained for each day of the trip; monthly and yearly climate data also will be assessed. To date, 7 mammalian and vegetation surveys have been conducted. Based on preliminary data, seasonal and habitat trends have been detected in mammalian populations, with the lowest capture

numbers occurring in the summer and reaching peak numbers in the spring. The trapping web located on mixed, slightly disturbed habitat has the most diverse community and the most number of captures/recaptures. Preliminary vegetation data shows seasonal and yearly trends. In the future, the animal, climate, and vegetation data will be used to build mathematical models that can be used to determine which factors have the largest impact on population and community persistence. Additionally, changes in the genomic make-up of the populations over time will be assessed.

Poster 19

FINE SCALE ASSESEMENT OF WOODY COVER NEAR WILDLIFE CROSSINGS FOR BOBCATS ON FM 1847, CAMERON COUNTY, TEXAS John Herschberger[1], Jason V. Lombardi[1], Michael E. Tewes[1], John H. Young[2], Gilberto Hurtado[1], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, [2]Texas Department of Transportation (John.Herschberger@students.tamuk.edu)

In Texas, 80% of the human population live in urbanized areas, which are rapidly expanding in many areas each year. Relatedly, increased traffic volume of vehicles on primary and secondary roadways can have a detrimental effect on wildlife species. Use of wildlife crossing structures in combination of cattle guards and fencing is regarded as an effective strategy for maintaining connectivity and reducing road mortality for large carnivores in other areas but have yet to be proven to be effective within Texas. The bobcat, *Lynx rufus* is an abundant native felid in South Texas and has become adapted to living near urban areas and can serve as a proxy for endangered ocelots, *Leopardus pardalis*. We monitored cat use of five future wildlife crossings and four cattle guards on FM 1847 from August to December 2019 in Cameron County. We will conduct a fine-scale (2 m) land cover classification for the study area and conduct a landscape-level and class-level spatial analyses around areas used by bobcats. Results from this study will allow researchers and state agencies to assess use effect of spatial distribution and structure of woody cover at each crossing structures, and potential benefits for bobcats and endangered ocelots.

Poster 20

HOTSPOTTER: A MACHINE LEARNING APPROACH TO IDENTIFY OCELOTS AND BOBCATS IN SOUTH TEXAS Autumn M. Hooker[1], Jason V. Lombardi[1], Michael E. Tewes[1], Landon Schofield[2], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University Kingsville, [2]East Foundation (Autumn.hooker@students.tamuk.edu)

Camera traps have widely been used to detect elusive species across the world and have allowed researchers to gain a stronger understanding of population dynamics of species. Classification and identification of species detected on camera traps is critical for further analyses, but techniques to do so are limited. Machine learning algorithms, such as Hotspotter have recently been developed to automatically individually identify unique pelage patterns used to quantify population metrics. We undertook this study to assess the feasibility of using Hotspotter to uniquely identify ocelots *Leopardus pardalis* and bobcats *Lynx rufus* in South Texas. We conducted camera surveys on the the East Foundation's El Sauz Ranch (113 km^2) in Willacy and Kenedy counties, Texas, USA. We conducted camera surveys at 28 paired camera stations in the southwestern (13 camera stations) and northwestern (15 camera stations) areas of El Sauz from January 2018 to December 2019. This study may allow researchers to gain a stronger understanding of the demographics and population sizes of elusive felids across a large geographic area. Hotspotter may reduce the time needed to process hundreds of photographs and may yield more precise and reliable identifications.

Poster 21

SURVEY OF MAMMALS IN CHIRIQUI PROVINCE, PANAMA Jackson Pierce[1], Connor J. Burgin[2,4], John D. Hanson[3,4], [1]Saint Anne Pacelli High School, [2]Columbus State University, [3]RTLGenomics, [4]Institute for Biodiversity Research and Education (jackson.pierce@sasphs.net)

In 2018 and 2019, three mammal surveys were conducted in Chiriqui, Panama. Pit falls, Sherman traps, Havahart traps, mist nests, snap traps, and camera traps were used to collect specimens and specimen data at three locations with different elevations. Studies were conducted at the Finca Hartmann coffee plantation in Santa Clara Panama (1,700 meters above sea level), Mount Totumas Cloud Forest reserve (1,900 meters above sea level), and at Boca Brava, an island in the gulf of Chiriquí. A total of 199 specimens were collected from 7 orders represented by 26 genera and 30–35 species.

Poster 22

THE POTENTIAL ADAPTIVE SIGNIFICANCE OF UV REFLECTIVE MORPHOLOGY IN INSECTIVOROUS BATS Carlie M. Jennings[1] and Sarah Vrla[2], [1]Department of Biology, University of Central Oklahoma, [2]Department of Biology, Texas Tech University (cjennings10@uco.edu)

Communication in the ultraviolet spectrum has an array of adaptive functions such as foraging, social signaling, territory marking, etc., and is known to occur in a wide variety of taxa. However, it has not been well studied in mammals. As a result, the prevalence and role of ultraviolet (UV) communication in mammals remains poorly understood. UV communication requires a social signaling mechanism, such as UV reflective morphology (i.e., hair) as well as a visual system capable of interpreting wavelengths in the upper UV range (390 nm). Using a UV photography protocol to qualitatively measure UV reflectance of pelage, several species of bats (Order Chiroptera) were found to possess UV reflective morphology. However, the function of this UV reflection remains unknown. In bats, potential functions include individual or species recognition, visibility during flight, or prey attraction, among others. We propose that UV reflection is more prevalent in insectivorous bats as an adaptive function of attracting insects. The degree of UV reflectance of species with insectivorous and frugivorous diets was compared. Species of Family Vespertilionidae were used to represent insectivores because nearly all species are insectivores and frugivorous species of Phyllostomidae were chosen for comparison. To determine degree of UV reflectance, a point system was assigned for each section of the body (anterior, posterior, dorsal, ventral) that exhibited reflection (0 = negative for reflectance, 1 = positive for reflectance) and a χ^2 test was used to investigate the presence of a significant relationship between degree of UV reflection and diet. Results herein suggest that UV reflectance has a higher prevalence with insectivorous species than frugivorous species. Because UV reflectance increases the risk of detection by predators, UV reflective signals are likely under strong selective pressure; therefore, there must be some adaptive benefit to possessing such morphology, though further investigation is needed.

Poster 23

ANIMAL DIVERSITY OF MEDIUM TO LARGE MAMMALS IN CALLAHAN COUNTY USING CAMERA TRAPS Hunter B. Lynn and Joel G. Brant**,** Department of Biology, McMurry University (lynn.hunter@mcm.edu)

Camera traps are extremely useful in documenting the activities of medium and large mammals. Animals are less distressed and habitats are less disturbed using camera traps when compared with other trapping activities. The purpose of this study is to document the medium and large mammals at Firebase Libby in Callahan County, Texas. Ten Moultrie camera traps (models A-30i and MFH-DGS-I35) were placed in representative habitats at Firebase Libby (i.e. wooded or pasture areas). Camera traps were deployed beginning in February 2019 and maintained regularly (changing batteries and SD cards when needed). Thirteen species of mammal were encountered during 1667 trap nights. *Sus scrofa* was by far the most abundant species with *Odocoileus virginianus* also very abundant. *Procyon lotor* and *Canis latrans* appear to prefer the pasture area. *Sylvilagus floridanus*, *Dasypus novemcinctus*, and *Urocyon cinereoargenteus* appear to prefer the wooded area. The data collected will be used to characterize the mammalian fauna in central Callahan County. These data also illustrate the impact of *Sus scrofa* on the mammal community.

Poster 24

ESTIMATING THE DENSITY OF SMALL RODENTS AT FIREBASE LIBBY, CALLAHAN COUNTY, TEXAS Alexus M. Scott and Joel G. Brant, Department of Biology, McMurry University (scott.alexus@mcm.edu)

Worldwide studies have been done to determine how small mammals support forest regeneration by pollinating, controlling pests, and providing a sustainable food source for carnivores. Determining a species density can assist in knowing the health of the environment. The purpose of this study is to sample the diversity of small mammals at Firebase Libby and to estimate the population size of each rodent species. Small mammal diversity was sampled using a wagon-wheel trapping array of 160 Sherman live traps. Arrays were placed in representative habitats and sampled monthly for two consecutive nights. Captured individuals were marked with an RFID pit tag and released at the point of capture. Six species have been encountered at Firebase Libby. *Peromyscus attwateri* prefers the wooded area while *Peromyscus leucopus* and *Reithrodontomys montanus* prefer the pasture area. *Peromyscus attwateri* was the only species with enough recaptures to estimate population density, resulting in an estimate of four mice per wooded acre.

Poster 25

IMPLICATION OF CHOICE OF BURROW LOCATION IN THE THIRTEEN-LINED GROUND SQUIRREL (*ICTIDOMYS TRIDECEMLINEATUS)* Taqwa Armstrong, Emily Davis, Hallie Dickerson, and Jessica Healy, Department of Biology, Austin College (tarmstrong16@austincollege.edu)

Thirteen-lined ground squirrels (TLGS) range from Texas to Canada, but recently there are fewer colonies in the southern portion of their range, possibly due to food shortages, habitat fragmentation, or climate change, including flooding of burrows while animals are in torpor. Little is known about the potential effects of climatic differences on burrowing behavior or life history characteristics. To fill this gap we live-trapped and examined life history characteristics (reproduction, behavior, hibernation pattern, and choice of burrow location) of TLGS across a latitudinal range from Texas to Minnesota. By measuring the relative abundance of preferred food in areas with and without burrows, I hypothesized that areas with burrows would have a higher food density within a 2m radius than areas without burrows. Alternatively, I hypothesized that more burrows would be located close to headstones than in the open, as headstones could be protective against predation. Neither hypothesis was supported by our data and suggests that food and protection alone cannot predict burrow location. Therefore, some other characteristics such as soil texture could explain burrow choice. Soil analysis showed that (with the exception of Texas) the organic matter decreased as we progressed North, indicating the need for more samples since the data came from a singular sample from each state. Many southern populations were in areas with clay soil, which is susceptible to water retention and flash flooding events. This has implications for the survival of populations in other areas of the species range with similar soil types as the climate continues to change and these flooding events become more common.

The following posters (26–31) are to be considered for the Clyde Jones Graduate Award.

Poster 26

GENETIC DIVERSITY OF *MYOTIS SEPTENTRIONALIS* Jenna R. Grimshaw[1], David R. Ray[1], and Richard D. Stevens[2,3], [1]Department of Biological Science, Texas Tech University, [2]Department of Natural Resource Management, Texas Tech University, [3]Museum of Texas Tech University (jenna.grimshaw@ttu.edu)

Because smaller populations are at higher risk of extinction due to genetic drift and decreased heterozygosity, understanding the genetic diversity of at-risk populations provides biologists and managers data to make informed conservation decisions. The Northern long-eared bat (*Myotis*

septentrionalis) which was once common in the north-east is now listed as threatened by the US Fish and Wildlife Service. The goal of this research was to identify levels of genetic diversity of *M. septentrionalis* by measuring genome-wide rates of heterozygosity and determining if *M. septentrionalis* consists of one large inter-breeding population or multiple isolated populations. We collected DNA samples (wing punches, liver, or toes) from 81 individuals across Kentucky, Louisiana, North Carolina, and Oklahoma. After DNA isolation, we sequenced DNA using double digest RADseq and then processed the data with Stacks and Structure software programs. Preliminary results support one large inter-breeding population based on the Wright Fixation Index (Fst). Further analyses are ongoing.

Poster 27

MYOMORPH PHYLOGENY INFERRED FROM ZONADHESIN VWD TANDEM REPEAT EXON EXPANSIONS Emma K. Roberts[1], Emily A. Wright[1], Robert D. Bradley[1,2], and Daniel M. Hardy[3], [1]Department of Biological Sciences, Texas Tech University, [2]Graduate School of Biomedical Sciences, Texas Tech University Health Sciences Center, [3]Natural Science Research Laboratory, Museum at Texas Tech University (emma.k.roberts@ttu.edu)

Origin of novel protein domains has been studied extensively over the last several decades, however the neogenesis of domain repeats certainly has been ignored as a mechanism responsible for the duplication and subsequent diversity of proteins. Nevertheless, internal tandem duplications, such as those described in ribosomal DNA molecules and globulin genes, can lead to the rapid expansion of domain repeats and when found in functional proteins, can serve as a source for novel genetic material and a means for the adaptation of species. The molecular evolution of orthologous protein domains may indeed reflect phylogenetic relationships between related species whereby sequence similarity, length and domain composition among repeats provides valuable information about duplication event patterns and mechanisms. This study presents an investigation of the molecular evolution of a mosaic gamete recognition protein called zonadhesin (gene: *Zan*). Herein, we are specifically interested in the von Willebrand type-D domain 3, which contains between 9-24 partial repetitive sequences depending on rodent taxon. Exon comparisons and subsequent Bayesian analysis of 235 individual partial domains from 12 species of myomorph rodents generated a phylogenetic tree and revealed an association of each tandem repeat to one another and subsequently, potential mechanisms of domain duplication. We conclude that the duplication pattern in *Zan* reveals concerted gene evolution occurred along with the presence of pervasive and often strong positive selection between tandem repeats. In addition, putative primitive tandem repeats were identified based on their presence and statistically supported association to each other across rodent species. It is speculated that there has been a series of tandem domain duplication events since the divergence of myomorph rodents.

Poster 28

GENETIC STRUCTURE AND THE POTENTIAL FOR HYBRIDIZATION IN POPULATIONS OF *PEROMYSCUS SPP.* OF PLATEAU REGIONS IN WESTERN OKLAHOMA Sarah C. Vrla[1], Michelle L. Haynie[2], and Gregory M. Wilson[2], [1]Department of Biological Sciences, Texas Tech University, [2]Department of Biology, University of Central Oklahoma (sarah.vrla@ttu.edu)

Low rates of hybridization of *Peromyscus leucopus* and *Peromyscus maniculatus* have been reported within a population in southern Quebec based on data from microsatellite markers and DNA sequencing. Though these species exhibit similar morphology, ecology, and life history traits, some genetic differences (i.e. number of chromosome arms) make successful hybridization unlikely. However, additional explanations (such as incomplete lineage sorting, retention of ancestral polymorphisms, unreliable diagnostic markers, etc.) may explain the shared genetic similarity identified in proposed hybrids within this Quebec population. Herein, we sampled a sympatric population of *P. leucopus* and *P. maniculatus* from western Oklahoma and used a comparable set of microsatellite primers to investigate potential for hybridization. In addition, DNA sequences from the mitochondrial cytochrome *b* gene were obtained to ascertain maternal lineages. Microsatellite data and cyt*b* analyses suggested 65 of 158

specimens examined were putative hybrids; however, these microsatellite loci may not serve as diagnostic markers of *P. leucopus* and *P. maniculatus*. Further study will include investigations into whether the hybrids detected are valid or can be explained through other phenomena.

Poster 29

MICROBIOMES ACROSS THE GUT-LUNG AXIS IN DESERT BIGHORN SHEEP AND AOUDAD IN TEXAS Rachael C. Wiedmeier[1], Emily A. Wright[1], Bob Dittmar[2], Robert D. Bradley[1], Warren C. Conway[3], and Caleb D. Phillips[1], [1]Department of Biological Sciences, Texas Tech University, [2]Texas Parks and Wildlife Department, [3]Department of Natural Resources, Texas Tech University (rachael.wiedmeier@ttu.edu)

Bighorn sheep (*Ovis canadensis*) inhabit the western United States, northwestern Mexico, and portions of southwestern British Columbia and Alberta. Many populations have encountered die-off events thought to be caused by a group of bacterial species referred to as the pneumonia complex, and this complex has been identified as transmissible to bighorn sheep from domestic sheep (*Ovis aries*) and goats (*Capra hircus*). Aoudad (*Ammotragus lervia*), an invasive species, coexist with desert bighorn sheep (*Ovis canadensis nelsoni*) in Texas, and are classified in Caprinae, along with bighorn sheep, domestic sheep and goats. Microbiomes have not been studied in bighorn sheep nor aoudad, but identifying typical microbial compositions will inform the baseline from which diseased state microbiomes will depart. For example, some members of the pneumonia complex are often found in healthy bighorn sheep, but how such microbiome communities are structured is unknown. Also, social behavior in animals is thought to influence microbial composition through direct and indirect transmission, and microbiota may disperse between aoudad and bighorn sheep through shared resources. Nasal, throat and fecal microbiomes are being characterized for bighorn sheep and aoudad from the Trans Pecos Region of Texas. This research will help characterize healthy microbiome compositions, document the presence and relative abundances of pneumonia complex bacteria in both bighorn sheep and aoudad, and characterize risk potential of microbial dispersal and transfer between aoudad and bighorn.

Poster 30

USE OF DNA FROM MUSEUM SPECIMENS AND TROPHY MOUNTS TO RECONSTRUCT THE GENETIC PROFILE OF TEXAS BIGHORN SHEEP Emily A. Wright[1], Rachael C. Wiedmeier[1], Froylan Hernandez[2], Caleb D. Phillips[1,3], Robert D. Bradley[1,3], and Warren C. Conway[4], [1]Department of Biological Sciences, Texas Tech University, [2]Texas Parks and Wildlife Department, [3]Natural Science Research Laboratory at the Museum of TTU, [4]Department of Natural Resources Management, Texas Tech University (emily.a.wright@ttu.edu)

Bighorn sheep (*Ovis canadensis*) inhabit montane regions spanning the western third of North America. Within Texas, desert bighorn sheep (DBS) historically were found in 16 mountain ranges in the Trans-Pecos Region. Vernon Bailey described *O. c. texianus* in 1912; however, overharvesting as well as competition and diseases from domestic sheep and goats led to the extirpation of the subspecies by the early 1960's. Following a 50+ year effort of restoration and translocation (source-stocks from three states and Mexico) by Texas Parks and Wildlife Department, DBS populations increased from 14 individuals in 1959 to >1,500 individuals distributed among 11 mountain ranges in 2019. Due to the extinction of *O. c. texianus*, obtaining bone fragments, dried muscle, skin clip, horn shaving, or hair samples from museum specimens and trophy mounts is the only method in which the genetic profile of this subspecies may be surmised. Recovery of known *O. c. texianus* dated pre- and post-1960 and additional present-day samples from museum collections (i.e., Smithsonian; Natural Science Research Laboratory at the Museum of TTU) and private individuals are necessary to determine: 1) a genetic profile for *O. c. texianus* and degree of genetic similarity between *O. c. texianus* and both *O. c. nelsoni* and *O. c. mexicanus* and 2) the degree of variation in *O. c. texianus* compared to present-day DBS in Texas. To accomplish these goals, fragments of the cytochrome-*b* gene will be sequenced from museum specimens and trophy mounts to determine genetic distances and ultimately establish phylogenetic relationships. Genetic data such as

these are crucial to infer genetic management and conservation plans for DBS populations in Texas, New Mexico, and Mexico.

Poster 31
COMPARATIVE MITOGENOMICS OF THE GENUS *GEOMYS* Haley Greenia, Shady Kuster, and Russell S. Pfau, Department of Biology, Tarleton State University (haley.greenia@go.tarleton.edu)

Although mitogenomes of many mammalian species have been sequenced, only three species of the rodent suborder Castorimorpha have published mitogenomes. These include two species of beaver (*Castor*) and a kangaroo rat (*Dipodomys ordii*). *Geomys*, another genus within Castorimorpha, includes 12 species. No complete mitogenome of *Geomys* has been published, and only two mitochondrial genes have been sequenced for all or most species of *Geomys*. My goal is to sequence mitogenomes of each species of *Geomys* to compare gene content, gene arrangement, tRNA secondary structures, and degree of heteroplasmy to determine if multiple, unique mitogenomes occur within the same cell or individual. Whole genomic DNA was extracted from tissue and serially diluted to find the minimum concentration of mitochondrial DNA required to amplify by PCR in order to reduce contamination by nuclear insertions of mitochondrial DNA (NUMTs). Rolling Circle Amplification was performed in order to preferentially amplify entire mitogenomes. Illumina libraries were constructed using tagmentation and sequenced with an Illumina HiSeq (150 paired end). Assembly of mitogenomes was conducted with NOVOPlasty and annotated with MITOS. Heteroplasmy will be quantified using NOVOPlasty. This study will provide a complete mitogenome sequence for each species of *Geomys* to be available for future studies.

The following posters (32–37) are to be considered for the Clyde Jones Undergraduate Award.

Poster 32
GENETIC VARIATION WITHIN A SPECIES OF PARASITIC NEMATODE, *SKRJABINGYLUS CHITWOODORUM*, IN SKUNKS Allie N. Denham and Loren K. Ammerman, Department of Biology, Angelo State University (adenham1@angelo.edu)

Various carnivores in the families Mustelidae and Mephitidae are prime targets for the nematode genus *Skrjabingylus.* Historically, a high prevalence of *Skrjabingylus chitwoodorum*, has been observed in the striped skunk, *Mephitis mephitis.* The genetic variability in this parasite and the existence of cryptic lineages has not been studied. Genetic barcoding of other parasitic nematodes have successfully used the COI mitochondrial gene for this purpose. We tested the hypothesis that little variation occurs within the parasite species due to the high level of gene flow documented in *M. mephitis.* We extracted DNA from >80 frozen and ethanol-preserved samples of *Skrjabingylus*. We amplified and sequenced COI from *S. chitwoodorum* samples removed from the sinuses of skunks. Preliminary analysis using Sequencher and MEGAX show a low range of genetic difference within COI, with the highest variation being 2.2%. No divergent lineages within our samples were recovered based on neighbor-joining analysis using Tamura-Nei +G distances and outgroup taxa *S. nasicola* and *S. petrowi*. These preliminary results support our hypothesis. More samples will be analyzed from additional regions of Texas to determine if the observed patterns are supported.

Poster 33
DIFFERENCES IN CODING SEQUENCE BETWEEN BATS AND HUMANS IN THE TUMOR SUPPRESSOR GENE PTEN Madelyn G. Goodman, Antony J. Miller, and Dana N. Lee, Department of Agriculture, Biology, and Health Sciences, Cameron University (mg931694@cameron.edu)

As the average human lifespan increases, so does the risk of developing age-related diseases. Cancer is among the most common of these diseases and is a leading cause of death. Therefore it is imperative to advance methods of prevention and treatment for age-related diseases. Despite the correlation between

cancer incidence and age in humans, bats are the longest living mammal of their size and rarely develop cancer. Our study aims to examine the differences in the coding sequence of the tumor suppressor gene PTEN in humans and bats. The PTEN (phosphatase and tensin homolog) protein inhibits cellular proliferation, survival, and motility. The normal function of the PTEN protein is commonly lost in human cancers and its deregulation causes implications in many other diseases. The PTEN gene is also found in bats and differences in coding sequence or regulation could possibly explain their resistance to cancer. We took wing punch samples from two species of bats (*Myotis velifer* and *Tadarida brasiliensis*) and separated the RNA. Then we converted the RNA into cDNA and isolated the PTEN gene using PCR and gel electrophoresis. A comparison of 350 base pairs of the coding sequence revealed 11 base changes and only one amino acid change unique to humans. These are preliminary results and interestingly PCR amplified multiple fragments, which may indicate alternative splicing is occurring in these bats.

Poster 34

STATUS AND BIOGEOGRAPHY OF BOLIVIAN *THRICHOMYS* Trey Graham, Daniela Arenas-Viveros and Jorge Salazar-Bravo, Department of Biological Sciences, Texas Tech University (trey.graham@ttu.edu)

Thrichomys is a genus of cursorial rodents of the family Echimyidae that ranges across open tropical ecoregions in central and eastern South America. The understanding of species boundaries within the genus has changed dramatically during the last decade with the widespread usage of chromosomal and molecular data, resulting in an unstable taxonomy. One of the issues recently raised, on the basis of a study of specimens from south central Brazil (Mato Grosso do Sul State), is the distinctiveness at the species level of *T. fosteri* (with type locality in Paraguay), usually considered a synonym of *T. pachyurus*. Here we provide the first morphologic, karyotypic and molecular data for a series of Bolivian specimens of *Thrichomys* aimed to resolve this taxonomic question. Eleven specimens collected at four Bolivia localities were morphologically assessed: descriptive statistics for 20 cranial measurements were calculated for a subset of specimens considered juveniles and for a subset of specimens considered to be adults. One specimen of *Thrichomys* was karyotyped using standard chromosome techniques. The genetic (*p*-distance) and phylogenetic (Bayesian inference) analyses were based on the first 801 base pairs of the cytochrome *b* gene of the same specimen and compared to that of 86 Brazilian and Paraguayan specimens of *Thrichomys* that belong to eight nominal species. *The Bolivian specimens* examined closely match Thomas's (1903) description of *Thrichomys fosteri* in size and qualitative characters. The karyotyped specimen showed a complement found in forms of Brazil. The Bolivian sample used for the genetic analysis shows little variation when compared with Paraguayan and southern Brazilian samples. The phylogenetic analysis show that Bolivian haplotype falls within the clade assigned to *Thrichomys fosteri*, by previous authors.

Poster 35

ORAL BACTERIA ACROSS SPECIES OF CRICETID RODENTS WITH VARYING DIETS IN GEORGIA AND ALABAMA Camilla V. L. Parker[1], Connor J. Burgin[1,3] and John D. Hanson[2,3], [1]Department of Biology, Columbus State University, [2]RTLGenomics, [3]Institute for Biodiversity Research and Education (camillavlparker@gmail.com)

Studies have found that certain diets (sucrose, etc.) affect rodent oral bacteria composition. We analyzed the oral bacteria found in four species of cricetid rodents found in the southeastern United States: *Peromyscus gossypinus*, *Peromyscus polionotus*, *Neotoma floridana*, and *Sigmodon hispidus*. Oral swabs were taken from eleven sampled individuals collected in west Georgia and east Alabama and sent to RTL Genomics for sequencing and identification of bacteria. While comparing the percentages of bacteria found in each specimen, we observed that the oral bacteria of *Peromyscus gossypinus* mostly consisted of *Pasteurella, P. polionotus* mostly consisted of *Streptococcus, Neotoma floridana* mostly consisted of *Fusobacterium*, and *Sigmodon hispidus* mostly consisted of *Pastuerella.* The dietary components of these rodent taxa are known but the nutrient levels are in their diets are not, however, a preliminary analysis has

been done with the data provided and more generalist species appear to have *Pasteurella* as a main component of their oral bacterial flora. Further analysis of the dietary and oral bacterial composition is needed to determine if there are any correlations. Moving forward through this next year, we will be collecting more oral bacteria samples of these species in order to expand our sample size and produce a more robust data set, as well as gaining a better understanding of how their diets affect the bacteria found in their mouths.

Poster 36

DIFFERENCES IN CODING SEQUENCE BETWEEN BATS AND HUMANS IN THE TUMOR SUPPRESSOR GENE TP53 Aspen N. Wright, Antony J. Miller, and Dana N. Lee
Department of Agriculture, Biology, and Health Sciences, Cameron University
(aspen.wright@cameron.edu)

The average human lifespan continues to increase, however, so does the susceptibility to develop age-related diseases. Because of this, the need to advance methods of disease treatment and prevention is urgent. Cancer, which is currently the second leading cause of death worldwide, is one of such diseases associated with aging. Despite the correlation with age and cancer incidence in humans, bats and elephants are two long-lived animals that rarely develop cancer. The TP53 gene exists in the DNA repair pathway and produces p53, a protein that triggers tumor suppression and prevents uncontrollable cell proliferation in response to DNA damage. Research has shown that multiple copies of the TP53 gene make elephants less likely to develop cancer, but the mechanism to explain why bats don't get cancer is unknown. The TP53 gene is also found in bats and may explain their propensity for longevity and cancer resistance. There is a lack of comparison between the nucleotide and amino acid sequence of the TP53 gene in humans and bats, but we hypothesize differences might be present. We took wing punch samples of three species of bats (*Myotis velifer*, *Tadarida brasiliensis*, and *Eptesicus fuscus*), separated the RNA, converted it to cDNA, and isolated the TP53 gene using PCR and gel electrophoresis. The gene sequence was compared in bats and humans. Most of the differences in nucleotides and amino acids were identical in all three bat species but unique in humans. Additionally, a test for selection showed positive selection for the TP53 gene in bats.

Poster 37

PHYLOGENY OF *PEROMYSCUS MANICULATUS* SPECIES GROUP USING NOVEL NUCLEAR MARKERS, *DHPS* AND *SYCE1* Daysi Alvarez[1], Laramie L. Lindsey[1], and Robert D. Bradley[1,2], [1]Department of Biological Sciences, Texas Tech University, [2]Natural Science Research Laboratory, Museum of Texas Tech University (daysi.alvarez@ttu.edu)

The genus *Peromyscus* (geographic distribution including much of North and Central America) is a speciose group with approximately 70+ species hypothesized to have arisen during the last 5-6 million years. Systematists have attempted to resolve species boundaries of *Peromyscus* through various morphological and genetic analyses. The *maniculatus* species group is of special interest because historically it has been thought to be comprised of approximately 4 species (*P. maniculatus*, *P. melanotis*, *P. sejugis*, and *P. polionotus*). *P. maniculatus*, by far, has been the most morphologically and genetically diverse member of the species group, with as many as 68 subspecies being recognized. Recent efforts indicate that (based on mitochondrial, some SNP data, and chromosomes) *P. maniculatus* may be represented by 5 additional species. Through previous analyses of transcriptome data, we determined two novel nuclear markers (*Dhps* and *Syce1*) associated with reproduction that have high dN/dS ratios comparing four taxa across the *Peromyscus* phylogeny. *Dhps* could act as a post-zygotic barrier for hybridizing species of *Peromyscus* and prevent further development of hybrid embryos. The *Syce1* gene may be acting as a pre-zygotic barrier, thus preventing hybridization between species of *Peromyscus*. Consequently, we examined these two genes in light of the proposed systematic elevations within what formally was recognized as *P. maniculatus*. For this study, liver tissues were obtained through the Natural Science Research Laboratory. Primers were designed for a 1,058 bp region of *Dhps*, and a 895 bp region

of *Syce1* (both spanning at least one intron and one exon). Polymerase chain reaction and Sanger sequencing were conducted on individuals from the *maniculatus* species group. Sequences were analyzed under Bayesian and likelihood frameworks. Preliminary results suggest that there is high sequence variability in the *Dhps* gene within the *maniculatus* species group.

Posters 38-41 are not competing for an award.

Poster 38

COMPARATIVE LANDSCAPE ANALYSIS OF WILDLIFE CROSSING STRUCTURES AND VEHICLE COLLISION SITES OF THE ENDANGERED OCELOT (*LEOPARDUS PARDALIS*)

AnnMarie Blackburn[1], Amanda M. Veals[1], Michael E. Tewes[1], John H. Young Jr., and Humberto L. Perotto-Baldivieso[1], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University–Kingsville, [2]Texas Department of Transportation, Environmental Affairs Division, (annmarie.blackburn@students.tamuk.edu)

Wildlife-vehicle collisions are a novel source of mortality for wildlife, having significant impacts on imperiled populations. Wildlife crossing structures are designed to mitigate the impact of road mortality by allowing safe passage of wildlife above or below roads. Ideally, crossing structures connect to suitable habitat for a target species. For many carnivores, vehicle collisions typically occur near habitat and use areas for those species; thus, crossing structures are often placed near road mortality hot spots. Ocelots (*Leopardus pardalis*) are a federally endangered felid with remnant populations of <80 individuals between two isolated populations in the Lower Rio Grande Valley (LRGV) of South Texas. Vehicle collisions are considered one of the highest sources of mortality for Texas ocelots. Crossing structures designed for ocelot use have been implemented throughout the LRGV since the 1990s. However, there has been no documented use of these crossing structures by an ocelot. The goal of this study is to analyze landscape characteristics surrounding these crossing structures compared to those surrounding ocelot-vehicle collision sites. We will quantify land cover types surrounding crossing structures (n = 32) at multiple spatial extents and calculate landscape metrics that explain the amount and distribution of each land cover type. We will then compare these metrics to those from ocelot-vehicle collision sites (n = 26). We aim to understand if ocelots are not using these structures due to improper placement in relation to ocelot habitat.

Poster 39

TRANSPOSON ACTIVITY AND ASSOCIATED MUTATIONS IN *MYOTIS* BATS

Nicole S. Paulat[1], Joseph D. Manthey[1], Roy N. Platt II[2], and David A. Ray[1], [1]Department of Biological Sciences, Texas Tech University, [2]Genetics Department, Texas Biomedical Research Institute (nicole.paulat@ttu.edu)

Transposable elements (TEs) are DNA sequences that mobilize through copy-and-paste or cut-and-paste mechanisms, expanding within a host genome. *Myotis* is one genus within vespertilionid bats which has experienced an unorthodox TE history. For example, their genomes are unique among mammals in containing many active DNA transposons, which continue to shape their genomic landscapes. Recent data suggests that, in addition to the indel mutations normally associated with TE activity, these genetic elements may also contribute to higher mutation rates via low-fidelity DNA repair mechanisms. DNA transposons preferentially insert near genes, and so transposon activity may be correlated with mutation rate increases in regulatory regions and coding sequences. Retrotransposons likely have a similar, but lesser mutational impact, as the elements insert via single-stranded nicks, and do not excise themselves. An analysis of transposon polymorphisms in eleven *Myotis* species, identified by Mobile Element Locator Tool (MELT), showed no difference in SNP or indel frequency by TE insertion sites, suggesting a potential difference in DNA repair compared to previous study systems.

Poster 40

HOW MANY LOCATIONS ARE NEEDED TO DETERMINE THE HOME RANGE OF OCELOTS AND BOBCATS? Maksim Sergeyev[1,2], Michael E. Tewes[1], Jason V. Lombardi[1,2], Tyler A. Campbell[2], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, [2]East Foundation, San Antonio (ecomaksimsergeyev@gmail.com)

Habitat use of wildlife is influenced by a multitude of variables including environmental cues, energy tradeoffs, resource quality, and predator-prey dynamics. Many species exhibit fidelity to certain portions of the landscape, confining their movement to an area typically referred to as a home range. Within this home range, an animal will generally be familiar with locations of landscape features such as water sources or patches of cover, presence of conspecifics, and availability of prey. Understanding the location and characteristics of an animal's home range is vital to proper management. However, the amount of monitoring time necessary to accurately estimate an animal's home range may be open to debate. Our objective was to determine the proportion of the total home range that can be estimated from 4 days, 7 days, and 30 days of data compared to the full monitoring period (4 months). Between 2014 and 2019, we captured and collared 11 ocelots (*Leopardus pardalis*) and 16 bobcats (*Lynx rufus*) on the East Foundation's El Sauz Ranch in Southern Texas. Locations were collected every 30 minutes. Using high-frequency GPS data, we described the home range of each animal using kernel density estimates based on all locations obtained (over 4 months). We then compared home range size to estimates obtained from 4, 7, and 30 days. Determining the amount of monitoring time necessary to understand habitat use of a species can improve allocation of resources and potentially provide results of comparable accuracy in less time.

Poster 41

CIRCUIT THEORY TO ESTIMATE ROAD CROSSINGS FOR THE ENDANGERED OCELOT (*LEOPARDUS PARDALIS*) Amanda M. Veals[1], AnnMarie Blackburn[1], Michael E. Tewes[1], Joseph D. Holbrook[2], Humberto L. Perotto-Baldivieso[1], C. Jane Anderson[1], Randy W. DeYoung[1], Tyler Campbell[3], and John H. Young Jr.[4], [1]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, [2]University of Wyoming, [3]East Foundation, San Antonio, [4]Texas Department of Transportation (amanda.veals@students.tamuk.edu)

Ecosystems and landscapes must be permeable to support wildlife populations. With an increasing road network in natural areas, roads serve as filters or barriers to animal movement. Inclusion of mitigation measures in transportation programs and project plans can help restore permeability to road networks across landscapes. Wildlife crossing passages can be an effective mitigation technique for the negative impacts of roads on species. However, high construction costs limit the number that can be implemented. It is therefore important to optimize the placement of crossing structures in road networks in a strategic fashion. Our project aims to evaluate models of landscape permeability for an endangered carnivore, the ocelot, as a function of road structure and habitat in southern Texas. We will build a circuit theory-based model from top identified resource selection functions (RSFs). We will build resistance surface scenarios in CircuitScape 4.0 based on the multivariate model predictions from the RSFs to develop a map to inform landscape connectivity as defined by circuit theory. We will develop these 3 landscape resistance scenarios based on road crossing density and traffic volume. We predict the surface with the highest resistance to animal movement will have the greatest traffic volume and lowest crossing structure density. Additionally, we will assess resistance surfaces based on current and projected land use scenarios for the years 2050 and 2100. The goal of this research is to identify locations for potential road crossing structures based on available habitat that will help mitigate ocelot-vehicle collisions. Circuit theory can identify these locations based on resistance scenarios. Texas Department of Transportation planners can use this information for existing and planned roadways for ocelot road crossing structure placement.

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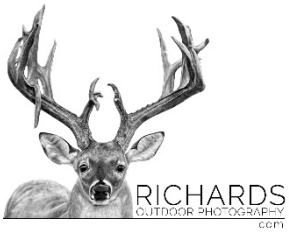

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Texas Society of Mammalogists
38th Annual Members Business Meeting
Texas Tech University Center at Junction
22 February 2020

AGENDA

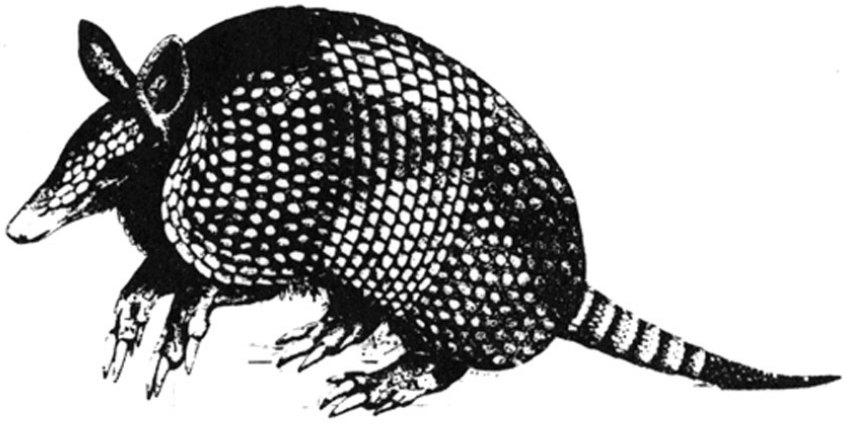
1. Approval of the Minutes of the 2019 Members Business Meeting
2. Report of Secretary-Treasurer, Marcy Revelez
3. Report of Permanent Secretary, Lisa Bradley
4. Report of Editor, Michelle Haynie
5. Reports of Committees
    a. Committee for Honorary Members, Phil Sudman
    b. Financial Advisory Committee, Phil Sudman
    c. Committee for Student Honoraria, Cathy Early
    d. Committee on Conservation, Mike Tewes
    e. *ad hoc* Auction Committee, Krysta Demere
    f. *ad hoc* Informatics Committee, Michelle Haynie
    g. *ad hoc* Conduct Committee, Jessica Light
    h. *ad hoc* Constitution Committee, Lisa Bradley
6. Election of Secretary-Treasurer
7. Election of Permanent Secretary
8. Election of President-Elect
9. New Business
    a. Selection of site for 2021 Annual Meeting
    b. Other New Business
10. Closing Remarks of TSM President, Jessica Light
11. Adjourn

Texas Society of Mammalogists
AMENDED Treasurer's Report for 1 January to 31 December 2019
Submitted by Marcia (Marcy) A. Revelez, Secretary-Treasurer

Income and expenses of TSM for the 2019 calendar year are shown below. Our checking account is with Bank and Trust. Our investments are handled by Morgan Stanley. The checking account balance as of the first of the year was $3,415.34. Total income in 2019 was $20,158.73 and total expenses were $18,767.43. An amount of $5,000 was transferred from Morgan Stanley to the checking account in 2019 to help with meeting costs. TSM total assets at the end of 2019 were $118,906.13. The value of the investment fund increased nearly 21% in 2019, but $5,000 was withdrawn and transferred to the checking account.

Checking Account Balance as of 31 December 2018	$3,415.34
Investment Account (Morgan Stanley) balance 31 December 2018	$99,458.03
Total TSM assets as of 31 December 2018	**$102,873.37**
2019 Income	
2019 Annual Meeting income (registration, meals and lodging fees)	
Student registration	$420.00
Non-student registration	$1,500.00
Late fees	$620.00
Meals	$3,250.00
Lodging	$1,655.00
Linens	$160.00
2019 Membership dues	$224.00
2019 Patron Memberships	$245.00
2019 Contributions	$248.62
2020 Annual Meeting activities	$1,256.06
T-shirts (125 ordered, 46 free)	$790.00
Auction Income (live $3,512, silent $852, donation $46)	$4,410.00
Entertainment (deposit refund)	$368.05
Meeting photos	$12.00
Transfer from Morgan Stanley account	$5,000.00
Total income	$20,158.73
2019 Expenses	
2019 Annual Meeting Expenses to TTU Center	$11,310.00
Entertainment - DJ ($600 + $90.39 for hotel); Bartender ($150)	$840.39
Refreshments/Beverages	$953.68
Program copy charges (ASU print shop)	$254.92
Nametags	$41.81
Computer, software	$119.98
Office supplies	$0.00
Supplies, Honorary Awards	$185.00
PO Box	$192.00
Student Awards	$3,300.00
T-shirts 2018 (18), 2019 (125 ordered)	$1,051.75
Speaker Travel Reimbursement	$0.00
Shipping	$119.14
Transfer fee, Morgan Stanley	$5.00
2019 Stripes fees (registration)	$245.05
PayPal fees	$148.71
Total expenses	$18,767.43
Checking Account Balance 31 December 2019	$4,806.64
Investment Account (Morgan Stanley) balance 31 December 2019	$114,099.49
Total TSM assets as of 31 December 2019	**$118,906.13**

Texas Society of Mammalogists



Newsletter
2020
The 38th Annual Meeting

2020 Banquet Speaker

Our banquet speaker will be Dr. Sharon Jansa, Professor in the Department of Ecology, Evolution and Behavior at the University of Minnesota and Mammal Curator at the Bell Museum. Dr. Jansa is broadly interested in mammalian systematics, biogeography, and evolution. She and her students are currently focusing on understanding the diversification of three isolated groups of mammals: South American didelphid marsupials, the native rodents of Madagascar, and the indigenous rodents of the Philippines. In her research, Dr. Jansa employs molecular data to infer phylogenetic and population history and her research occasionally delves into the realm of molecular evolution.

Patron Membership

Members are encouraged to consider becoming Patrons of the Society by donating $100 (or more) to support the Society's student paper awards. A list of Patron members is published on the website and in the program. Regular Patron membership is achieved with a donation of $100. Members who exceed $100 in donations to the Society's student awards fund will receive a certificate recognizing their total donation level as follows: $125, Ocelot Level; $250, Bobcat Level; $500, Puma Level; $1000, Jaguar Level. Members can upgrade at any time, and all donations are cumulative. There is no time limit or minimum contribution requirement as a member works toward the next level. Donation levels are confidential.

News & Announcements

Still Wanted! Observations and Specimens of Spotted Skunks!

Robert Dowler–My graduate students and I continue to collect data on spotted skunks in Texas and would be most appreciative if you could notify us of any specimens you encounter—observations, road-killed individuals, trail camera photos, obscure museum specimens, or recent additions to collections that might not be on databases. We would especially like TSM members to keep an eye out for road-killed animals that could be salvaged between now and the February meeting. If any specimens are found, regardless of condition, and frozen, we could possibly use these for endoparasite analyses. Thanks and see you in Junction. For questions or to send information: Robert Dowler-325/486-6639; robert.dowler@angelo.edu

Also Wanted! Specimens of Texas Porcupines!

Robert Dowler-I am also interested in getting road-killed or other salvaged porcupines for an analysis of a skin condition that is having an adverse effect on some porcupines in west central Texas. If you find animals (in reasonably good condition) and can freeze the carcass, I can arrange to pick these up to add to our sample. These do not have to have an obvious skin condition as we are trying to establish frequency of the disease. For questions or to send information: Robert Dowler-325/486-6639; robert.dowler@angelo.edu

Students Wanted!

We would like to encourage students to become more actively involved in the society. One of the ways you can do this is to join a committee. Below are the committees that are open for participation. If you are interested in joining a committee, please let us know while you are here at the meeting. You also can email TXmammals@gmail.com with the name of the committee(s) you would like to join. We will pass your name along to the committee chair and they will be in touch with you. In addition to committee work, we are looking for volunteers to assist at the meeting every year (e.g., help with registration, etc.). If you are willing to assist at the meeting, please email TXmammals@gmail.com and indicate when you would be available to help and what you would like to do.

Conservation Committee

The role of this Committee is to monitor governmental and other activities that relate to conservation of mammals in Texas; advise officers and membership of the Texas Society of Mammalogists on issues of concern; and respond to the issues via formal resolutions. This Committee is intended to serve as a clearinghouse for information on all aspects of conservation of Texas mammals and to maintain the capacity to respond promptly and effectively in crises.

Ad hoc Auction Committee

The role of this Committee is to request and collect donations, set up and help conduct the live and silent auctions at the meeting, and help collect payments at the end of the auctions.

Ad hoc Government Liaison Committee

The role of this Committee is to facilitate interactions between the Texas Parks and Wildlife Department and TSM regarding issues that may affect mammalian conservation and research in Texas. It is similar to the Conservation Committee but is aimed specifically at communicating with TPWD.

Ad hoc Informatics Committee

The role of this Committee is to update and maintain the web and social media presence of the society. TSM currently has Facebook and Twitter accounts.

Website Updates

We are working on updating the society website and are seeking requests for information you would like to see included on the site. Please send your suggestions and requests to Michelle Haynie (mhaynie@uco.edu; Website Editor).

Abilene Christian University

Department of Biology, 1600 Campus Court, Abilene, TX 79699

Tom Lee
Phone: 325-370-4442
Email: leet@acu.edu

Research Interests, Projects, and Grants:
Abilene Christian University funded research last summer for a trip to Trans-Pecos Texas. Dr. Joel Brant, Jonathan Jasper, and I worked on Heteromyid rodents in the Chihuahuan Desert.

I received a grant from the American Society of Mammalogists for the purpose of organizing a symposium on the Mammals of the Andes at the American Society of Mammalogists 100th anniversary and the 99th meeting in Washington D.C. John Hanson and I were presenters at this symposium.

Undergraduate Students and Their Research:

- My students and I are writing another study on the mammals of the Andes of Ecuador. Seth Crockett, Nicholas Tinoco, and I worked at almost 13,000 feet in southern Ecuador on the last project.
- Jonathan Jasper will present data on mammals of southern Yunnan, China that Art Cleveland collected from 1987 to 1990. Jonathan will present on the mammals of southern Yunnan at the 2020 TSM meeting.
- My students, Seth Crockett, and I conducted a camera trapping survey at Abilene State Park. This project was part of the emammal (snapshot) Smithsonian nationwide camera-trapping program. Seth and Slaton Souther will present our data from this project.

Additional Information:
The Abilene Christian University Natural History Collection reopened last year after it was closed for two years while the room it was housed in was renovated.

Angelo State University

Department of Biology, San Angelo, TX 76909

Loren K. Ammerman
Phone: 325-486-6643
Email: loren.ammerman@angelo.edu
Web page: www.angelo.edu/content/profiles/75-loren-k-ammerman

Research Interests, Projects, and Grants:
I am interested in bats and other mammals. I work with students to use molecular data to reconstruct evolutionary relationships of organisms and to investigate

species boundaries and phylogeography. I also am interested in distribution, community structure, and the ecology of bats, especially in Texas.

Current funding is to continue using thermal imaging and PIT tag systems to monitor seasonal roost use and colony size fluctuation of *Leptonycteris nivalis* in Big Bend National Park (Bat Conservation International).

Current Graduate Students and Their Research:

- **Miranda Perry** – MS thesis student, Macronutrient composition of milk in insectivorous bats from the Chihuahuan Desert, August 2018–present

Current Undergraduate Students and Their Research:

- Allie Denham – Genetic variation in *Skrjabinylus* (Nematoda) from striped skunks (ASU Undergraduate Research Scholar, Fall 2019–present)
- Zoey Stormes – Genetic markers for species of *Sylvilagus* in west Texas (ASU Undergraduate Research Scholar, Spring 2020)
- Katie Holland – Genetic techniques for studying mammals (Independent Research, Spring 2020)
- Francisco Fuentes – Genetic techniques for studying mammals (Independent Research, Spring 2020)

Additional Information:
The Angelo State Natural History Collection has over 19,000 mammal specimens and over 20,000 tissue specimens. The collection is searchable at https://www.angelo.edu/dept/asnhc/collections.php and on VertNet and GBIF. Contact Loren Ammerman or Robert Dowler if you have any questions about the collection.

Also, I will be offering a Maymester field course called "Natural History of Bats" at the undergraduate and graduate level during May 2020 through Angelo State University. This course includes a 5-night field component in Big Bend National Park. Contact me if you would like to learn more about participating in this course.

Robert C. Dowler

Phone: 325-486-6639
Email: robert.dowler@angelo.edu
Web page: http://www.angelo.edu/content/profiles/293-robert-dowler

Research Interests, Projects, and Grants:
My graduate students and I are continuing field work to determine the spatial ecology of the plains spotted skunk (*Spilogale putorius interrupta*) in Texas after receiving funding through the Texas Comptroller's office. We are continuing work on other aspects of the ecology of eastern spotted skunks, including their endoparasites. I am considering putting additional M.S. students on additional areas of this research in the coming year. **I also am interested in all specimen records in Texas for any spotted skunks, as well as any sightings,**

photographs, or tissue samples with locality data. In particular we are trying to gather whole animals for endoparasite studies. I am also interested in the conservation biology and systematics of Galapagos rodents, collaborating with Cody Edwards at George Mason University.

Graduate Students and Their Research:

- J. Clint Perkins, former M.S. student, is now a Ph.D. student at Texas Tech University working on the spatial ecology of populations of plains spotted skunks at the Katy Prairie. I am co-advisor with Dr. Richard Stevens at TTU.
- Kamren Jefferson is conducting M.S. thesis research on den site selection of the plains spotted skunk at our study site on the Katy Prairie near Houston, Texas.
- Matthew H. Hamilton is working on his M.S. in Biology working on spatial ecology of striped skunks where they co-occur with plains spotted skunks on the Katy Prairie near Houston.

Undergraduate Students and Their Research:

- Levi Britting is investigating causes of a skin disease in porcupines as part of an undergraduate research project. We are actively seeking road-killed or trapped porcupines for this project.
- Rebecca Scott is conducting research on the mammals of Gaines County, Texas.

Austin College

900 N. Grand Ave., Sherman, TX 75090

Jessica Healy-La Price
Phone: 903-813-2338
Email: jhealy@austincollege.edu

Research Interests, Projects, and Grants:
My primary area of study is the physiological ecology of ground squirrels that hibernate. Using both laboratory and field populations of thirteen-lined ground squirrels, I investigate interactions between hormones that control food intake and reproduction. A current project involves measuring hibernation patterns in wild thirteen-lined ground squirrels across a latitudinal gradient from Texas to Canada. I also have an ongoing long-term project examining the effects of small mammal exclosures on a prairie restoration site.

Undergraduate Students and Their Research:

- Taqwa Armstrong, Emily Davis, Hallie Dickerson – Life history characteristics of thirteen-lined ground squirrels across a latitudinal gradient

Cameron University

Lawton, OK 73505

Dana N. Lee
Phone: 580-591-8009
Email: dalee@cameron.edu

Research Interests, Projects, and Grants:
I primarily study bats and am interested in all aspects of their ecology, genetics, and evolutionary relationships; although, I use molecular biology tools to study the genetic variation of other wildlife populations. Undergraduate students in my lab are either examining DNA sequence and regulatory regions of tumor suppressor genes in bats or using PCR to detect viruses found in Texas and Oklahoma bats. Joel Brant (McMurry University) and I are working on producing a molecular phylogeny for subspecies of the Eastern Mole.

Houston Museum of Natural Science

Dept. of Vertebrate Zoology, 5555 Herman Park Dr, Houston, TX 77030-1799

Dan Brooks
Phone: 713-639-4776
Fax: 713-639-4767
Email: dbrooks@hmns.org
Web page URL: www.hmns.org/exhibits/curators

Research Interests, Projects, and Grants:
Although I do quite a bit of work with birds, research interests in mammalogy span a variety of topics including community and behavioral ecology, biogeography and taxonomy, harvest patterns, natural history, and conservation. I am particularly interested in Neotropical species in lowland regions east of the South American Andes (especially the Peruvian Amazon, Paraguayan Chaco, and eastern Bolivia). Additional regions of coverage include Texas, Middle America, Sub-Saharan Africa, and Southeast Asia.

Current mammalogy projects I'm involved in include:

- Tim McSweeny is wrapping up projects on a large urban colony of *Tadarida*, including predation by Night herons (currently in press) and movements during major flooding events (presented at Urban Mammalogy Symposium last summer at ASM meeting in DC). He will begin graduate studies in Mammalogy in January!
- Research on biodiversity, ecology, and harvest of meso- and large mammals of the Planas River Basin, Colombian Amazon with C. Aya-Cuero et al. was presented as a poster last summer at ASM meeting in DC, and recently published.

Graduate Students and Their Research:
Working at a museum, I don't have my own grad students but currently serve as an external committee member for several students. In terms of Mammalogy, there are currently two committees I serve on, both Ph.D. candidates:

- Juan Carlos Diaz (Rice Univ.) – Tracking the origins and source of genetic variation in the gene *Vkorc1*
- Kim Dingess (Indiana Univ.) – Vocal communication of the Dusky Titi Monkey (*Callicebus donacophilus*)

Additional Information:
The primary driver of the Houston Museum of Natural Science is Education, including outreach. We educate every 4th and 7th grader in the Houston Independent School District annually (approx. 700,000 students/yr), have nearly 2.5 million individuals come through the doors per annum, and are the 4th highest attended museum in the country; surpassed only by Smithsonian, AMNH, and the MOMA. We are the highest attended US museum west of the Mississippi. Every year I tour college-level classes through our collections and permanent wildlife exhibit halls. If you have any interest in coming for a visit just touch base directly!

McMurry University

Department of Biology, Abilene, TX 79697

Joel G. Brant
Phone: 325-793-3875
Email: brant.joel@mcm.edu

Research Interests, Projects, and Grants:
My research interests are primarily concerned with the natural history of mammals, particularly in Texas and the Chihuahuan Desert. My current research program focuses on the natural history & ecology of mammals in the Southern Rolling Plains, northern Edwards Plateau, and northeastern Chihuahuan Desert. My current projects include a survey of the mammals of the Southern Rolling Plains, specifically Taylor County & surrounding areas (with Tom Lee); an examination of the ecological distribution and population genetics of *Scalopus aquaticus* in Texas (with Dana Lee); assessing the ecological impacts of wind farms on bat diversity (with Tom Lee); and a survey of mammals at Camp Bowie Training Center in Brown County, Texas.

Midwestern State University

College of Science and Mathematics, 3410 Taft Blvd, Wichita Falls, TX 76308

Ray E. Willis
Phone: 940-397-4408
Email: ray.willis@msutexas.edu

Research Interests, Projects, and Grants:
I am the curator of the Dalquest Vertebrate Collection. My current research is conducted at the Dalquest Research Station located on the northeastern border of Big Bend Ranch State Park. I have initiated ongoing herpetological and mammal surveys of Dalquest with monthly trips throughout the year, along with extended summer opportunities.

I recently finished a two year grant surveying the mammals of Camp Maxey National Guard base located in Paris, TX, as well as a grant surveying the reptiles and amphibians of Camp Swift in Bastrop, TX. I am in my second year of a $473,000 NSF grant which is being utilized to purchase mammal cabinets, -80 freezers, computers, and digitization of the third largest mammal collection in Texas.

Students and Their Research:
I currently have five graduate students working on various vertebrate morphology and phylogenetic research projects. I have funding for all current projects and anticipate having room for at least three more students who would be interested in vertebrate research.

Purdue University

West Lafayette, IN

J. Andrew DeWoody
Phone: 765-496-6109
Email: dewoody@purdue.edu
Web page: https://web.ics.purdue.edu/~dewoody/DeWoody/wordpress/

Research Interests, Projects, and Grants:
Evolutionary genetics and genomics; molecular ecology and evolution; natural history; conservation biology; wildlife and fisheries management. Our research occurs at the intersection of ecology, evolution, and genetics. Ongoing or recent projects have centered on fishes, herps, birds, and a variety of mammals including marsupials, rodents, and cetaceans.

Graduate Students and Their Research:
My graduate students and postdocs work on a variety of questions in ecology and evolution, including important conservation issues related to threatened and endangered species (e.g., gray whale population structure). Students matriculate through either the Biology program or a Wildlife program.

Undergraduate Students and Their Research:
My undergraduates are all mentored by graduate students or postdocs. Most start as "assistants," but the best students develop their own research projects.

Additional Information:
I am always looking for bright, motivated students so please contact me if you are interested in an immersive experience at a top-notch graduate school. See my webpage for more details.

RTLGenomics[1] and Institute for Biodiversity Research and Education[2]

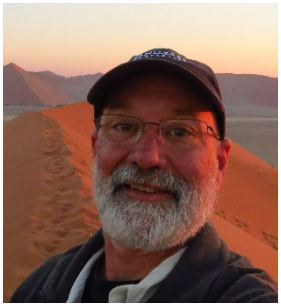
[1]Lubbock, TX and [2]Columbus, GA

John Delton Hanson
Phone: 806-549-4669
Email: j.delton.hanson@gmail.com

Research Interests, Projects, and Grants:
I work as the director of RTLGenomics, a next generation sequencing service provider in Lubbock, TX. In addition, I have recently helped found a research institute focused on increasing participation of underrepresented and suburban students in field and laboratory biodiversity research by involving them in ongoing research activities in the US and abroad. My research currently is on the systematics of various Neotropical rodent groups as well as a project with gopher eye function. I have ongoing collaborations with researchers in Panama and various institutions in the US.

Tarleton State University

Department of Biological Sciences, Stephenville, TX 76402



Philip D. Sudman
Phone: 254-968-9154
Email: sudman@tarleton.edu
Web page URL: faculty.tarleton.edu/sudman/

Research Interests, Projects, and Grants:
I continue to have a keen interest in pocket gopher genetics/

phylogenetics/ population genetics as well as general mammal historical biogeography. As I have just returned to a full-time faculty position, I am open to students with a variety of interests, so if you are interested at all in a project of mutual interest and are seeking a small university atmosphere, please get in touch

Graduate Students and Their Research:

- Dakota Cox, Mammals of Somervell County

Russell S. Pfau

Phone: 254-968-9761
Email: pfau@tarleton.edu
Web page: faculty.tarleton.edu/pfau/

Research Interests, Projects, and Grants:

My main research focus is population and evolutionary genetics. Small mammals have been the primary subject of my research; but I have broadened my taxonomic coverage to include crabs, fish, plants, frogs, and insects. Ongoing projects include:

- Distribution of shrews (*Blarina*) in the southern Great Plains using mtDNA sequencing (for identification) and morphometric analysis to examine geographical patterns of variation
- Population genetics and soil-type correlations of several pocket gopher species in the genus *Geomys*
- Distribution of *Sigmodon hispidus* in Mexico
- Population genetics of the invasive mud crab, *Rhithropanopeus harrisii*
- Species status of two bumblebees in Texas (in collaboration with Jessica Beckham and Jeff Johnson, University of North Texas)
- Population genetics of the Texas endemic plant, *Dalea reverchonii.*
- Conservation genetics of the crawfish frog (State Wildlife Grant, TPWD) in collaboration with Toby Hibbitts, Texas A&M—College Station.

Undergraduate and Graduate Students and Their Research:

- Nadia Samiya – Population genetics of the pocket gopher *Geomys texensis*
- Haley Greenia – Mitochondrial genomics of the pocket gopher genus *Geomys*
- Shady Kuster – Mito-nuclear genetics of the pocket gopher *Geomys breviceps*
- David Kiker – Mitochondrial genomics of the Texas kangaroo rat *Dipodomys elator*
- Josef Leachman – Impact of soil type on the distribution of the pocket gopher *Geomys texensis*

Texas A&M Natural Resources Institute

Texas A&M University, College Station, TX 77843

Krysta D. Demere
Phone: 979-458-8553
Email: Krysta.demere@ag.tamu.edu
Web page: https://nri.tamu.edu/

Research Interests, Projects, and Grants:
In recent years, much of my research efforts have revolved around the ecological monitoring of military lands and conducting baseline biological surveys to ensure compliance with environmental policies. I am currently participating in efforts to educate the general public and landowners on the fundamental practices and benefits of private land stewardship while promoting the conservation of natural resources in Texas. My personal areas of interest are largely concerned with community structure, ecology, the natural history of bats and other non-game species. Last but not least, I have been honored to serve as the official artist for TSM since 2018 and look forward to representing the society each year.

1919 Oakwell Farms Parkway, Suite 100, San Antonio, Texas 78218

Stephanie G. Martinez
Phone: 210-277-0292 x 106
Email: Stephanie.martinez@ag.tamu.edu
Web page: https://nri.tamu.edu/people/research/stephanie-martinez/

Research Interests, Projects, and Grants:
I am a research associate for Texas A&M Natural Resources Institute. I currently support the conservation of nationwide declining, threatened and endangered species by working with the U.S. Fish and Wildlife Service, as well as state and federal partners, to write Species Status Assessments (SSAs).

Prior to joining the NRI SSA team, I worked closely with DoD Natural Resources programs where I assisted with game species and feral hog management, and environmental monitoring efforts that aided in minimizing urban-wildlife interactions.

I received a Bachelor of Science in biology from Abilene Christian University in 2013, and a Master of Science in biology from Angelo State University in 2015. During my education, I worked almost exclusively with Mexican free-tailed bat urban populations. I am currently a member of the Texas Society of Mammalogists, the Southwestern Association of Naturalists and the North American Society for Bat Research.

My research interests include urban mammal ecology, and how human development influences behavior and species adaptation. Outside of work, I enjoy the outdoors by birdwatching, hiking and marathon training.

Texas A&M University-College Station

Department of Ecology and Conservation Biology, Biodiversity Research and Teaching Collections, Texas A&M University, College Station, TX 77843

Thomas E. Lacher, Jr.
Phone: 979-458-4357
Email: jlight2@tamu.edu
Web page: www.jessicalight.org

Research Interests, Projects, and Grants:
Ecology and conservation of macaw species in Peru, livestock; Mammalian biodiversity, and local communities in Huascaran National Park in Peru; Transboundary conservation of bats and agaves in the Texas and northern Mexico; Acoustic biology of nectar-feeding bats in northern Mexico; Models of white-nose transmission in bats in Texas and Mexico; Payment for ecosystem services and mammalian conservation on a landscape matrix in Costa Rica; Spatial ecology of sloths in Costa Rica; Fragmentation and mammalian biodiversity in Costa Rica; Population and community ecology of bats in the southern Brazilian Atlantic Forest; Cacao plantations and marmoset ecology in the Brazilian Atlantic Forest; Climate change and land-use impacts on amphibians in Colombia, Assessment and monitoring of globally threatened species.

Graduate Students and Their Research:

- Gabriela Vigo Trauco, Ph.D. Scarlet macaw reproductive ecology: determining ecological factors affecting reproduction. Major advisor.
- Jessica Gilbert, Ph.D. The impacts and dynamics of the socio-ecological system of livestock grazing on biodiversity in the Huascaran Biosphere Reserve. Major Advisor.
- Nicolette Roach, Ph.D. Distribution, Vulnerability, and Conservation of Amphibians in the Sierra Nevada, Colombia. Major Advisor.
- Jordan Rogan, Ph.D. Biodiversity Thresholds and Functional Traits as Determinants of the Resilience of Mammals in Fragmented Landscapes of Costa Rica. Major advisor.
- Jaileen Rivera Rodrigues, M.S. Foraging behavior and vocalizations of *Leptonycteris nivalis*. Major Advisor.
- Alaya Keane, M.S. Impacts of intensity of cacao agroforestry on primate communities. Major Advisor.
- Adriana Méndez-Jiménez, M.S. Assessment of cyanobacteria monitoring and regulation across the five major regions of Brazil: connections between water policies, differential reinforcement, and public health. Co-advisor with Dr. Leslie Cizmas.
- Bonnie Gulas-Wroblewski, Ph.D Arthropod-borne zoonoses in Texas skunks

(Mammalia: Mephitidae): Implications for conservation medicine and public health Co-advisor with Dr. Donald Brightsmith.
- Lilianna Wolf, M.S. Modeling the potential sustainment, growth, and travel of the virulent fungus *Pseudogymnoascus destructans* in Mexican karst regions. Co-advisor with. Dr. Michael Morrison.

Undergraduate Students and Their Research:
- Michaela Fernandez: Assisting with the Small Mammal Specialist Group Extinction risk assessment
- Teodora Gutierrez: Assisting with the Small Mammal Specialist Group Extinction risk assessment
- Carson Hood Assisting with the Small Mammal Specialist Group Extinction risk assessment
- Logan Lancaster Assisting with the Small Mammal Specialist Group Extinction risk assessment
- Victoria Muehr Assisting with the Small Mammal Specialist Group Extinction risk assessment
- Clara Smejkal Assisting with the Small Mammal Specialist Group Extinction risk assessment
- Emiley Wiley: Assisting with the Small Mammal Specialist Group Extinction risk assessment
- Sarah Ardry: Assisting with Argentina camera trap data
- Danielle De Chellis: Assisting with Argentina camera trap data
- Tommy Rodriguez: Assisting with Argentina camera trap data

Additional Information:
- Member of the IUCN Red List Committee (Planning Committee for the Red List Process)
- Co-Chair IUCN Small Mammal Specialist Group
- Member, IUCN Climate Change Specialist Group
- Associate Conservation Scientist, Global Wildlife Conservation, Austin, Texas
- Co-Editor, Volumes 6 and 7, Handbook of the Mammals of the World

Department of Wildlife and Fisheries Sciences, Biodiversity Research and Teaching Collections, Texas A&M University, College Station, TX 77843

Jessica Light
Phone: 979-458-4357
Email: jlight2@tamu.edu
Web page: www.jessicalight.org

Research Interests, Projects, and Grants:
I am an evolutionary biologist with a focus on phylogenetic, population genetic, and ecological interactions between parasites and their hosts. To

address these broad research interests, I employ a variety of tools such as molecular (multiple genes, population genetic loci, or genomic data) and morphological data from field-collected and museum specimens. My lab is currently funded by the National Science Foundation (Thematic Collections Network to digitize external parasites of terrestrial vertebrates), Texas EcoLabs (to explore associations between pocket gophers and their lice), TPWD (to explore the distribution of *Chaetodipus nelsoni,* the Nelson's pocket mouse in Texas), and Texas A&M University. We also have several proposals in review to explore bat population genetics and *Peromyscus* systematics.

Graduate Students and Their Research:

- Natalie Hamilton is a first year Ph.D. student (co-advised with Dr. Michael Morrison) studying the population genetics, relatedness, and social connectivity of Townsend's big-eared bats across the western United States.
- Lacie LaMonica is a first year Ph.D. student interested in host-parasite relationships.
- Leila Siciliano-Martina is a fourth year Ph.D. student (co-advised with Dr. Michelle Lawing). Leila is exploring evolutionary changes in morphology in captive and domesticated animals.

Undergraduate Students and Their Research:

- Undergraduate students Emma Dohnalik and Grace Vielleux have been instrumental in participating in several *Peromyscus* morphometrics projects. Both students plan to stay active in the lab over the next year.
- A large number of students (Sarah Ardry, Stephen Fowler, Lacie LaMonica, and River Martinez) have assisted with the TPWD *C. nelsoni* project undertaking field work in South Texas. These students have been instrumental in collecting valuable data.
- Our Texas EcoLabs research continues with the help of undergraduate students Abby Adams, Sarah Ardry, Stephen Fowler, Melanie Garduno, Lacie LaMonica, Briana Mena, Julia Mendez, and David Ojeda (Spring and Fall 2019) and graduate students Danielle Dillard and Lacie LaMonica (Fall 2019).
- Several undergraduate students have worked in the Biodiversity Research and Teaching Collections on various organizational projects. Their assistance is much appreciated.

Additional Information:

The mammal division in the Biodiversity Research and Teaching Collections (http://brtc.tamu.edu) currently has over 66,000 specimens. Our data are available online through VertNet, iDigBio, and GBIF.

Texas A&M University-Kingsville

Feline Research Program, Caesar Kleberg Wildlife Research Institute

Michael Tewes
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Web page: https://www.ckwri.tamuk.edu/research-programs/feline-research-program

Research Interests, Projects, and Grants:
Small cats – ocelot, bobcat, jaguarundi, margay, clouded leopard, Asiatic golden cat, leopard cat, marbled cat; not-so-small: cougar and jaguar

Graduate Students and Their Research:

- Amanda Veals: Ph.D. student; examining resource selection and landscape connectivity of the ocelot in South Texas with the aim to help the Texas Department of Transportation plan for wildlife crossing structures to mitigate vehicle collisions for this endangered species
- Jason Lombardi: Ph.D. student; Factors of Ocelot Occupancy in South Texas (Collaborative Effort with East Foundation); Ocelot-Road Monitoring Project on FM 1847 in Cameron County, TX (Collaborative Effort with TXDOT)

Jane Anderson
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Research Interests, Projects, and Grants:
I specialize in applied, interdisciplinary ecology, typically focused on: terrestrial mammal ecology and management, invasive species management, and human dimensions of natural resource conservation. I am currently studying ocelot landscape ecology in south Texas.

Texas Tech University

Department of Biological Sciences, and Natural Science Research Laboratory, Museum of Texas Tech University, Lubbock, TX 79409

Robert D. Bradley
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Web page: www.biol.ttu.edu, www.nsrl.ttu.edu

Research Interests, Projects, and Grants:

My research interests include: systematic relationships, molecular evolution, genomics, and natural history of mammals, particularly in the cricetid and geomyoid rodents; determining the genetic basis for adaptation in *Peromyscus*, examination of hybrid zones between genetically distinct taxa; understanding isolating mechanisms and the dynamics of genetic introgression; exploring the utility and application of the Genetic Species Concept; examination of the origin and evolution of rodent-borne viruses, especially in the use of rodent phylogenies and genetic structure to predict the transmission and evolution of viruses; modeling predictions associated with epidemiology; and growth and utilization of natural history collections, especially those pertaining to mammals.

Current Projects:

- Systematics of the genus *Peromyscus*
- Use of genomic methods to investigate speciation and adaptation in *Peromyscus*
- Systematic and phylogenetic studies of *Peromyscus boylii* species group
- Effects of zonadhesin gene in speciation of mammals
- Hybridization between white-tailed and mule deer
- Genetics of transplanted populations of bighorn sheep in Texas with Warren Conway and Caleb Phillips
- Endangered species research on *Dipodomys elator* with Richard Stevens and David Ray
- Phylogenetic relationships of Neotomine and Reithrodontomyine rodents
- Systematic and phylogenetic studies of the genus *Neotoma*
- Systematic studies of the genus *Geomys* and *Thomomys* with Richard Stevens and David Ray
- Ecology of hanta- and arenaviruses in the southwestern US and Mexico
- Revision of *Texas Natural History: A Century of Change* with D. J. Schmidly and L. C. Bradley

Graduate Students and Their Research:

- Emma Roberts (PhD Candidate) is in her 6th year. Emma will be graduating this spring – her dissertation research involves gamete recognition proteins, reproductive isolation and the role they play in mammalian speciation.
- Laramie Lindsey (PhD Candidate) is in her 6th year. Laramie is being co-chaired by Dr. Caleb Phillips and her dissertation involves examining transcriptomes and exomes in

various species of *Peromyscus* in order to detect genes associated with speciation processes. Laramie will be graduating this spring and pursuing a postdoc with Peter Larsen at the University of Minnesota.

- Emily Wright (MS student transferring into a PhD position) is in her 3rd year. Her research project will utilize genomic methods to characterize population structure, connectivity, genetic variation, and health of Desert Bighorn Sheep in Texas.
- Heidi Stevens (MA student) is in her 3rd year. Her research examines the post-mortem degradation rate of DNA and RNA in liver and muscle samples collected from *Sigmodon hispidus*". Heidi is a Museum Science major so her research project focuses on our Genetic Resource Collection.
- Joanna Bateman (PhD student) is in her 2nd year and will use genomic methods to determine speciation and evolution in heteromyid rodents.
- Sarah Vrla (PhD student) is in her 1st year, following the completion of a MS degree with Michelle Haynie at University of Central Oklahoma.

Recently Graduated Students:

- Taylor Soniat completed his MS degree this past summer. His thesis was entitled "Assessing levels of DNA degradation in frozen tissues archived under various preservation conditions in a natural history collection". Taylor is now the Collections Manager at the Center for Disease Control & Prevention, Atlanta, GA.

Undergraduate Students and Their Research:

- Last year, 7 undergraduate students (Daysi Alvarez, Jacob Bayouth, Anne Pham Cassie Poehlein, Marissa Rodriquez, Danielle Steele, and Irene Vasquez) were involved in various research projects in the Laboratory.

Additional Information:

- My teaching responsibilities include: Mammalogy, Natural History of the Vertebrates, Molecular Systematics and Evolution, Mammalogy for Advanced Students, and Principles of Systematics. In addition, I teach Mammalogy at the Texas Tech University Center at Junction each May (referred to as the Intersession Semester). This is an excellent opportunity to receive credit at the Graduate or Undergraduate level. I also teach "Field Methods" for the Museum of TTU each summer. This three-week course offers an opportunity to garner experience in field biology.
- I am the Director of the Natural Science Research Laboratory, Museum of Texas Tech University.
- In addition, I am editor of the publication series (*Occasional Papers* and *Special Publications*) at the Natural Sciences Research Laboratory, Museum of Texas Tech University. We are seeking to increase the number of contributions to these two series, so please, send us your manuscripts!
- In the Fall of 2019, the Memorial Volume for the Dr. Robert J. Baker was completed. It is available on the NSRL website and is cited as follows: Bradley, Robert D., Hugh H. Genoways, David J. Schmidly, and Lisa C. Bradley. 2019. Overture. Pp. v-ix in From field to laboratory: A memorial volume in honor of Robert J. Baker (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1-911.

Caleb D. Phillips

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Research Interests, Projects, and Grants:
The Phillips laboratory studies metagenomes, genomes, craniofacial development, as well as some morphology and molecular mammalogy. The lab is currently supported by a Texas Parks and Wildlife Department SWG, the National Science Foundation, as well as an ongoing genetic consulting contract with Zara Environmental LLC.

Graduate Students and Their Research:

- Matthew Fox (PhD student): Post-transcriptional regulation of Sonic Hedgehog in craniofacial development
- Craig Tipton (PhD student): Interindividual, temporal, and geographic distribution of chronic wound microbiomes and how they are influenced by host (human) genetics
- Preston McDonald (MS student): Status, Distribution, Morphology and Genetics of *Sigmodon fulviventer dalquesti* in the Chihuahuan Desert Ecoregion
- Megan Rowe (MS student): Distribution of Musashi-binding elements across the genomes of mammals
- Rachael Wiedmeier (MS student): Spatio-temporal structure of bighorn sheep microbiomes and how they may relate to disease susceptibility
- Hendra Sihaloho (PhD student): Community assembly of microbiomes of forest interior bats of Malaysia

Additional Information:
My teaching responsibilities include Bioinformatics, Metagenomics and Organic Evolution. These courses are offered at both graduate and undergraduate levels. I am also Curator of Genetic Resources at the Natural Science Research Laboratory.

Richard D. Stevens

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Research Interests, Projects, and Grants:

- Patterns of biodiversity of New World bats.
- Conservation of Atlantic Forest bat communities.
- Metacommunity structure of rodents of the Mojave Desert.
- Distributional update for Texas Kangaroo rats (with Robert Bradley and David Ray).

- Summer and winter day-roost use by *Myotis septentrionalis* in Louisiana.
- Winter occupancy and activity of bats in Louisiana and eastern Texas (with Liam McGuire).
- Comparative population genetics of imperiled bats of Louisiana (with David Ray).
- Population Status of Texas Pocket Gophers (with Robert Bradley, David Ray, and Neal Platt).
- Continued Study of the Plains Spotted Skunk (with Bob Dowler).
- Use of Highway Structures by Bats in the Trans-Pecos Ecoregion of Texas.

Graduate Students and Their Research:

- Cristina Rios-Blanco—Cristina started her Ph.D. at TTU in August 2014. She is interested in how bat communities are assembled at regional scales. She is studying Neotropical bat metacommunities along elevational gradients and trying to use elevational contexts to better understand bat metacommunity structure. She will also be developing a network approach to apply to metacommunities to better elucidate biological processes important to metacommunity dynamics.
- John Stuhler—John is a fifth year Ph.D. student having completed his M.S. at the University of Wisconsin. He is interested in the ecology/conservation biology of Texas kangaroo rats and is conducting an intensive study of habitat preferences. He is also interested in large-scale diversity patterns in heteromyid rodents.
- Michaela Halsey— Michaela, a fifth year Ph.D. student, is interested in the influence of the physical landscape on gene flow and population genetic structure in Heteromyid and Geomyid rodents. She plans to demonstrate how such information, analyzed via bioinformatic methods, can guide conservation management and practice. She is co-advised by David Ray and me.
- Erin Stukenholtz— Erin finished her M.S. in August 2016. She conducted her thesis on dietary patterns of bats, especially differences between pregnant and nonpregnant (males, females and juveniles) bats in terms of their diets and relating this back to the energetics of pregnancy and lactation. She also developed a less invasive means of determining early pregnancy by examining vaginal cytology and progesterone levels in feces. She is now working on her Ph.D. focusing on the urban ecology of feral pigeons.
- Carlos Garcia—Carlos is a M.S. student under David Ray and me. For his masters, he is working on studying the roosting ecology of the threatened bat species, *Myotis septentrionalis*, in Louisiana and is interested in studying the diets between *M. septentrionalis* and *M. austroriparius*. He has also conducted a survey throughout the state of Louisiana for white-nose syndrome.
- Jenna Grimshaw—Jenna is a third year Ph.D. student co-advised by David Ray and me. She earned a M.S. with Chris Higgins at Tarleton State University. Her current research is to identify patterns of genetic structure in three species of critically-imperiled Louisiana bats: *Myotis austroriparius*, *M. septentrionalis*, and *Eptiscus fuscus*. More specifically, she aims to determine if each of these three species comprise a single population or multiple genetic subpopulations with little gene flow. She is also interested in the distribution of transposable elements among mammalian genomes from a genomic ecological perspective.
- Brett Andersen—Brett is a third year Ph.D. student co-advised by Liam McGuire and me. He earned his M.S. from University of Nebraska at Kearney under Keith Geluso. Brett is

interested in winter bat community structure in east Texas and Louisiana as well as differences in ecophysiology of migrating versus non-migrating species of *Lasiurus*.

- Holly Wilson—Holly is a second year Ph.D. student who recently earned her M.S. from Fort Hays State University under Elmer Birney. She is interested in how bats use highway structures as day-roosts in the Trans Pecos of Texas as well as characterizing ecological neighborhoods of pallid bats.
- Clint Perkins—Clint is a second year Ph.D. student who recently earned his M.S. from Angelo State University under Bob Dowler. His project revolves around population and spatial ecology of the plains spotted skunk, *Spilogale putorius interrupta*.
- Macy Madden—Macy is a Ph.D. student co-advised by Robert Bradley and me. She is interested in plant-pollinator interactions between baobab trees and *Rousettus aegyptiacus* and *Epomophorus* species in South Africa and Kenya.
- Samantha Garcia—Samantha is a first year M.S. student co-advised with Liam McGuire. She earned her B.S. in Biological Sciences at Texas Tech. She is examining elevation gradients in bats characterized across multiple dimensions of biodiversity.
- Angela Alviz—Angela is a first year Ph.D. student who received her M.S. in Biology from the Pontificia Universidad Javeriana. Angela is interested in Tapir metapopulation dynamics in Colombia.

Trinity University

Department of Biology, One Trinity Place, San Antonio, TX 78212

David O. Ribble
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Research Interests, Projects, and Grants:
I am interested in the evolutionary ecology of small mammals, including *Peromyscus* and elephant-shrews. My research in recent years has ranged from studies of social organization to mating behavior to thermal ecology. I have recently begun leading a course in Costa Rica where we are monitoring the elevational distribution of small mammals on the Pacific Slope from Monteverde to the coast. I just finished my first year serving as Associate Vice President of Academic Affairs for Budget and Research, so while my own research agenda has diminished, I am enjoying supporting and promoting others at Trinity University.

University of Central Oklahoma

Department of Biology, Center for Wildlife Forensic Science and Conservation Studies,
Edmond, OK 73034

Michelle L. Haynie
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Research Interests, Projects, and Grants:
My research focuses on mammalian evolution biology, primarily in population genetics and molecular systematics. I am interested in using genetic markers to address conservation and evolutionary questions, with most of my current research focusing on comparative hybrid zone studies and the identification of cryptic species. I also am interested in genomic drivers of the speciation process and local adaptations.

My current projects include:

- Genetic examination of *Geomys* contact zones in Oklahoma
- Examining the potential spread of *Geomys bursarius* into eastern Oklahoma
- Status and trends of bobcat populations in Oklahoma (with Vicki Jackson, Sue Fairbanks, and Jerrod Davis; funded by ODWC)
- A evaluation of bobcat genetic structure in Oklahoma
- A long-term small mammal mark-recapture survey at UCO's Selman Living Lab to identify factors that impact population and community persistence (with Francisca Mendez-Harclerode, Gloria Caddell, Chad King, and Sean Laverty)

Graduate Students and Their Research:

- Laura Kimmel – Phylogeography of Sonoran mud turtles in a fragmented landscape; co-advised with Dr. Paul Stone
- Tim McSweeny – Genetic diversity and population structure in Oklahoma bobcats
- Irene Vasquez – Genetic identification of gophers in southeastern Oklahoma to assess the potential spread of *Geomys bursarius* to this region

Undergraduate Students and Their Research:

- Taylor Gray – Taylor is assisting with the bobcat project and is part of the Selman team; she also is interested in the implications of UV reflective morphology in arctic camouflage
- Carlie Jennings – Qualitative survey of UV reflective morphology in bats; Carlie also is assisting with the bobcat project and is part of the Selman team
- C. Claire Smith – Claire is assisting with the bobcat project and is part of the Selman team
- Rebekah Frank – Rebekah is assisting with the bobcat project

- In addition to the students working in my lab, 24 other undergraduate students from two different institutions have participated in the Selman project. I also have had 5 graduate students, 4 from other labs, participate.

Additional Information:

- I am still in the process of writing the "Mammals of Oklahoma" with Bill Caire, Lynda Loucks, and Brandi Coyner. We are getting closer!

Vicki Jackson

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Research Interests, Projects, and Grants:
My research interests include spatial ecology and captive wild animal care.

My current projects and grants include:

- October 2019: STEM Summer Bridge Program – UCO STLR Program.
- August 2018: Mammal Survey for The Nature Conservancy- Oklahoma City Zoo Property – The Nature Conservancy.
- March 2018: STEM Freshman Research and Mentoring Program – UCO STLR Program.
- October 2017: STEM Summer Bridge Program – UCO STLR Program.
- July 2017: Current Distribution of Eastern (Plains) Spotted Skunks (*Spilogale putorius interrupta*) in Eastern Oklahoma – Oklahoma Department of Wildlife Conservation.
- April 2017: Conference: Identifying Challenges for Elementary Educators: Implementing the Oklahoma Academic Science Standards – National Science Foundation (Division of Undergraduate Education).
- August 2016: Baseline Mammalian Surveys at Oka' Yanahli Preserve – The Nature Conservancy.

Graduate Students and Their Research:

- Mesocarnivore Survey of Southeastern Oklahoma (KaLynn Branham)
- Mesocarnivore Survey of Pontotoc Nature Preserve (Aaron Kidd; graduating in May)
- Dominance Hierarchies of Juvenile African Painted Dogs (Rikki Curto; completed Fall 2018)
- Occupancy Modelling of Mesocarnivores at Oka' Yanahli Nature Preserve (Dineesha Premathalike; completed May 2018)
- Kenneth Shimer – new MS student

Undergraduate Students and Their Research:

- Mammal Survey at a Public Park, Oklahoma City, OK (Ashely Hughes, Toran Muldowney-Anderson, Theron Blunck)
- Introduction to Captive Animal Behavior, Oklahoma City Zoo, Oklahoma City, OK (Brayden Fennity, Hailey Cloud, Jose Gallegos, Josh Jacob)
- Small Mammal Surveys at Oka' Yanahli Nature Preserve, Johnston County, OK (Wendy Monterroso)
- Spotted Skunk Survey in LeFlore County, Oklahoma (Austin Jones)
- Creation of a Slide Library for Identification of Mammalian Fur (Sofia Alvarez-Briglie)
- Using Photographic Evidence to measure Growth in African Painted Dogs (Amanda Smith)

University of Michigan

Museum of Zoology, 3600 Varsity Drive, Ann Arbor, Michigan 48109

Cody W. Thompson
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Research Interests, Projects, and Grants:
I consider myself a classically trained mammalogist, and as such, I use knowledge gained from observations made during fieldwork and through the examination of museum collections to answer questions about mammalian diversity. Specifically, my lab focuses on the following four areas: 1) hybrid zones and hybridization, 2) systematics and taxonomy, 3) technology in museum collections, and 4) basic natural history. My lab currently is funded by the National Science Foundation and the Huron Mountain Wildlife Foundation.

Undergraduate Students and Their Research:

- Vaishnavi Krishnan – Exploring vertebrate diversity using computed X-ray tomography (CT) scanning
- Shion Otsuka – Exploring vertebrate diversity using computed X-ray tomography (CT) scanning
- Rhea Rajani – Exploring vertebrate diversity using computed X-ray tomography (CT) scanning

Additional Information:
Ijoined the Mammal Division at the University of Michigan Museum of Zoology (UMMZ) in June 2013. The UMMZ is administered by the Department of Ecology and Evolutionary Biology (EEB). I serve as the UMMZ Mammal Collections Manager and maintain a research appointment in EEB. With these two roles, I am fully involved in all aspects of the UMMZ

Mammal Division, and I enjoy the challenge of integrating my experience working in museum collections with my own research program.

The University of Texas at Austin

Texas Memorial Museum, 2400 Trinity St. Stop D1500, Austin, TX 78712

Pamela R. Owen
Phone: 512-232-5511
Email: p.owen@austin.utexas.edu
Web page: www.TexasMemorialMuseum.org

Research Interests, Projects, and Grants:

- Evolutionary history of American badgers (Taxidiinae).
- Late Cenozoic mammalian faunas: Phill Shaw (museum volunteer) and I continue work on late Pleistocene mammal remains from the Slaughter Creek Site in southeastern Travis County. Besides the *Capromeryx* (diminutive pronghorn) material we described in 2017, there are some intriguing taxa from this site, including: a llama-like camelid, wolves (*Canis dirus* and *C. lupus*), and a machairodont felid. Other taxa identified include *Bison*, *Odocoileus*, *Equus*, *Procyon lotor*, and *Canis latrans*.

Additional Information:
As Associate Director of Texas Memorial Museum, I coordinate and support collections-based natural science programs for educators, preK-16 learners, and the public. The museum makes available several mammal-focused loaner kits to local educators. I continue to serve as Associate Editor for *Mammalian Species* (fossil record section) and serve on the Public Education Committee of the American Society of Mammalogists. I provide annual training in mammalogy for five chapters (Balcones Canyonlands, Capital Area, Good Water, Hays County, and Lost Pines) of Texas Master Naturalists.

University of Houston—Downtown

Department of Natural Sciences, 1 Main Street, Houston, TX 77002

Amy Baird
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Web page: https://bairdlab.wordpress.com/

Research Interests, Projects, and Grants:
My research interests include molecular phylogenetics, phylogeography, and speciation of mammals. Current projects include genetic studies of local populations of pocket gophers; molecular phylogenetics of lasiurine bats, including phylogeography

of the Hawaiian Hoary bat; population genetics of bowhead whales (grant funded through the North Slope Borough); and taxonomy of *Rhogeessa* bats (with John Bickham and Jessica Light). I've also been working on herps with a phylogeographic study of *Rhinoclemmys* (with John Carr). I am partially funded by a grant from the North Slope Borough (PI).

Undergraduate Students and Their Research:

- Travis Exline – Travis is working on phylogeography of shrews from Central America
- Pedro Brito – Pedro is working on mtDNA sequencing and SNPs in bowhead whales

U.S. Centers for Disease Control and Prevention

CDC Biorepository, Atlanta, GA 30345

Marcia (Marcy) A. Revelez
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Web page URL: https://www.cdc.gov/csels/dls/cdc-biorepository.html

Research Interests, Projects, and Grants:
I have over twenty years of experience working in natural history collections, primarily with mammal and genomic collections. I am now the Lead and Collections Manager for the CDC Biorepository, which is made up of approximately 6 million specimens from research, surveillance, and emergency response efforts at CDC. My role is to modernize the biorepository, with emphasis on policy and collection stewardship. Research interests revolve around best practices, collections management, data management, and IPM. I am part of a new endeavor to create a preparedness repository for CDC, to facilitate public health response to emergency outbreaks in the U.S.

Additional Information:
Member, federal Interagency Working Group of Scientific Collections (IWGSC); member, Enviro-Bio Group for International Society of Biological and Environmental Repositories; member, workgroup National Plan for digitization of biodiversity collections (Network Integrated Biocollections Alliance (NIBA)), Biodiversity Collections Network (BCoN); member, Systematics Committee, American Society of Mammalogists (ASM)

Fellows and Their Research:
Taylor Soniat, Collections Specialist. Taylor is examining optimal storage conditions and sample viability at the CDC Biorepository.

Minutes of the 2019 Business Meeting

Texas Society of Mammalogists
General Business Meeting
Texas Tech University Center, Junction, Texas
9 February 2019

The meeting was called to order by President Richard Stevens at 3:17 pm in the Packard Building of the Texas Tech University Center at Junction. The minutes of the 2018 Annual Business Meeting, as written in the 2019 Program for the Texas Society of Mammalogists (TSM), were approved.

Officers' Reports

Secretary-Treasurer. Secretary-Treasurer Marcy Revelez reported that as the members were gathering for the business meeting, she had handed out amended copies of the Treasurer's Report, which contained corrections to the report that had been printed in the Program. She explained that she had to correct the 2018 beginning balances to $5,400.20 in the checking account and $106,330.04 in the investment account, for total assets of $111,730.24. She briefly explained the income and expense items in the report. She noted that total expenses were greater than total income in 2018, but the checking account balance was sufficient to cover the difference. The investment account had a significant loss at the end of 2018 due to market fluctuations, but had since recovered those losses.

Marcy also reported that the 2017 Treasurer's Report required amending, and that the Executive Committee had reviewed and approved that amended report. Lisa Bradley explained that the 2018 Program, posted on the TSM website, would be revised to contain the amended report.

Permanent Secretary. Permanent Secretary Lisa Bradley reported that she takes photographs to document the meeting, and she maintain the archives of the society at the TTU Southwest Collection and asked that members send any relevant items for the archives to her. She also noted that she submits the annual tax statement to the IRS each year to maintain the Society's tax exempt status, and she prepares the annual program for the meeting. She asked that Committee Reports be turned in to her at the meeting or forwarded to her soon after the meeting.

Editor. Newsletter Editor Michelle Haynie reported that she prepares the Newsletter of the Society and maintains the website of the Society. She asked that those with research programs please contact her each year to update (or maintain) their profiles in the Newsletter. She also said that any announcements or news that members feel would be appropriate to post to the website or print in the Newsletter should be sent to her.

President Elect. President Elect Jessica Light explained that as Chair of the Student Honoraria Committee, she would be giving her report at the banquet.

President Richard Stevens thanked the officers for their hard work in preparing for and conducting the annual meeting and otherwise handling the business of the society. The officers were recognized with a round of applause. Marcy Revelez also thanked John Hanson for creating and maintaining the online registration and abstract submission functions for TSM. John was also thanked with a round of applause.

Reports of Committees

Phil Sudman, Chair of the Committee for Honorary Members, pointed out that the past honorary members were listed on the back page of the program, and that anyone could bring a name to him, or to anyone in the

Executive Committee, for possible recognition as an honorary member. He explained that the remainder of his report would be made at the banquet.

Phil Sudman, Chair of the Financial Advisory Committee, reported on the status of the society's investment account, as shown in the Treasurer's report. He commented that the account had recovered 2018 losses (from $106,330 on Jan. 1 to $99,458 on Dec. 31), and the balance at the end of January 2019 had rebounded to $106,468. He reported that the investment fund had been established in 2013 with a deposit of $67,780, supplemented with contributions of $10,166, and has since grown by about 36% over the last six years. This is an overall good yield that will bolster TSM's goals of assisting students.

Michael Tewes, Chair of the Committee on Conservation, invited committee member Jane Anderson to present the report. Jane reported that she had visited with Jonah Evans by phone in January, with their discussion centering on three topics. 1) The USFWS is considering listing the Texas Kangaroo Rat under the Endangered Species Act. Jonah asked if any members have information regarding life history, survey data, or anything else relevant to the status of this species, that they send that information to him or to the USFWS lead for the Texas Kangaroo Rat, brian_small@fws.gov. 2) The USFWS is considering listing the Tri-colored Bat (*Perimyotis subflavus*). Their 12-month finding is scheduled to be published in 2021. 3) Two road-killed canines recovered on Galveston Island were determined to be 50% Red Wolf. Further, scat found in Louisiana tested as 100% Red Wolf. The TPWD and USFWS are keeping a close eye on this issue.

Michelle Haynie, Chair of the *ad hoc* Informatics Committee, reported that she is working to update the website. She acknowledged John Hanson for developing and managing the online registration and abstract submission capabilities of the website, as well as handling the group emails for the Society. Committee members Jessica Light and Marcy Revelez are working on the Twitter and Facebook accounts of the society. Michelle asked that if anyone has announcements, job postings, internships, or anything else that might be appropriate for TSM post on its website, please contact her. Marcy suggested that the website direct users to contact Michelle directly, rather than using the Society's email txmammals@gmail.com, because that email is not checked regularly.

Richard Stevens, Chair of the *ad hoc* Constitution Committee, gave that committee's report. He explained that the Constitution and By-laws of the Society did not officially establish what constitutes a quorum for the general business meeting or the executive committee meeting, and other minor issues were noticed that the committee determined should be addressed. He explained that the Executive Committee had approved the following amendments to be brought forward to the membership for a vote (proposed changes appear in italics).

Original text of Article I of the TSM By-Laws:
Points of order should be consistent with Roberts Rule of Order.

Proposed Amendment to Article I of the TSM By-Laws:
Points of order should be consistent with Roberts Rule of Order. *Attendance by twenty current members constitutes a quorum for the General Business Meeting.*

Original text of Article V, Section 4 of the TSM By-Laws:
4. Executive Committee – This Committee will consist of the President, Past Presidents and elected officers. The Committee serves as the executive board of the Society and will receive and consider items that might affect the functioning of the Texas Society of Mammalogists and make recommendations to the membership. The Committee will also serve as the Nominating Committee and will prepare a slate of nominations for election to the offices of the Texas Society of Mammalogists.

Proposed Amendment to Article V, Section 4 of the TSM By-Laws:
4. Executive Committee – This Committee will consist of the President, Past Presidents, and current elected officers. *The Committee serves as the executive board of the Society. The Committee* will receive and consider items that might affect the functioning of the Texas Society of Mammalogists and make recommendations to the membership. The Committee will also serve as the Nominating Committee and will prepare a slate of nominations for election to the offices of the Texas Society of Mammalogists. *Fifty percent of the attending members of the Executive Committee constitutes a quorum for the meeting of the Executive Committee.*

Original text of Article VI of the TSM By-Laws:
TSM Award – The TSM Award is presented for the best oral presentation in mammalian molecular biology, evolution, and systematics by a graduate student. Eligibility is open to any graduate student who has not previously received this award. The TSM Award was established in 1990.

Bobby Baker Award – The Bobby Baker Award is presented for the best oral presentation in mammalian molecular biology, evolution and systematics by an undergraduate student. Eligibility is open to any undergraduate student who has not previously received this award.
The Bobby Baker Award was established in 2013 in honor of Bobby Baker (1986-2012), who was an active and award-winning undergraduate member of the Texas Society of Mammalogists.

Clyde Jones Awards – The Clyde Jones Awards are presented for the best poster presentations given by one graduate student and one undergraduate student in mammalian molecular biology, evolution, and systematics. Eligibility is open to any student who has not previously received the award at the respective academic level.
The initial Clyde Jones Award was established in 2004 in honor of Clyde Jones (1935-2015), Horn Professor of Biological Sciences at Texas Tech University. Jones was an active member of TSM since its inception in 1983 until his death in 2015, and was President of the Society in 1987-88.

Proposed Amendment to Article VI of the TSM By-Laws:
TSM Award – The TSM Award is presented for the best oral presentation in mammalian molecular biology, evolution, *or* systematics by a graduate student. Eligibility is open to any graduate student who has not previously received this award. The TSM Award was established in 1990.

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Original text of Article IV of the TSM Constitution:

ARTICLE IV. – Officers

Section 1. The Officers of the Association shall be President, President-elect, Secretary/Treasurer, Permanent Secretary, and Editor.

Section 2. The President shall take office at the close of the annual meeting following his/her term as President-Elect and shall serve for one year, to be succeeded by the President-Elect.

Section 3. The President-Elect shall take office at the end of the annual meeting following his/her election and shall serve for one year, after which he/she shall succeed to the Presidency. If for any reason the President shall be unable to carry out the duties of his/her office, duties shall be carried out by the President-Elect for the remainder of the term of office or for as long as may be required.

Section 4. The President and the President-Elect are not eligible for re-election to the same office until one year after expiration of their terms. The Secretary/Treasurer shall be elected for a term of two years and may be re-elected.

Section 5. A Permanent Secretary shall be elected for a period of five years; and shall serve as liaison officer, historian, parliamentarian and in such other manner as designated by the officers of the society.

Section 6. The Editor shall be elected for a term of five years and may be re-elected.

Proposed Amendment to Article IV of the TSM Constitution:

ARTICLE IV. – Officers

Section 1. The Officers of the Association shall be President, President-elect, Secretary/Treasurer, Permanent Secretary, and Editor.

Section 2. The President shall take office at the close of the annual meeting following his/her term as President-Elect and shall serve for one year, to be succeeded by the President-Elect.

Section 3. The President-Elect shall take office at the end of the annual meeting following his/her election and shall serve for one year, after which he/she shall succeed to the Presidency. If for any reason the President shall be unable to carry out the duties of his/her office, duties shall be carried out by the President-Elect for the remainder of the term of office or for as long as may be required. *The President-Elect shall not be eligible for re-election until one year after the expiration of their term as President.*

Section 4. ~~*The President and the President-Elect are not eligible for re-election to the same office until one year after expiration of their terms.*~~ The Secretary/Treasurer shall be elected for a term of two years and may be re-elected.

Section 5. A Permanent Secretary shall be elected for a period of five years; and shall serve as liaison officer, historian, parliamentarian, and in such other manner as designated by the officers of the society. *The Permanent Secretary may be re-elected.*

Section 6. The Editor shall be elected for a term of five years and may be re-elected.

The three proposed By-law amendments were each voted on and approved by the membership. These by-law changes became effective immediately. It was explained to the members that the proposed Constitutional amendment would be sent by email to all members and remain open for voting for a two-week period after distribution. [Effective 27 February 2019, the amendment was unanimously approved by the members voting.]

Marie Tipps, Chair of the *ad hoc* Auction Committee, reported that the 2018 auction raised $4,815 ($4,235 from live auction and $580 from silent auction). She thanked the membership for donating items to be auctioned. She thanked the committee members, Cory Ross, Carla Ebeling, and Joel Brant. Marie also announced that she would be stepping down as Chair of the committee, and asked for volunteers to fill that role. She explained the duties of the committee Chair. Marie will remain an active member of the committee. [During the recess, Krysta Demere and Katie Kuzdak volunteered to co-chair the Auction Committee.] She announced to the members that cash, check, or card payments would be accepted (after the close of the live auction), and she further explained the process of the auction. Marcy called for volunteers to take over the auction, and she thanked Marie for all her hard work as Chair. The membership recognized Marie with a round of applause.

Election of Officers

President Stevens announced that the Executive Committee had nominated Marcy Revelez to another term as Secretary-Treasurer. The floor was opened for additional nominations. Hearing none, Marcy was re-elected by acclamation.

President Stevens announced that the Executive Committee had nominated two candidates for President-Elect, Cathy Early (University of Mary-Hardin Baylor) and Ray Willis (Midwestern State University). Both nominees stood and introduced themselves. The floor was opened for additional nominations; there were none. A written ballot election was held. The winner was Cathy Early.

New business

It was moved and seconded to hold the 2020 TSM meeting at the TTU Center at Junction. Motion passed. The 2020 meeting will be held February 21-23.

President Richard Stevens announced that the Society would be establishing an *ad hoc* Code of Conduct Committee, which would be bringing forth some recommendations to the Executive Committee over the course of the next year. He also explained that the *ad hoc* Constitution Committee would remain active, as additional issues not resolved this year will need to be addressed in 2020.

The General Business Meeting was recessed at 3:57pm.

The General Business Meeting was reconvened at 6:15pm.

Jessica Light, Chair of the Student Honoraria Committee, announced the winners of the presentation awards. Each winner received a cash award ($500 for the Packard Award and $400 for all others).

The award winners for oral presentations were:
1. Robert L. Packard Award — Virginia Jaquish, Angelo State University
2. TSM Award —Oscar Sandate, Texas Tech University
3. William B. Davis Award —Macy Madden, Texas Tech University

4. Bobby Baker Award —no competitors in this category
5. Rollin H. Baker Award —Krystal Goedde, McMurry University

Poster presentation award winners were:
1. Clyde Jones Award (graduate) —Nicole Paulat, Texas Tech University
2. Vernon Bailey Award (graduate) —Kaylee Hollingsworth, Texas A&M University
3. Clyde Jones Award (undergraduate) —Caylie Holybee, Cameron University
4. Vernon Bailey Award (undergraduate) —Terri Cox, Texas Tech University at Waco

Phil Sudman, Chair of the Honorary Membership Committee, began his report by recognizing several attendees who were past honorary members and also founding members of TSM. Those were: David J. Schmidly, Art Cleveland, Ira Greenbaum, Bob Martin, and Robert Dowler. All were recognized with a round of applause, and were photographed. All Honorary Members that were present also were asked to come up front for a group photo. Prints of a caricature group portrait of past presidents, created by the late Terry Maxwell for the occasional of the Society's 25th anniversary, were also autographed by the attending past presidents. The caricature prints are to be auctioned each year that they remain available.

Phil Sudman then presented framed Honorary Member certificates to the 2017 awardee, Michael Tewes, and the 2018 awardees, Robert Bradley and Lisa Bradley. Phil then described the accomplishments of the 2019 Honorary Member, and concluded by announcing Loren Ammerman as the new honorary member. Loren was recognized with a standing ovation. Loren will receive her framed certificate at the 2020 meeting.

President Richard Stevens then announced that Robert Bradley would be presenting some important business to the membership. Robert began by implying that there was a serious issue with a certain member of the society that needed to be addressed. However, the serious nature of his announcement soon turned light as it was revealed that Robert, as "acting chair" of the Honorary Membership committee, was surprising Phil Sudman with Honorary Membership. Phil was recognized with a standing ovation. He will receive his framed certificate (with Robert Bradley again serving as acting Chair of the Committee) at the 2020 meeting.

Bob Martin, faculty winner of the 2018 Mammal Challenge, announced the winners of the 2019 Mammal Challenge. The student winner was Taylor Soniat of Texas Tech University, and the faculty winner was Jessica Healy-La Price of Austin College. Taylor and Jessica will prepare the mammal challenge contest for the 2020 meeting.

Invited speaker Dr. David J. Schmidly gave a presentation entitled "Helping Conserve Texas' Wildlife Diversity: Challenges for the 21st Century."

The meeting was adjourned at 8:22 pm.

Respectfully submitted,
Lisa Bradley
Permanent Secretary

STUDENT AWARDS

These awards are made possible by the generous donations of the Society's members and by fundraising activities.

Robert L Packard Award – The Robert L. Packard Award is presented for the Best Overall oral presentation. Eligibility is open to any student who has not previously received this award. This award currently includes an honorarium of $500.

The Robert L. Packard Award was first awarded in 1985 for the best student presentation. In 1990, when the TSM Award was established, the Packard Award was designated for the best presentation in classical mammalogy. Since 1998, the Packard Award has been designated for the Best Overall oral presentation. The award was named in honor of Robert L. Packard (1928-1979), the founder of the Texas Society of Mammalogists.

TSM Award – The TSM Award is presented for the best oral presentation in mammalian molecular biology, evolution, and systematics by a graduate student. Eligibility is open to any graduate student who has not previously received this award. This award currently includes an honorarium of $400.

The TSM Award was established in 1990.

William B. Davis Award – The William B. Davis Award is presented for the best oral presentation in classical mammalogy at the organismal level by a graduate student. Eligibility is open to any graduate student who has not previously received this award. This award currently includes an honorarium of $400.

The William B. Davis Award was established in 1998 in honor of William B. Davis (1902-1995), a leading mammalogist in Texas and the first Head of the Department of Wildlife and Fisheries Sciences at Texas A&M University. Davis authored or co-authored five editions of *The Mammals of Texas* (1947, 1960, 1966, 1974, 1994).

Bobby Baker Award –The Bobby Baker Award is presented for the best oral presentation in mammalian molecular biology, evolution and systematics by an undergraduate student. Eligibility is open to any undergraduate student who has not previously received this award. This award currently includes an honorarium of $400.

The Bobby Baker Award was established in 2013 in honor of Bobby Baker (1986-2012), who was an active and award-winning undergraduate member of the Texas Society of Mammalogists.

Rollin H. Baker Award – The Rollin H. Baker Award is presented for the best oral presentation in classical mammalogy at the organismal level by an undergraduate student. Eligibility is open to any undergraduate student who has not previously received this award. This award currently includes an honorarium of $400.

The Rollin H. Baker Award was established in 2002 in honor of Rollin H. Baker (1916-2007), president of the Society in 1984-85 and an active member of TSM from 1984 until his death in 2007.

Clyde Jones Awards – The Clyde Jones Awards are presented for the best poster presentations by one graduate student and one undergraduate student in mammalian molecular biology, evolution, and systematics. Eligibility is open to any student who has not previously received the award at the respective academic level.

The initial Clyde Jones Award was established in 2004 in honor of Clyde Jones (1935-2015), Horn Professor of Biological Sciences at Texas Tech University. Jones was an active member of TSM since its inception in 1983 until his death in 2015, and was President of the Society in 1987-88.

Vernon Bailey Awards – The Vernon Bailey Awards are presented for the best poster presentations by one graduate student and one undergraduate student in classical mammalogy at the organismal level. Eligibility is open to any student who has not previously received the award at the respective academic level.

The initial Vernon Bailey Award was established in 2004 in honor of Vernon Bailey (1864-1942), Chief Field Naturalist and Senior Biologist for the Department of Agriculture's Bureau of Biological Survey (1897-1933). Bailey conducted the first and most complete biological survey of Texas, from 1889 to 1905.

TEXAS SOCIETY OF MAMMALOGISTS

Honorary Members

Class of 1985
W. Frank Blair (D)
Walter W. Dalquest (D)
William B. Davis (D)
Robert L. Packard (D)

Class of 1986
Rollin H. Baker (D)

Class of 1991
Howard McCarley (D)

Class of 1992
J Knox Jones, Jr. (D)

Class of 1995
Clyde Jones (D)

Class of 1997
Robert J. Baker (D)

Class of 1998
James Scudday (D)
Herschel Garner

Class of 1999
David J. Schmidly

Class of 2002
Art Harris

Class of 2003
Arthur G. Cleveland

Class of 2004
Ira F. Greenbaum
Robert E. Martin

Class of 2006
Ann Maxwell
Terry Maxwell (D)

Class of 2007
Guy Cameron
Earl Zimmerman

Class of 2008
John Bickham

Class of 2010
Robert Dowler

Class of 2011
Ron Pine

Class of 2013
Fred Stangl

Class of 2015
Rodney Honeycutt

Class of 2017
Michael Tewes

Class of 2018
Lisa Bradley
Robert Bradley

Class of 2019
Loren Ammerman
Phil Sudman

Patron Members

Jo Actkinson
Loren K. Ammerman
Amy Baird
Robert Baker (D)
Rollin Baker (D)
John Bickham
Lisa Bradley
Robert Bradley
Joel Brant
Guy Cameron
Darin Carroll
Brian Chapman
Ron Chesser
Scott Chirhart
Arthur G. Cleveland
Michael Dixon
Robert C. Dowler
Cathy Early
Carla Ebeling
Herschel Garner
Jim Goetze
Ira F. Greenbaum
Meredith Hamilton
John Hanson
Michelle Haynie
Steve Hoofer
Mandy Husak
Michael Husak
Clyde Jones (D)
Stephen Kasper
Thomas E. Lee
Jessica Light
Robert E. Martin
Ann Maxwell
Terry Maxwell (D)
Kevin McKinney
Steve McReynolds
Anne Merchant
Chris Montag
Jim Patton
Russell Pfau
Caleb Phillips
Carl Phillips
Brenda Rodgers
Duke Rogers
Kent Rylander
David J. Schmidly
Stephanie Shelton
Steve Smith
Phil Sudman
Michael Tewes
Ron Van Den Bussche
Christopher Walker
Kenneth T. Wilkins
Don Wilson
Bernd Wursig
Earl Zimmerman