SCHEDULE AND PROGRAM – 2019 ANNUAL MEETING
Southeastern Missouri State University
Cape Girardeau, MO
11-12 OCTOBER

11 October 2019

6:00 - 9:30 PM – **Welcome and Social –** Trail of Tears State Park

12 October 2018

8:00 – 9:00 AM – **Breakfast and Registration** – Southeast Missouri State University campus, **Magill Hall,** Southeast, 1000 Towers Cir, Cape Girardeau, MO 63701.

9:00 – 9:05 AM – **Introduction** (Andrew Hope) – Hosting institution; Session chair.

9:05 – 9:15 AM – **Welcome** – John Scheibe

9:15 – 10:15 AM – **Paper Session 1**

9:15 AM **1. Addison G. Allen*[a] (MS), Zachary P. Roehrs[b], R. Scott Seville[c], Hayley C. Lanier[a]** *Dietary competition during fire succession influences ecological turnover between dominant small mammal species.* [a] Sam Noble Museum of Natural History, Department of Biology, University of Oklahoma. [b] School of Math and Sciences, Laramie County Community College. [c]Department of Zoology and Physiology, University of Wyoming at Casper.

9:30 AM **2. KaLynn D. Branham* (MS), Victoria L. Jackson.** *Multi-species Occupancy, Detection, and Habitat Selection of Mesocarnivores in Southeastern Oklahoma with a Focus on Eastern Spotted Skunks.* Department of Biology, University of Central Oklahoma.

9:45 AM **3. Susan Anderson* (UG).** *UV-C Light Exposure as a Possible Treatment Method Against* Pseudogymnoascus destructans *on* Myotis septentrionalis *Fibroblast.* Department of Biology, Missouri State University.

10:00 AM **4. Syndey Gwaltney* (UG), Riley Schmidt, Stephanie Foré.** *What is the value of a research mammal collection in a liberal arts and science undergraduate university?* Department of Biology, Truman State University.

10:15 AM **5. Nathan J. Proudman*[a] (PhD), Jerrod L. Davis[b], Victoria L. Jackson[c], Michelle Haynie[c], W. Sue Fairbanks[a].** *Assessing the distribution, trends and abundances of bobcats (*Lynx rufus*) in Oklahoma.* [a] Department of Natural Resource Ecology and Management, Oklahoma State University. [b]Oklahoma Cooperative Fish & Wildlife Research Unit, Oklahoma State University. [c]Department of Biology, University of Central Oklahoma.

10:30 AM **6. Blake Sasse*.** *Did Plains Spotted Skunk Populations Crash in the 1940s?* Arkansas Game and Fish Commission, Mayflower, AR.

10:45 – 11:15 AM – **Break**

11:15 AM – **Keynote Address**

Liz Flaherty, Ph.D. *Informing management of mammals and their habitats using stable isotope analysis.* Assistant Professor of Wildlife Ecology & Habitat Management, Purdue University.

12:15 PM – 2:00 PM – **Lunch**

2:00 PM – 3:30 PM – **Poster Session**

7. Robert A. Beers[a]* (UG), Addison G. Allen[a], Zachary P. Roehrs[b], R. Scott Seville[c], Hayley C. Lanier[a]. *Fire succession impacts abundance but not diversity in Yellowstone small mammal communities.* [a] Sam Noble Museum of Natural History, Department of Biology, University of Oklahoma. [b] School of Math and Sciences, Laramie County Community College. [c]Department of Zoology and Physiology, University of Wyoming at Casper.

8. Will Childress (PhD)*, W. Sue Fairbanks. *Modifying an existing trap design to increase efficiency of catching American black bear (*Ursus americanus*), while reducing chances of head snare in target species and by-catch of non-target species.* Department of Natural Resource Ecology and Management, Oklahoma State University.

9. Marcos da Cruz*[a,b] (PhD), Marcelo Weksler[b], Hayley C. Lanier[a]. *Phylogenetic analysis of the family Cricetidae (Rodentia: Muroidea) based on the mitochondrial genome.* [a] Sam Noble Oklahoma Museum of Natural History, University of Oklahoma; Department of Biology, University

of Oklahoma. [b] Museu Nacional da Universidade Federal do Rio de Janeiro, Department of Vertebrates, Sector of Mammalogy.

10. Paige R. Harman* (UG), Sean P. Maher. *Comparisons of the potential distribution of* Blarina *in Missouri.* Department of Biological Sciences, Missouri State University.

11. Raj Prasai* (MS), John S. Scheibe. *Use of camera traps to detect southern flying squirrels,* Glaucomys volans*.* Department of Biology, Southeast Missouri State University.

12. Kailey R. Meacham, Mary E. Schmidt, Fraser J. Combe, Andrew G. Hope*. *Spatiotemporal prevalence of parasites with mammal community turnover and wody encroachment in the Great Plains.* Division of Biology, Kansas State University.

13. Mary E. Schmidt, Kailey R. Meacham, Fraser J. Combe, Andrew G. Hope*. *What are the evolutionary origins of Kansas mammals? Community assembly dynamics through the Great Plains.* Division of Biology, Kansas State University.

14. Gabriel Estavillo, Peter Eyheralde*. *Scavenging arthropod diversity of mammal carcasses in oak savanna and forest ecosystems.* Department of Biology, William Penn University.

3:30 PM – **Break**

4:00 – 5:00 PM – **Business Meeting** – Society business and announcement of recipient of Student Research Presentation/Poster Awards - all are encouraged to attend!

6:30 – 9:30 PM – **Dinner and Social** – Katie O'Ferrels Irish Pub (https://katyoferrells.com/).

ABSTRACTS

ORAL PRESENTATIONS

1. Addison G. Allen*[a] (MS), Zachary P. Roehrs[b], R. Scott Seville[c], Hayley C. Lanier[a] *Dietary competition during fire succession influences ecological turnover between dominant small mammal species.* [a] Sam Noble Museum of Natural History, Department of Biology, University of Oklahoma. [b] School of Math and Sciences, Laramie County Community College. [c]Department of Zoology and Physiology, University of Wyoming at Casper.

Fires have increased in season length and area burned in the United States over the last 3 decades, potentially altering their impacts on ecological communities. Thus, understanding what drives ecological responses to fire may help us predict how changes in fire regimes will affect ecosystem functions. In western North America, fire succession in mammal communities is marked by a transition between a few dominant species: southern red-backed voles (*Myodes gapperi*) dominate old-growth forests but are largely replaced by North American deermice (*Peromyscus maniculatus*) immediately after a fire. These abundance shifts have been observed in multiple studies, but the processes that mediate these shifts are debated. One possibility is a competitive exclusion-release model, which suggests coexisting species occupy different dietary niches due to competition and exclusion in resource-limited habitats. We tested whether the observed post-fire increase in deermice might be explained by competitive release from voles, which often fare poorly in post-fire environments. Here, we examine dietary shifts between deermice and voles before and after a fire using stable isotope analyses. Furthermore, we evaluate the degree to which deermice and voles fit a competitive exclusion-release framework. Our results indicate that deermice transitioned to a more varied diet, enriched in 13C (i.e., more C4 plants) after the fire. This research provides important insights into how small mammals are impacted by fire succession and competition for similar foods.

2. KaLynn D. Branham* (MS), Victoria L. Jackson. *Multi-species Occupancy, Detection, and Habitat Selection of Mesocarnivores in Southeastern Oklahoma with a Focus on Eastern Spotted Skunks.* Department of Biology, University of Central Oklahoma.

Mesocarnivores are important ecological species that provide many significant roles in their habitats. One mesocarnivore species in particular, the eastern spotted skunk (*Spilogale putorius*), is classified as either a species of conservation concern, threatened, or endangered throughout much of its range. In Oklahoma, they are described as a Tier III species of greatest conservation urgency. We seek to understand the distribution of mesocarnivores in southeastern Oklahoma while focusing specifically on eastern spotted skunks. We are using occupancy models to determine distribution trends of eastern spotted skunks and the other mesocarnivores while taking into account differences in detectability. In addition, we are considering covariates such as habitat characteristics and the presence of other species in our PRESENCE models. We are collecting presence/absence data between the months of October and April (2018-2019 and 2019-2020) using Reconyx Hyperfire cameras. We are deploying these cameras in areas of McCurtain and LeFlore counties for a duration for one month. In locations where eastern spotted skunks have been detected, we are leaving cameras at that site for the continuation of the field season to understand occurrence frequency for the species. We are recording habitat characteristics such as, canopy cover, average tree height, understory density, forest type, land use, and terrain at each

location. These characteristics are important for determining habitat preference for the mesocarnivore species. The information resulting from this study should be useful to manage a variety of mesocarnivores including eastern spotted skunks due to their vulnerability and classification as a furbearing species.

3. Susan Anderson* (UG). *UV-C Light Exposure as a Possible Treatment Method Against Pseudogymnoascus destructans on Myotis septentrionalis Fibroblast.* Department of Biology, Missouri State University.

The *Pseudogymnoascus destructans* (*P.d.*) fungus, since 2006, has caused major declines to native bat populations in North America causing many bat species to become endangered. It has recently been discovered that the *P.d.* fungus is vulnerable to UV-C light due to it lacking the UVE1 gene enzyme for nucleotide repair in the AER (alternate excision repair) pathway. Because of this, using UV-C light is a possible treatment for bats infected by the P.d. fungus, as well as treating their habitats with UV-C light. However, there has no published research on the possible effects that the UV-C light would have on bats themselves. For this experiment, Northern long-eared bats (*Myotis septentrionalis*) fibroblasts were used due to this species high vulnerability to *P.d.*. Fungal spores and bat skin cells were all tested under the same conditions of UV-C exposure of an intensity of 10 mJ/cm2 at exposure length of 5, 15, and 45 seconds. As time of exposure increase, both the spore and cell death increase due to an increase in duration of the high frequency of UV-C light. However, using UV-C light could be a possible source of treatment for bats if properly and carefully regulated.

4. Syndey Gwaltney* (UG), Riley Schmidt, Stephanie Foré. *What is the value of a research mammal collection in a liberal arts and science undergraduate university?* Department of Biology, Truman State University.

The Truman State Mammal Collection was founded in 1980 by Dr. Scott Ellis. Currently the collection is curated by Dr. Stephanie Foré and undergraduate students. The objective of our presentation is to share how a collection can be used in an undergraduate liberal arts and science university. Student curators manage the 4311 specimens, of which 3873 are from Missouri. The specimens are from 8 different orders, and 19 different families. In a liberal arts and science, undergraduate school, the collection is currently being used in a variety of ways including training student curators, science classrooms and art studio classes. Curators have learned how to identify specimens, manage specimen loans, develop and maintain a website, and event plan for outreach. Future plans include developing and managing a camera trap monitoring study to record local fauna in Adair county.

5. Nathan J. Proudman*[a] (PhD), Jerrod L. Davis[b], Victoria L. Jackson[c], Michelle Haynie[c], W. Sue Fairbanks[a]. *Assessing the distribution, trends and abundances of bobcats (*Lynx rufus*) in Oklahoma.*
[a] Department of Natural Resource Ecology and Management, Oklahoma State University. [b]Oklahoma Cooperative Fish & Wildlife Research Unit, Oklahoma State University. [c]Department of Biology, University of Central Oklahoma.

Bobcats (*Lynx rufus*) are one of the most heavily harvested furbearers in Oklahoma, yet little is known of the population status and their trends over the last decade. Previous estimates have used data collected from fur harvest and roadside kills, but these sources are often highly variable and not necessarily dependent on bobcat population trends. This study aims to determine the

trends and ecological patterns of bobcat distributions across the state, whilst also focusing on 3 areas of specific interest from different ecoregions of Oklahoma. We are using specifically designed hair snare cubbies to collect hair samples that will be identified to species microscopically. Hair follicles will allow genetic identification of individual bobcats on the intensive study areas. Hair-snare cubbies will be deployed state-wide by student volunteers and using occupancy modelling, population trends and distribution of bobcats in Oklahoma will be determined. Using more intensive arrays of hair snare cubbies on the 3 specified areas of interest, individual bobcat encounter histories will be analyzed in a spatially explicit capture-recapture framework, which will be used to make inferences on the ecological patterns of space-use and resource selection of individual bobcats. This data will help inform management decisions for an economically and culturally important, heavily harvested fur-bearer species in Oklahoma.

6. Blake Sasse*. *Did Plains Spotted Skunk Populations Crash in the 1940s?* Arkansas Game and Fish Commission, Mayflower, AR.

The plains spotted skunk (*Spilogale putorius interrupta*) is a small mesocarnivore that experienced a significant range expansion in North America during the first half of the twentieth century. In the 1930s and 1940s this subspecies was common in the fur trade with more than 100,000 animals being taken annually, however by the early 1950s harvest had declined to less than 10% of previous and less than 1% of earlier levels by the 1980s. Several potential non-exclusive causes of this decline have been suggested including landscape change, overharvest, disease, changes in the predator community, pesticides, and that declines may represent a return to the historical range of the species after earlier expansion aided by human development of these regions. That a decline in population density and possibly in distribution of the plains spotted skunk after the 1940s occurred is not in doubt, however, several authors have used changes in reported harvest as a basis for concluding that there was a rapid loss in the 1940s and early 1950s. Based on examination of harvest records for this species and other mesocarnivores and available historical literature, there is no strong evidence for a rapid decline in populations occurred during this period.

POSTER PRESENTATIONS

7. Robert A. Beers[a]* (UG), Addison G. Allen[a], Hayley C. Lanier[a], Zachary P. Roehrs[b], R. Scott Seville[c]. *Fire succession impacts abundance but not diversity in Yellowstone small mammal communities.* [a] Sam Noble Museum of Natural History, Department of Biology, University of Oklahoma. [b] School of Math and Sciences, Laramie County Community College. [c]Department of Zoology and Physiology, University of Wyoming at Casper.

Given the increase in wildfire frequency and severity throughout the intermountain west, it is increasingly important to understand the effect fires have on ecological communities. Understanding the effects of fire succession on community structure allows us to better predict the influence future fires will have on species occurrence, interactions, and persistence. In this study we use 4 grids that were established after the 1988 Yellowstone fires to examine the effects of subsequent fires on small mammal diversity. We contrasted species richness and abundance two years before and after the 1988 and 2016 fires. Prior to the 2016 fire, communities were dominated by red-backed voles (*Myodes gapperi;* >50% of captures) and shrews (*Sorex* spp.; ~25% of captures), with a mixture of other small mammal species. After the 2016 fire, species richness

remained relatively constant but abundance fluctuated, with deermice (*Peromyscus maniculatus*) comprising 75% of captures and dominating all four trapping grids. In contrast, red-backed voles and shrews dropped to 6-7% and 3-4%, respectively. We hypothesize the reason this shift may be in part due to dietary generalism in deermice. Results suggest that fire regime (timing and intensity) may be key to understanding post-fire community assemblages. Long-term studies, such as this, are critical for predicting the impacts of wildfires on ecological habitats and their communities.

8. Will Childress (PhD)*, W. Sue Fairbanks. *Modifying an existing trap design to increase efficiency of catching American black bear (*Ursus americanus*), while reducing chances of head snare in target species and by-catch of non-target species.* Department of Natural Resource Ecology and Management, Oklahoma State University.

Oklahoma black bear researchers have traditionally used the M-15 Humane Foot Snare (bucket snare) for capture-recapture study designs. Years of trapping the same areas, with the same trap design, have caused the bears to become wary of the traditionally used bucket snares. This increase in wariness does not deter interactions with the trap, but shows the bears becoming strategic in their approaches to obtain the bait from the trap. These strategies include ripping the bucket off the tree and tearing the lid off the front of the bucket, drastically increasing the potential for head snares. Another concern with the bucket snares is by-catch caught during the trapping period, which is typically raccoons. Modifications made to the bucket snare include adjustment of the spring arm and replacement of the bucket with 6" PVC pipe. This allows researchers to reduce the probability of head snares, while increasing capture efficiency and reducing by-catch. In a preliminary study, we successfully captured seven black bears in 109 trap nights, with zero head snares, and zero non-target species captured. Our preliminary study resulted in a 256% increase in trap efficiency over previously used trapping methods in the study area.

9. Marcos da Cruz*[a] (PhD), Marcelo Weksler[b], Hayley C. Lanier[a]. *Phylogenetic analysis of the family Cricetidae (Rodentia: Muroidea) based on the mitochondrial genome.* [a] Sam Noble Oklahoma Museum of Natural History, University of Oklahoma; Department of Biology, University of Oklahoma. [b] Museu Nacional da Universidade Federal do Rio de Janeiro, Department of Vertebrates, Sector of Mammalogy.

With more than 700 species worldwide, the family Cricetidae (Rodentia: Muroidea) is the second-most diverse family of mammals. Previous studies inferring phylogenetic relationships among Cricetidae subfamilies (Arvicolinae, Cricetinae, Neotominae, Sigmodontinae and Tylomyinae) have found contrasting results and low nodal support. The main objective of the present study is to better infer phylogenetic relationships among Cricetidae subfamilies based on the complete mitochondrial genome. Phylogenetic analyses with maximum likelihood and Bayesian inference included 57 mitogenomes (approximately 16,000 base pairs) represented by 8 new mitogenomes of Cricetidae species sequenced in this study, 43 Cricetidae mitogenomes from GenBank and 6 outgroup representatives (Dipodoidea and Muroidea). Phylogenetic analyses were based on different datasets that included protein coding, rRNA, tRNA, D-loop control region, and amino acid sequences. Analyses were also based on different partition schemes (single partition, partitioned by codon position, partitioned by gene and codon position). Results from different partition

schemes and datasets differed in bootstrap and posterior probability support. Nonetheless, most of the analyses consistently recovered Sigmodontinae as sister group to Tylomyinae and Arvicolinae as sister group to Cricetinae forming clades with medium or high support. The phylogenetic position of Neotominae differed among analyses, but most recovered Neotominae as sister group to the clade comprised by Tylomyinae, Sigmodontinae, Arvicolinae and Cricetinae. Further studies including a broader taxonomic sampling combined with genome-wide and morphological data will better resolve this phylogenetic conundrum.

10. Paige R. Harman* (UG), Sean P. Maher. *Comparisons of the potential distribution of* Blarina *in Missouri.* Department of Biological Sciences, Missouri State University.

The application of taxonomy, which is the classification and naming of organisms, can have impacts on conservation and management efforts. Erroneous records of occurrence, particularly location and/or identification, impede such efforts. There are three species of short-tailed shrew, genus *Blarina*, in the United States: *B. carolinensis*, *B. hylophaga*, and *B. brevicauda*, with the latter two predominantly found within the central United States. Recent genetic evidence suggests that most individuals in Missouri are *B. brevicauda*, rather than *B. hylophaga*. Due to several morphological similarities between *B. hylophaga* and *B. brevicauda*, it is important to consider that records of *Blarina* could be misidentified. Using data from VertNet and EcoClimate, we constructed distribution models of *B. hylophaga* and *B. brevicauda* and assessed how forecasts differed and whether we could discern differences in suitability between the different taxonomies. Here we demonstrate that environments in Missouri are suitable for both species, but, perhaps, there is higher suitability for *B. hylophaga*. VertNet lacks significant sample sizes of both shrew species, and this perhaps impacted our results. Our models are not a panacea to delineate the shrew's specific identity, and would be better used to estimate a species geography. To accurately investigate taxonomic status of shrews in Missouri, additional fieldwork and collection is imperative.

11. Raj Prasai* (MS), John S. Scheibe. *Use of camera traps to detect southern flying squirrels, Glaucomys volans.* Department of Biology, Southeast Missouri State University.

Many small mammal studies involve live trapping which can be labor intensive, expensive, influences behavior and results in some mortality. Camera traps are less invasive and can be used to assess presence and occupancy of species. We used camera traps with bait tubes to detect southern flying squirrels (SFS), *Glaucomys volans*. We surveyed three sites using 10 to 25 cameras and bait tubes. We used program Presence to estimate detection probabilities and area occupied by flying squirrels and non-target species. Detection probabilities for flying squirrels were influenced significantly by non-target species, prompting us to modify the bait tube design. When portion of area occupied was high, detection probabilities for raccoons was highest on the first night and then decreased, while for flying squirrels detection probabilities were highest after 3 nights. When portion of area occupied was smaller, this pattern was not apparent and there was no negative affect of raccoons on flying squirrel detections. Detection probabilities for flying squirrels were related to forest structure, presence of raccoons, and to a minor extent, bait used. The three sites differed significantly in terms of detection probabilities and portion of area

occupied by flying squirrels. Our results demonstrate that camera traps used with bait tubes provide an efficient and statistically reliable means of assessing occupancy by flying squirrels without the risk of mortality or adverse effects on behavior.

12. Kailey R. Meacham, Mary E. Schmidt, Fraser J. Combe, Andrew G. Hope*. *Spatiotemporal prevalence of parasites with mammal community turnover and wody encroachment in the Great Plains.* Division of Biology, Kansas State University.

Human practices (development, agriculture, cessation of burning) have fragmented Native Prairie habitats through the Great Plains. Consequences include woody encroachment, mosaic communities of grassland and woodland mammals, and increase in zoonotic pathogens. We present a first diagnosis of ectoparasite prevalence across a prairie-woodland experimental landscape to investigate the influence of climate, mammal host, and habitat on parasite distributions. We test hypotheses: H_0: Distribution of ectoparasites will be uniform across habitats (suggesting host generalists across mammals); H_1: Ectoparasites will have a greater density in woody habitats (reflecting the observation that both woody encroachment and vector-borne disease are increasing); H_2: Ectoparasite distributions will be variable across groups (e.g., fleas vs. ticks), habitats, and years. Small mammals were sampled for two years across three prescribed fire treatments including annual, 4-year, and 20-year burns on Konza Prairie LTER. All fleas, ticks, lice, and mites were collected from small mammals, separated by group and quantified by both presence/absence, and general densities (low, medium, high). We analyzed differences among years, fire treatments, and small mammal species, using pairwise and multi-variate statistics. Preliminary results indicate that in years with low rainfall and mammal density, ectoparasites persist primarily in woody habitats. In productive years with high mammal densities, ectoparasites are more widespread across habitats but exhibit group-specific trends. Woody encroachment appears to increase source habitats for maintaining prevalence of parasites through time.

13. Mary E. Schmidt, Kailey R. Meacham, Fraser J. Combe, Andrew G. Hope*. *What are the evolutionary origins of Kansas mammals? Community assembly dynamics through the Great Plains.* Division of Biology, Kansas State University.

The Great Plains, ranging through the center of North America, support both grassland and woodland mammal species that often have broad distributions, and high intra-specific diversity with multiple geographic lineages. Purely endemic communities should be more stable and exhibit shared evolutionary histories. Mixed communities with species having distant origins may reflect community turnover, and higher potential for new interactions, including transfer of parasites across the continent. We test the competing hypotheses: H_0: Lineages within small mammal species in northeast Kansas all share the same origins; H_1: Lineages have varying evolutionary histories, stemming from different geographic origins through North America. Small mammals from eight species were sampled from a mosaic of multiple habitat types (grassland, shrubland, woodland) across the Konza LTER site. We extracted DNA from five individuals of each species, and sequenced the Cytochrome-b gene, a common barcode locus for mammals. For each species, we downloaded existing range-wide sequence data from GenBank, and estimated phylogenetic trees using Bayesian methods, to assess lineage placement of Kansas specimens. Preliminary results

indicate multiple geographic and evolutionary origins among current prairie mammals, indicating community mixing through time. Increasingly heterogeneous habitats through the Great Plains due to human land practices will promote continued mixing of mammals with distant origins across North America, increasing new host-parasite associations, and risk of emerging disease.