



50th Annual Meeting – July 12-16 Lincoln, Nebraska

MEETING ABSTRACTS

Arranged by Presenter's last Name
Presenters Bolded

* designates student competition participant

TALKS

CHARACTERIZING SPIDER COMMUNITIES IN GEORGIA PEANUT LANDSCAPES

Curtis Abell*, Jason Schmidt

University of Georgia; University of Georgia at Tifton

Biodiversity of arthropod natural enemies can enhance biological control in agricultural systems, yet the composition of these communities remains poorly characterized in southeastern U.S. peanut agroecosystems. We examined spider assemblages in peanut (*Arachis hypogaea*) fields across Georgia using vacuum sampling over two years at 67 sites. In total, we collected approximately 1,850 individuals representing 22 families, with Salticidae, Oxyopidae, and Thomisidae being the most abundant, comprising 59.5% of all specimens. Although communities were similarly dominated by active hunting taxa, the identity of the dominant families and overall taxonomic diversity differed from previous assessments of spider fauna in peanut systems, indicating a more diverse assemblage with a distinct community structure. These results establish an updated baseline for spider diversity in peanut systems and identify key taxa likely to contribute to biological control. Ongoing analyses examine how in-field position and landscape composition shape spider assemblages across spatial gradients.

Talk Session 1 | Ecology

BRAIN-WIDE NEURONAL IDENTITIES AND CORRELATES OF WEB BUILDING IN ULOBORUS DIVERSUS

Gregory Artiushin, Andrew Gordus

Johns Hopkins University

Orb web building is a fascinating behavior for neuroanatomical dissection, as it is an impressively complicated, long-lasting and innate behavior which is nevertheless accomplished by an animal with a relatively small nervous system. Since the time of Witt and colleague's pioneering efforts to use laser ablation to discern brain regions involved in the behavior, the question of which neuronal populations govern orb web construction has remained essentially unaddressed.

Using fluorescence in situ hybridization in the whole-mounted *Uloborus diversus* central nervous system, we have generated a 3D representation of the spatial orientation and number of total neurons in the *U. diversus* brain, as well as specific populations expressing key neuroactive substances which range from in the thousands (e.g. GABAergic, glutamatergic neurons) to hundreds (e.g. serotonergic neurons) to less than 10 (e.g. histaminergic neurons). By overlaying this signal with a probe for an activity-regulated gene – a marker whose transcriptional expression correlates with preceding neuronal firing – we present our progress in mapping the location and neurochemical identity of the putative populations which are active in the *U. diversus* brain during web building.

Talk Session 5B | Morphology, Physiology & Development

TESTING A MODEL OF NATURAL “REVERSE SPECIATION” BY EVALUATING HYBRID ZONES IN THE HABRONATTUS AMERICANUS SPECIES GROUP (ARANEAE: SALTICIDAE)

Ian Ashton*, Marshal Hedin

Brigham Young University; San Diego State University

We now know that many animals hybridize, and through the subsequent process of introgression can exchange genes with related species. Widespread introgression can homogenize genomes and lead to a reversal of the speciation process, merging related lineages. One example of possible reverse speciation is seen in the genus *Habronattus* (Salticidae). Male *Habronattus* jumping spiders have a great diversity of colors, patterns, and courtship dances. Despite these differences, there are multiple examples of both hybridization and introgression in the genus. Several species in the relatively young *Habronattus americanus* subgroup form hybrid zones at contact areas. Previous research on a hybrid zone between *H. americanus* (Keyserling, 1885) and *H. kubai* (Griswold, 1979) at Mt. Shasta, California showed patterns consistent with reverse speciation, including a variety of intermediate male hybrid phenotypes suggesting the formation of a hybrid swarm. This and other research also indicate a shared female preference for red coloration in male spiders across the subgroup. We are investigating an additional hybrid zone in Oregon between the same two species to understand if there is a wider trend of reverse speciation. We assessed differences in microhabitat preference between morphologically identified parent species and hybrids, characterized morphological diversity, and assessed population genetic structure using genomic-scale data. Preliminary evidence suggests that like the patterns seen at Mt. Shasta, there are many combinations of sexually selected morphological characters in male hybrids and an abundance of red colored individuals. Initial investigation has also shown no significant genetic clustering or difference in microhabitats.

Talk Session 1 | Evolution, Genetics & Genomics

STRATEGIES TO IMPROVE STUDENT ENGAGEMENT AND LEARNING OUTCOMES IN A COMBINED UNDERGRADUATE/GRADUATE-LEVEL SPIDER IDENTIFICATION COURSE

Anthony Auletta, Lisa A. Taylor

University of Florida

Spiders (Araneae) are one of the most diverse groups of animals on the planet and are highly abundant in both natural and human-modified habitats. Despite this, dedicated spider biology courses are relatively rare in university curricula, even within entomology programs. As a result, many entomologists and other naturalists receive no formal training in spider identification, which can lead to incomplete or erroneous conclusions during biodiversity surveys and other research projects. To address this gap, we have developed a 16-week hands-on Spider Biology Lab course, which is embedded into the undergraduate and graduate Entomology & Nematology curricula at the University of Florida. This lab course, which complements a pre-existing Spider Biology lecture course, emphasizes field techniques to collect spiders as well as spider identification to the

family level. Throughout the semester, each student creates a curated collection of spider specimens that showcases local spider diversity. Students also learn to identify over 40 spider families by sight, as well as how to use a dichotomous key to identify any North American spider to family. In this presentation, we will share details of our course design and strategies that we have used to improve student engagement and learning in the course– including our recent gamification of the spider collection, which has led to measurable increases in the diversity of spider families represented in student collections (with 42 families collected in 2025). We will also share resources that can help fellow educators who are interested in developing and teaching similar spider identification courses.

Talk Session 4A | Education / Outreach

BIOLOGY MEETS GEOMETRY: WEB-BUILDING SPIDERS' SOLUTIONS TO THE TYRANNY OF GEOMETRY

Leticia Aviles

University of British Columbia

A key scaling challenge organisms face is a declining surface area to volume ratio with increasing size, an unavoidable property of three-dimensional objects if maintaining their shape. As resources are acquired through the surface, but energy needs are proportional to the volume, which correlates with mass, the result would be a decrease in the energy captured per unit mass with increasing size. This challenge must be addressed at all levels of organization, from individual cells to entire societies.

Web-building spiders exhibit a diversity of solutions to overcome this geometric scaling challenge depending on their social system and the architecture of their webs: solitary spiders with sheet-and-tangle webs create a vacuole within their webs that grows faster than the rest of the web; group-living spiders with shareable webs cooperate in the capture of larger insects in larger colonies; group-living spiders with non-shareable orb webs preserve surface area for the capture of prey through a modular architecture; and the food-stealing or commensal spiders that colonize the webs of the cooperative social spiders reduce their densities as the host colony increases in size. Strikingly, this diversity of solutions in spiders with vastly different web architectures or means of acquiring food results in nearly identical relationships between energy acquired per unit mass and body or colony size.

Plenary | Other

CO-EVOLUTION OF EXCEPTIONALLY SHORT FREE-RUNNING PERIODS WITH SPIDER WEB BUILDING BEHAVIOR SUGGESTS SELECTIVE ADVANTAGE OF A FAST CLOCK

Nadia A. Ayoub, Thomas H. Clarke, Natalia Toporikova, Thomas Jones, Darrell Moore, Jessica Petko
Washington and Lee University; Eastern Tennessee State University; Penn State York

Circadian clocks with near 24-hour endogenous free-running periods (FRPs) are thought to be evolutionarily advantageous. In contrast, we have discovered remarkably broad distributions of FRPs for locomotor activity within and among spider species (17.8 - 29.1 hours), suggesting spiders may be released from the typical selective constraints of an FRP close to the solar day. To test this hypothesis, we inferred evolutionary relationships among 26 species spanning the diversity of spiders and a scorpion using ~800 homologous genes. Strikingly, we discovered that the two species of spiders, *Cyclosa turbinata* and *Allocyclosa bifurca* (Araneidae), with the shortest recorded clocks (~18h FRP) also build a trashline out of debris and excrement in the center of their orb web. During the day, the spider sits in the middle of the trashline and is completely camouflaged, versus most nocturnal spiders that hide in a retreat during the day. These two species had previously been considered each other's closest relatives, but our phylogeny strongly supports a distant relationship, with each trashline builder evolving from an orb web weaver with an ~24-hour FRP. Thus, trashline building co-evolved with a short clock at least twice. We propose that relaxed selection for a 24-hour FRP allowed spiders to evolve variable endogenous clocks, and later that variation provided the substrate for selection for a short clock in trashline builders. The short clock may have been advantageous for species that rely on effective camouflage from predators at dawn.

Talk Session 2A | Evolution, Genetics & Genomics

POPULATION CROSS EXPERIMENTS REVEAL VARIATIONS IN REPRODUCTIVE SUCCESS IN OPILIONES

Ryan Bacon ; Ruth Dunlap; Mercedes Burns

University of Maryland, Baltimore County & University of Illinois Chicago; Macalester College;
University of Maryland, Baltimore County

Environmental conditions shaped by precipitation and temperature impose potentially divergent selective pressures which can significantly influence the evolutionary trajectory of reproductive morphology and behavior. Specifically, allopatric populations of organisms with limited dispersal may show pronounced divergence in these traits. Sexual conflict is one evolutionary mechanism that can lead to reproductive trait variance between populations. This variation may partially be driven by breeding season length and resource availability, creating a pattern of local adaptation to sexual conflict. To investigate population-level variation in coercive and competitive ability and their impacts on fitness we conducted outdoor male transplant experiments with the eastern harvester, *Leiobunum vittatum*, in Maryland and Minnesota, two locations with different phenological windows. Comparing the likely paternity of experimental clutches allowed us to estimate the reproductive competitive ability of males from each population and their ability to secure matings. We identified significant differences in reproductive phenology between populations and a generally low level of genetic variability within and between populations. Finally, we found evidence of increased paternity by Minnesota males under a reduced breeding season, and interpret this as potential evidence of enhanced coercive ability of these males.

Early Career Symposium | Ecology

IDENTIFYING MECHANISMS OF SEXUAL SELECTION IN THE WOLF SPIDER *SCHIZOCOSA TRISTANI*

Laura Bedoya*, Rowan McGinley

Smithsonian Tropical Research Institute

Sexual selection is an evolutionary force that includes intrasexual and intersexual mechanisms, which result in the non-random fertilization of gametes. These mechanisms can lead to the evolution of diverse secondary sexual traits, which can be morphological or behavioral. Sexually selected traits can be affected by various factors. Our objective was to identify the sources of sexual selection (intersexual and intrasexual) in a sexually dimorphic Neotropical wolf spider, *Schizocosa tristani*. Males display black-and-white ornamentation on their first pair of legs and perform multimodal courtship displays, consisting of visual displays and vibrations transmitted through the substrate. For this project, we conducted experiments in the absence of competition (one female with one male) or in the presence of competition (one female with two males). In the absence of competition, mounting latency correlated with male ornamentation, which is consistent with the role of female preferences in mating success. However, in the presence of competition, ornamentation did not predict mating success. Furthermore, males exhibited behaviors not observed in the absence of competition, such as interrupting the rival male's courtship and mounting each other on the female. Our results suggest that the effect of female choice may be reduced in the presence of competition and that intersexual and intrasexual selection may interfere with each other in this species.

Talk Session 7 | Behavior

ARCHITECTURE AND HABITAT MEDIATE UNDERGROUND THERMAL STABILITY

Jackie Billotte, Ruth Hufbauer, Richard P. Reading

Colorado State University

Burrows are widespread refuges that can buffer organisms from environmental extremes. Understanding how burrows function under variable conditions requires quantifying associated microhabitats, burrow architecture, and the thermal environments they generate relative to surface conditions. We quantified the thermal environment, microhabitat characteristics, and burrow architecture of the Texas brown tarantula (*Aphonopelma hentzi*) in the shortgrass prairies of Colorado, a system characterized by extreme and highly variable temperatures. We recorded hourly temperatures for one year inside and immediately outside 31 burrows, assessed ground cover surrounding burrow entrances, and analyzed burrow structure using three-dimensional scans of plaster casts. Burrows strongly decoupled subsurface temperatures from surface conditions. During the warmest month, surface temperatures reached 80 °C, whereas burrow temperatures did not exceed 39 °C; during the coldest month, surface temperatures dropped to -25.5 °C, while the lowest burrow temperatures remained substantially warmer (-10.5 °C). Burrows also reduced the rate of temperature

change, with hourly fluctuations typically $<1^{\circ}\text{C}$ inside compared to $>10^{\circ}\text{C}$ outside. Microhabitat surveys showed that burrows were consistently associated with grass-dominated patches, regardless of the grazing regime. Burrows were structurally simple, consisting of a single entrance leading to a steep shaft and terminal chamber, with limited branching and moderate tortuosity. Our results demonstrate that tarantula burrows provide a stable thermal refuge across extreme seasonal conditions and document consistent patterns in associated microhabitats and burrow forms. These findings establish a foundation for future work examining the mechanistic links among habitat selection, burrow structure, and microclimate regulation.

Talk Session 4B | Ecology

JORŌ SPIDER AGGREGATE SILK DISPLAYS NON-NEWTONIAN MATERIAL PROPERTIES ACROSS VARIABLE TESTING SPEEDS

Salvatore P. DeAndrea, **Tyler A. Brown**, Ivy E. Pfeffer, Sarah D. Stellwagen

University of North Carolina at Charlotte

Orb-weaving spiders catch a wide variety of prey, the majority of which fly and collide with the web at different speeds. To best capture struggling prey, orb-weaver aggregate silk must be capable of withstanding high stress while simultaneously spreading quickly to sufficiently adhere to prey. Aggregate silk, which forms the glue-like prey capture droplets, is hypothesized to be a non-Newtonian material, with early research finding that glue adhesive force at failure increases non-linearly and exhibits lower extensibility when probed at faster speeds. However, the function of this biomaterial has rarely been evaluated at ecologically relevant speeds, limiting our understanding of its material properties during prey capture. To investigate the behavior of orb-weaver glue at ecologically-realistic speeds, we tested aggregate silk glue droplets at 0.07, 0.85, 8.5, and 85 mm/s using a custom-built biomaterials testing apparatus equipped with a force transducer. We did this for two spider species with contrasting prey preferences: *Argiope aurantia*, which typically catches large orthopterans, and *Trichonephila clavata*, an introduced species which often catches small dipterans. We found that the glue of both species demonstrated higher strength and lower extensibility as test speed increased, indicating non-Newtonian-like properties. The differences in adhesive performance suggest that this material has evolved an adaptive prey capture response to selective pressures such as dynamic prey interactions and material investment differences.

Talk Session 5B | Silks & Venoms

HABITAT SELECTION IN THE SOUTHERN DEVIL SCORPION *VAEJOVIS CAROLINIANUS* (SCORPIONES: VAEJOVIDAE)

Bob A. Baggett, **Christopher A. Brown**

Tennessee Tech University

The Southern Devil Scorpion *Vaejovis carolinianus* is one of only two scorpions native to the eastern United States. Relatively little is known about the ecology of this scorpion, and thus the objectives of this study were to (1) determine if *V. carolinianus* exhibits a preference in surface area size of cover objects used as retreat sites, and (2) determine if there is a preference in soil moisture content under the cover object. A total of 140 scorpions were captured from two different locations in the Upper Cumberland region of Tennessee during 2013–2014, a roadcut near Edgar Evins State Park and France Mountain in Overton County. In separate laboratory preference trials, scorpions were allowed to choose among three retreat sites (large, medium, and small ceramic tiles) and three soil moisture levels (0–15%, 16–30%, and 31–45%). In the field, transects were established at both locations in 2014 to count and measure rocks that may serve as potential retreat sites. The results of the surface area trials, supported by transect measurements from the field locations, indicated that female *V. carolinianus* prefer to use large-size objects as retreat sites. The results of the soil moisture trials varied, with no statistical significance in the results from the Edgar Evins and 2013 France Mountain populations. However, the 2014 France Mountain population did show a preference for wetter soils. Based on the test results, it appears that *V. carolinianus* select larger rocks as retreat sites, but that this choice may not be related to soil moisture levels.

Talk Session 2B | Behavior

UNRAVELING THE GENETIC BASIS FOR SILK PRODUCTION IN AMAUROBIUS FEROX

Sandra Correa-Garhwal, **Genesis Castillo**

Suffolk University

While the genome of the European Black Lace Weaver (*Amaurobius ferox*) was recently published, the molecular architecture of its silk remains largely uncharacterized. Here, we integrate genomics and transcriptomic data to define the spidroin gene family in this cribellate representative. Using a combination of BLAST-based homology searches and de novo gene prediction on the *A. ferox* reference genome, we identified 15 complete spidroin genes. Phylogenetics and repeat analyses classified the majority of these sequences into established spidroin categories, providing a genomic map of silk diversity in this lineage. To validate gene utility and expression patterns, we performed RNA-seq on silk gland tissues. Preliminary expression profiles confirm the active transcription of these 15 candidates and reveal differential expression across gland type. This research seeks to advance our understanding of the molecular basis of silk production, the evolutionary transition from cribellate to ecribellate silk systems, and the role of specific spidroin genes in determining the remarkable properties of spider silk.

Lightning Talks | Silks & Venoms

SPIDERS BYPASSING JETLAG: RAPID RE-ENTRAINMENT TO EXTREME PHASE-SHIFTED LIGHT-DARK CYCLES

Caroline N. Cavin*, Joseph Giulian, Raven Ragsdale, Thomas C. Jones, Darrell Moore

East Tennessee State University

Circadian clocks are essential mechanisms that allow organisms to coordinate activities at the optimal times within the 24-hour solar cycle. Circadian rhythms typically have a free-running period (FRPs) very close to 24 hours. However, an exceptional superfamily of spiders, the Araneoidea, break this norm because their FRPs naturally range from 18 to 28 hours. These extreme FRPs force araneoids to undergo large phase shifts daily to align themselves with the Earth's solar day. During such shifts, the circadian system undergoes a period of transition before achieving resynchronization with external time cues, such as light, which could take several days. We pose the question, is there a difference in the underlying phase shift response between araneoid (*Metazygia wittfeldae* and *Larinioides cornutus*) and non-araneoid (*Pholcus manueli* and *Tigrosa annexa*) spiders? Because of the non-resonance between araneoid endogenous periods and the 24-hour day, an adaptive solution would be a mechanism allowing re-entrainment to phase shifts faster than non-araneoid spiders whose FRPs are still very close to 24 hours. To evaluate this hypothesis, we conducted 6-hour phase advances and delays using multiple species of araneoid and non-araneoid spiders. We found that three out of four species were able to rapidly re-entrain to a 6-hour phase shift regardless of direction with only one day of transients.

Talk Session 7 | Behavior

ADVANCES IN UNDERSTANDING AMBLYPYGID BIODIVERSITY IN NORTH AMERICA

Nicolas Cazzaniga and Lorenzo Prendini

American Museum of Natural History; City University of New York

Due to their continuous growth, reclusive nature, and low vagility, the distributions and species limits of many whip spiders (*Amblypygi* Thorell, 1883) remain poorly understood and much cryptic diversity remains unrecognized. Many species complexes remain grouped under a single name or retain names assigned based on one source of evidence. Whereas knowledge of the systematics of the Neotropical amblypygid family Phrynidae Blanchard, 1852 continues to advance, the systematics of North American phrynids lags behind, due to outdated practices, poorly resolved characters, and limited sampling. Recent discoveries resulted in the addition of two new phrynid species, *Paraphrynus tokdod* Cazzaniga and Prendini, 2025 and *Phrynus abstrusus* Cazzaniga and Prendini, 2026, to the U.S. fauna. In the present contribution, we consider the implications for cryptic speciation in the family, identify a new record of troglomorphy for the group, and assess the potential for Anthropocene colonization in the southeast. Our results identify problematic character systems such as secondary spines and trichobothrial counts, raise questions regarding putative species boundaries, and propose potential novel characters for phrynid systematics.

Talk Session 5A | Systematics

SUBSTRATE USE PREDICTS POPULATION DIVERGENCE IN A SHARED VIBRATORY SIGNAL LANDSCAPE IN SCHIZOCOSA WOLF SPIDERS

Noori Choi, Rowan H. McGinley, James Starrett, Jason E Bond, Eileen A Hebets

University of Canterbury; Smithsonian Tropical Research Institute; University of California, Davis; University of Nebraska-Lincoln

Since vibratory courtship signals are transmitted through the substrate, signaling environments are expected to play a major role in the diversification of signal evolution of ground-dwelling spiders. However, this prediction has been difficult to test empirically because of the conceptual and practical challenges in the quantitative comparison of vibratory signals across multiple populations and species. We quantified population-level divergence in a shared vibratory signal landscape of 52 populations of 19 species of *Schizocosa* wolf spiders by embedding signal traits in a common morphospace generated using Gaussian Hidden Markov Model (GHMM), Dynamic Time Warping (DTW), and Energy Distance (ED). We then tested whether divergence in signal space use was associated with geographic distance, phylogenetic background, and substrate usage.

Geographic and phylogenetic distances were evaluated using distance-based models, and substrate effects were tested on ED-derived principal coordinate axes using permutation-based multivariate regression. Geographic distance explained little to no variation, and phylogenetic background showed only weak or inconsistent effects. By contrast, substrate usage predicted divergence in signal space use. This pattern was driven primarily by grass association, with leaf-litter association showing a weaker but still detectable effect. Models including both phylogeny and substrate explained the most total variation, but phylogeny did not show a clearly supported unique effect once substrate was included.

Our results suggest that substrate use is a stronger predictor of population divergence in vibratory signal space use than either phylogenetic or geographic distance alone, highlighting the importance of local signaling environments in the diversification of wolf spider courtship signals.

Talk Session 2B | Behavior

USING YOUTUBE TO BRING BIOLOGY BACK TO LIFE FOR UNDERGRADUATE STUDENTS

Tyler B. Corey

Southeast Community College

Perhaps the most engaging way to welcome students into biology is to allow the incredible organisms that we study, and how we study them, to speak for themselves. Yet what brings biology to life is too often diluted by an education system built on textbooks, which can only do so much to convey what inspires biologists and places an additional financial burden on students. I will present my undergraduate biology teaching framework, where I use YouTube as the central learning resource, to introduce students to and reconnect them with the life that fuels biology. YouTube channels like ZeFrank, Kurzgesagt, and TED-Ed are produced by expert science communicators, who synthesize primary sources and collaborate directly with scientists, to feature the organisms and research methods behind our scholarly literature. These channels embrace analogy, humor, and the genuine absurdity of biology, and regularly release current videos that keep pace with scholarly literature faster than textbooks. To guide students through these videos, I have developed learning scaffolds ("notes shells") that highlight key concepts, emphasize steps of the scientific process, and prompt reflection and discussion. I use completed shells as foundations for flipped-classroom activities, formative and summative assessments, and building study skills. Students build their own biology textbook from their completed shells, along with their ability to utilize the free, ever-current, open-access resource that is YouTube. I will share an arachnid-centric notes shell sample, student feedback on my pedagogy, and guidance for implementing these methods in undergraduate courses of any size, in-person or online.

Talk Session 4A | Education / Outreach

UNDERSTORY SPIDER COMMUNITY COMPOSITION ACROSS STAND TYPES AND LEVELS OF VEGETATION COMPLEXITY IN OREGON COAST RANGE DOUGLAS-FIR FOREST

Sean Counihan*, Margaret Hallerud, Christopher Marshall

Oregon State University

To assess the effect of stand type and understory vegetation structure on spider species composition, functional diversity, and relative abundance, we sampled 18 sites in the southeastern Elliott State Forest,

spanning two categories of forest stands and three levels of understory complexity. For all surveyed areas we collected fine-scale information on vegetation diversity and structure. We collected 4137 spiders from 17 families, belonging to 53 identifiable species. Spider community composition was analyzed in relation to stand-level characteristics and vegetation structure; we present the findings of those analyses as well as discussion of this study's contextual relevance to recent biodiversity surveying efforts in the Elliott State Forest.

Lightning Talks | Ecology

BIOLOGY AND NATURAL HISTORY OF CAMEL SPIDERS (ARACHNIDA, SOLIFUGAE)

Paula E. Cushing, David E. Vrech, Prashant Sharma

Denver Museum of Nature & Science; Universidad Nacional de Córdoba; University of Wisconsin, Madison

Camel spiders (arachnids in the order Solifugae) are major desert-dwelling predators of insects and other arthropods throughout the world and are, themselves, an important food resource for other desert-adapted predators. In other words, camel spiders are major components of desert communities. In recent years, research has advanced our understanding of this enigmatic group of arachnids. Recently the authors have acquired a book contract with Springer Nature to write a new textbook focused on this group of arachnids. *Biology and Natural History of Camel Spiders (Arachnida, Solifugae)* will present our current understanding of the anatomy, systematics, taxonomy, behavior, physiology, genetics, and natural history of these animals. In addition, this book includes an overview of the extraordinary mythology surrounding them. This text draws upon the expertise of over 20 researchers throughout the world including chapter authors from Argentina, Austria, China, the Czech Republic, Iran, Israel, South Africa, Turkey, and the US who are exploring various aspects of the biology of Solifugae. It is the hope of the editors and chapter authors that it will serve to both inform and inspire all those interested in desert ecosystems and the animals that call these habitats home. Expected publication with Springer Nature is early 2028.

Talk Session 4A | Education / Outreach

NEBRASKA AGROECOSYSTEM SPIDER COMMUNITIES AND THEIR TROPHIC INTERACTIONS WITH KEY PESTS OF CORN

Samantha R. Daniel, Dr. Eileen A. Hebets, Dr. Julie A. Peterson, Dr. Robert J. Wright

University of Nebraska-Lincoln

As generalist predators, spiders can fulfill a wide variety of ecological niches allowing them to intercept and prey upon an array of insect species. This characteristic could be particularly advantageous within agricultural ecosystems. This study sought to reveal the composition and abundance of spider communities within corn fields in western Nebraska and determine the potential for spider predation upon two key pests of corn: western corn rootworm (*Diabrotica virgifera virgifera*) and western bean cutworm (*Striacosta albicosta*). Spiders were collected from eight corn fields from May to August 2017 and four corn fields from May to August 2018. A total of 1,011 spider specimens composed of 15 families, 34 genera, and 53 species were collected from the 12 field sites for both years combined. Of the total specimen count, 300 (30%) were immatures. Two families, Lycosidae and Linyphiidae, made up 60% ($n = 605$) and 24% ($n = 244$) of all specimens collected, respectively. Field-collected Thomisidae and Lycosidae were screened for target prey DNA: none of the screened thomisids tested positive for *S. albicosta* DNA while only two lycosids tested positive for *D. v. virgifera* DNA. While these results indicate very low predation of these pests by the selected spider families in the field, a variety of factors including short DNA detectability windows, spider feeding habits, and prey availability at the time of spider capture may help to explain these results and illustrate a need for additional studies.

Talk Session 4B | Ecology

THE ARACHNID COLLECTION AND RESEARCH AT THE SAN DIEGO NATURAL HISTORY MUSEUM

Shahan Derkarabetian

San Diego Natural History Museum

The San Diego Natural History Museum (SDNHM) represents the most comprehensive collection for its mission region, southern California and the Baja California peninsula. Not widely-known as a collections-based resource for arachnological research, recent curation work and research is aiming to change this. In this

presentation I will detail the recent and significant progress in volunteer-driven digitization of the arachnology collection at SDNHM, provide taxonomic and geographic details of specimens held in the collections, and discuss recent and ongoing fieldwork efforts. This presentation and recent effort is aimed at increasing the reach and increasing the use of SDNHM collections among the broader arachnological community.

Talk Session 4A | Other

ILLUMINATING THE CIRCADIAN REGULATION OF BIOMATERIAL PROPERTIES

Hannah Faye*, Sarah Stellwagen

The University of North Carolina at Charlotte

Chronobiology is the study of persistent, cyclical biological rhythms that help optimize an ecologically relevant schedule between the timing of abiotic factors (light, temperature, etc.) and biological processes (i.e., foraging, prey capture, predator avoidance, etc.). The most well-studied portion of chronobiology is circadian rhythms, which drive key changes in behaviors and phenotypes through direct gene regulation through a self-influencing feedback loop. Previous research shows that artificial light at night (ALAN) can disrupt the natural timing of circadian rhythms, causing circadian stress. Sessile organisms, such as spiders, are more likely to experience circadian stress due to the inability to escape ALAN's effects, and in such cases, phenotypic plasticity may be their only way to respond. Spiders have shown phenotypic plasticity by altering their silk (a biomaterial) in response to different types of stress. Few studies have examined the direct connection between invertebrate biomaterial properties and circadian rhythms. Additionally, there is a lack of research examining the effects of ALAN on external biomaterials, such as those used for prey capture or domiciles. We investigate these relationships by using ALAN-induced circadian stress and measuring aspects of prey capture webs, silks, and glues, such as the number of prey capture and structural lines, applied force the biomaterial can withstand before failure, extensibility, and other aspects.

Talk Session 1 | Ecology

PROGRESS TOWARDS ARACHNOBASE: AN ARACHNID GENOMICS RESOURCE

Saoirse Foley

Marian University

The past few years have seen a surge in studies focused on arachnid genomics, generating an increasing volume of genomic and functional data across Arachnida. Despite this growth, the arachnid research community currently lacks a centralized, dedicated platform for integrating, organizing, and accessing these resources. Therefore, Arachnobase is being developed to support the research needs of the community. Arachnobase will be an online genomics resource designed to support comparative, functional, and genomic research across different species. This presentation will introduce the vision and development framework for Arachnobase, provide an update on the status of the project and progress to date. This will include the scope of the resource (i.e. which species will be integrated, and with what metadata), how the cross-linking of species data will be achieved, planned software integrations on-site, database architecture options, and data stewardship practices.

Talk Session 4A | Education / Outreach

EFFECT OF SPIDER WEB INCLINATION ON PREY INTERCEPTION AND DEBRIS ACCUMULATION IN FOREST UNDERSTORY

S.A. Fortner*, A.Y. Stark, S.P. Yanoviak

University of Louisville; Villanova University; University of Louisville & Smithsonian Tropical Research Institute

Trade-offs in web structure and function (e.g., prey capture rates vs. construction and maintenance costs) likely contribute to variation in web characteristics among orb-weaving spiders. *Leucauge venusta* (Walckenaer) exhibits high intraspecific variation in the angle of web inclination relative to the ground. We investigated the effect of web inclination on prey interception and debris accumulation in artificial *L. venusta* webs in forest understory in Kentucky, USA. In May, July, and September 2024 we placed circular, clear plastic sticky traps at three inclinations (vertical, 45 degrees, or horizontal) along three 100m transects. We recorded abundance, identity, and body length of captured prey, and the amount of debris accumulated. Most captured

prey (94%) were small insects (<5mm body length) and most (66%) were true flies, mainly fungus gnats (Diptera: Mycetophilidae). The average body length of prey was higher on horizontal and 45° traps than on vertical traps. Mean prey abundance was higher on vertical traps than on horizontal or 45° traps and horizontal and 45° traps accumulated more debris than vertical traps. The results suggest that web inclination affects the amount and size of prey captured and the likelihood of web damage or spoilage from falling debris in forest understory. Collectively, these results suggest that the horizontally tilted orb webs of *L. venusta* reflect an evolutionary balance between prey abundance, prey size, and damage risk.

Talk Session 1 | Ecology

GENOMIC SIGNATURES OF THE DESERT FERRARI: COMPARATIVE GENOMICS REVEALS A STREAMLINED SOLIFUGE REPERTOIRE

Erika L. García, Siddharth S. Kulkarni, Matthew R. Graham, Carlos E. Santibañez-López, Prashant P. Sharma

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The evolutionary transition to terrestrial life required overcoming several physiological hurdles; however, such challenges were amplified in desert environments. While several xeric-adapted arachnids utilize permanent burrows or “sit-and-wait” foraging strategies as possible energy conservation adaptations in harsh habitats, camel spiders exhibit a counterintuitive, high-energy lifestyle. Using a comparative genomics framework, we investigated the molecular underpinnings distinguishing Solifugae within Chelicerata. We identified lineage-specific expanded orthogroups and evaluated selective pressures acting upon paralogous sequences within our ingroup solifuge species. Additionally, we also focused on fatty acid-associated proteins and heat shock proteins to elucidate how Solifugae may have evolved such anomalous behaviors compared to their arachnid relatives. Our analyses revealed significant signatures of positive selection within key gene families across the solifuge lineage. Notably, paralogs within the cytochrome P450 and biotinidase families showed consistent evidence of selection across all three taxa, suggesting specialized metabolic or detoxification requirements. Furthermore, we identified candidate loci implicated in axonal guidance and lipid metabolism, and a specialized fatty acid enzyme repertoire. While subsequent research is required to determine whether some of the genomic signatures unveiled here are shared across a broader phylogenetic distribution within Solifugae, we established a critical baseline for future functional validation.

Talk Session 2A | Evolution, Genetics & Genomics

EXPERIENCE MATTERS! HOW LIGHT HISTORY REORGANIZES THE SPIDER CIRCADIAN CLOCK

Joseph Giulian, Caroline Cavin, Raven Ragsdale, Natalia Toporikova, Jessica Petko, Nadia Ayoub, Thomas C. Jones, Darrell Moore

East Tennessee State University; East Tennessee State University; East Tennessee State University; Washington and Lee University; Penn State York; Washington and Lee University; East Tennessee State University; East Tennessee State University;

It is no secret that some spiders are found in their natural habitats partitioning foraging and other behaviors to specific times of day. Yet, how these timed behaviors arise in relation to environmental cues remains unclear. Specifically, it is often unknown whether locomotor activity occurs as a direct response to environmental cues, such as light and temperature, whether its timing is regulated by an internal molecular circadian rhythm's response to these stimuli, or whether it reflects some combination of both processes. Utilizing chronobiological methods and perspectives, we evaluate the extent to which locomotor activity is controlled by endogenous circadian rhythms in the nocturnal cellar spider *Pholcus manueli* and the nocturnal orb weaver *Larinioides cornutus*. *Pholcus manueli* shows the capacity to rapidly reset activity-onset patterns in response to discrete 6-hour advances and delays in the timing of light cycles. Its circadian responses also reveal bizarre diversity in periodic outputs, including an aftereffect that stabilizes onset patterns in a manner that can give the appearance of an unshiftable rhythm. *Larinioides cornutus* displays a separate and unique circadian aftereffect, in which many individuals initially express a short-period rhythm that gradually lengthens before reversing into a long-period condition. Together, these experiments illuminate how the duration and timing of prior light histories shape subsequent circadian outputs in spiders.

Early Career Symposium | Behavior

SYSTEMATICS AND BIOGEOGRAPHY OF THE ALIATYPUS EREBUS GROUP

Tobias Hays*, Rodrigo Monjaraz-Ruedas, Marshal Hedin

San Diego State University; Natural History Museum of Los Angeles County; San Diego Natural History Museum

The California Floristic Province (CAFP) is a global center of endemism shaped by a dynamic tectonic history that has structured the distribution and diversification of low-dispersal taxa. Since the Miocene, major geological processes including the uplift of the Sierra Nevada, initiation of the San Andreas Fault, rotation of the Transverse Ranges, and northward translation of the Salinian Block have fragmented habitats and reorganized landscapes across California. These events produced steep environmental gradients, reconfigured drainage systems, and generated persistent barriers to dispersal, including marine incursions and the development of the Central Valley.

This complex history of landscape fragmentation has been especially influential for dispersal-limited organisms like mygalomorph spiders. In the genus *Aliatypus*, a group of sedentary, burrow-dwelling spiders largely endemic to California, phylogenomic evidence reveals extensive cryptic diversity structured by historical barriers. East-west genetic breaks correspond closely with major geological features, particularly the across the Central Valley and fault-bounded Salinian Terrane, highlighting the role of tectonics in isolating populations and promoting allopatric divergence. Uplift and fault activity, coupled with marine inundation of coastal basins, likely created a shifting mosaic of habitats that repeatedly subdivided ancestral populations over the past 25 million years.

This study integrates phylogenomics and biogeographic modeling to test species boundaries and reconstruct lineage histories within the *Aliatypus erebus* group. By explicitly linking diversification patterns to tectonic events, we demonstrate that the present day distribution and phylogenomic relationships of these spiders are direct consequences of California's unique geography.

Talk Session 6 | Evolution, Genetics & Genomics

SEASONAL VARIATION IN WHOLE-BODY AND EXCRETA ELEMENTAL COMPOSITION OF A RIPARIAN ORB-WEAVING SPIDER (*LARINIOIDES CORNUTUS*)

Colton Hezog*, Shawn M. Wilder

Oklahoma State University

Predators influence nutrient cycling by assimilating elements from their prey and returning nutrients to ecosystems via excretion and discarded prey remains. However, seasonal variation in predator whole-body elemental composition and nutrient excretion remains poorly understood, especially for spiders. We examined temporal variation in whole-body elemental composition and nutrient excretion in a riparian orb-weaving spider (*Larinioides cornutus*) across the growing season of 2024. Adult females were collected across seven sampling periods spanning mid-June to early October, and whole-body concentrations of macronutrients and multiple trace elements were quantified. Excreta was collected from all spiders during each trial, pooled within sampling periods when necessary, and analyzed for C and N concentrations. Seasonal trends were evaluated using generalized linear models with Julian day as a predictor, and linear and quadratic models were compared using Akaike's Information Criterion.

Whole-body N and P concentrations, and several trace elements (K, Li, Mn, Na, Ni, S, Si, and Sr) exhibited significant seasonal variation, with several elements differing in both the direction and shape of temporal trends. In contrast, there were not any significant seasonal patterns in excreta C and N concentrations. Model selection favored linear relationships for most elements, although quadratic models were supported for some responses (i.e., K and Na), indicating non-monotonic seasonal changes. These results suggest that seasonal shifts in prey composition and/or spider physiology influence elemental assimilation, while elemental excretion of macronutrients remained comparatively stable. Our findings highlight the importance of incorporating trace elements and seasonal context when evaluating predator-mediated nutrient cycling in terrestrial ecosystems.

Talk Session 1 | Ecology

DIVERSITY, DISTRIBUTION, AND EVOLUTIONARY ADAPTATIONS OF LINYPHIIDAE SPIDERS: GLOBAL PATTERNS AND RECENT ADVANCES FROM CHINA

Muhammad Irfan

Southwest University

Linyphiidae, commonly known as sheet-web spiders, represent the second most speciose spider family worldwide, with a nearly cosmopolitan distribution across all major biogeographic regions. They occupy diverse habitats ranging from tropical forests and agricultural landscapes to alpine and polar ecosystems. Their evolutionary success stems from remarkable adaptations, including extremely small body size (often < 5 mm), highly complex genital morphology, specialized reproductive behaviors, and exceptional tolerance to harsh conditions. The family is distinguished by intricate and diverse genital structures critical for species identification and phylogenetic studies. Many taxa, particularly in Erigoninae, exhibit specialized cephalic modifications such as pits and projections. Males often produce copulatory gifts in the form of glandular secretions from these cephalic pits during courtship (an unusual reproductive strategy in spiders). Linyphiids dominate many cold, high-altitude environments, displaying physiological and behavioral adaptations that enable them to function at sub-zero temperatures, including web construction on snow surfaces. China is a major center of linyphiid diversity, driven by its complex geology, varied climates, and heterogeneous landscapes. Taxonomic studies over the last seven years in southern China have dramatically increased knowledge of the family through the description of numerous new species and new records, revealing high endemism. Despite these advances, large areas remain undersampled, and the true diversity is likely underestimated. Key gaps include insufficient molecular phylogenetic data, unclear biogeographic patterns, and limited ecological studies. Future research should integrate morphological, molecular, and ecological approaches to delimit species, understand evolutionary relationships, and elucidate the mechanisms behind their diversity and adaptations to extreme environments.

Plenary | Systematics

UNTANGLING SPECIES LIMITS IN MYGALOMORPH SPIDERS: INTEGRATING GENOMICS, MORPHOLOGY, AND ECOLOGY ACROSS CALIFORNIA

Emma E. Jochim, James Starrett, Stephen Richards, Jason E. Bond

University of California, Davis; Utah Valley University

An integrative approach to species delimitation incorporates evidence from multiple sources, e.g., genetic, morphological, ecological, behavioral, etc., and is becoming the standard in delimitation efforts. Coupled with genomic and sub-genomic datasets, integrative approaches have facilitated the discovery of cryptic diversity across many mygalomorph taxa. If we can confidently assign species boundaries, mygalomorphs may provide a unique opportunity to investigate questions of speciation pattern and process as highly structured taxa often reflect geological scale climatic and landscape changes. The *Aptostichus atomarius* species complex comprises both inland and coastal dune inhabiting trapdoor spiders and is a prime group for employing landscape-scale genomic methods. Using whole-genome resequencing and environmental association analyses, we identify genes under selection associated with habitat-specific environmental pressures and examine patterns of adaptive divergence across these contrasting habitats.

Early Career Symposium | Systematics

RECTIFYING THE PARAPHYLY OF EREMOBATES: UCE PHYLOGENOMICS ELUCIDATES PATTERNS OF TAXONOMIC-MORPHOLOGICAL MISMATCH IN THE LARGEST GENUS OF EREMOBATID SOLIFUGES

R. Ryan Jones, Jair Castillo-Rojas, Paula E. Cushing

Denver Museum of Nature & Science; Centro de Investigación Científica y de Educación Superior de Ensenada; Denver Museum of Nature & Science

Eremobates, the most speciose genus of eremobatid solifuges at 83 species, has long been used as a repository for species with ambiguous phylogenetic signal. Currently, *Eremobates* is structured into six species groups, though all but two species groups (both monotypic) have been recovered as para- or polyphyletic using UCE data. In this project, we identify stable & robust clades that constitute putative new genera, identify a multitude of putative new species, propose a number of synonymies, and evaluate morphological character systems for taxonomic utility. In addition, we re-describe multiple species that have not been documented since their initial detail-poor descriptions in the 1800s and early 1900s. Lastly, we discuss biogeographical and

ecological patterns within the group, and the potential for investigating vicariant and sympatric speciation, introgression, and adaptation.

Talk Session 5A | Systematics

BENEATH THE SURFACE: A NEW NORTHERN SPECIES OF TROGLORAPTOR (ARANEAE: TROGLORAPTORIDAE), GENETIC DIVERSITY AND NATURAL HISTORY

Madeline M. Jones*, Finn Watson, Marshal Hedin, and Greta J. Binford*

Lewis & Clark College; Lewis & Clark College; San Diego State University; Lewis & Clark College

We present a morphological description of a recently discovered species of spider in the family Trogloraptoridae, from the Columbia River Gorge in northwestern Oregon. The family was previously monotypic (*Trogloraptor marchingtoni*) and only known from populations near the southwestern Oregon - northern California border. *Trogloraptor tulishpun* sp. nov. retains the key family synapomorphy, distinctive subsegmented raptorial tarsi, and an oblique membranous division of the basal segment of the anterior lateral spinnerets. *Trogloraptor tulishpun* is distinguished from *T. marchingtoni* by its color pattern, clypael height, vulvar and palp structure. We have found *T. tulishpun* in four localities in the Columbia River Gorge, which show little mitochondrial sequence divergence from one another, but are highly genetically distinct from *T. marchingtoni*. *Trogloraptor tulishpun* is found in basalt features, including lava tubes and shallow talus caves, and has been observed to eat arachnids and moths, making them top predators in these environments.

Talk Session 3 | Systematics

CONTRASTING MECHANISMS OF BURROW DISTRIBUTION IN COASTAL DUNE TRAPDOOR SPIDERS: VEGETATION ASSOCIATION AND SPATIAL AGGREGATION

Fran Keller, Kylie Dickinson, Emma Jochim, Iris Quayle, Julianna Campos, Hanna Briggs, Colton Wiggins, and Jason Bond

University of California, Davis

Coastal dune ecosystems support endemic trapdoor spiders, yet population data for these species are limited. We conducted the first coastal dune trapdoor spider population estimation surveys at Moss Landing State Beach (California) and for *Aptostichus stephencolberti* Bond and Stockman 2008 at Sunset State Beach using randomly selected 1m² quadrats across ~26,000 m² per site. Burrow densities were similar between sites (Sunset: 0.287 burrows/m²; Moss: 0.453 burrows/m²), yielding estimated population sizes of ~35,206 and ~30,959 individuals, respectively. However, spatial analyses revealed contrasting mechanisms of burrow distribution. At Sunset State Beach, burrow presence was strongly associated with vegetation and occurred closer to plants, despite vegetation being randomly distributed. In contrast, no vegetation-burrow association was detected at Moss Landing, although both burrows and vegetation were spatially clustered. These results indicate habitat-associated burrow placement at Sunset State Beach but vegetation-independent clustering at Moss Landing State Beach, suggesting that conservation strategies should be site-specific and consider multiple ecological processes.

Talk Session 4B | Ecology

A COMPARISON OF THE FLEXURAL AND TENSILE STRENGTH OF SPIDER PREY CAPTURE SILKS

Ella Kellner*, Sarah Stellwagen

The University of North Carolina at Charlotte

Spider webs are made from several types of silk, some of which are among the strongest biomaterials known. A strand of silk may withstand forces in many directions in order to capture prey. For example, cobweb weavers use gumfoot lines as spring-loaded traps to capture ambulatory prey, conversely, orb weavers use capture spiral silk to intercept and retain flying prey. The tensile strength, or the parallel forces generated when a silk strand is pulled from both ends, has been tested and is well-characterized for these silks. However, flexural strength, or the force that results when a silk is pushed or deformed perpendicularly, has not been investigated. As silks in nature are warped and distorted from many directions depending on their use, it is important to understand the contrasting functional characteristics under alternative stresses. We have begun testing the

flexural strength of spider prey-capture silk at two speeds to investigate how variable speeds can impact energy absorption. Comparing prey capture strategies, which are adapted to the habitats in which spiders reside, can provide key insights into how differences in spider silk biomechanics evolve.

Talk Session 3 | Silks & Venoms

INTO THE THIRD DIMENSION: QUANTIFYING VARIATION OF THE UNIQUE WEBS OF CALYMMARIA (ARANEAE: CYBAEIDAE)

Alexandra J. Kerschner*, Ben A. Olsen, Alana M. Rader, Tracy T. Burkhard

Lewis & Clark College

Spider webs are crucial to the predatory success, and therefore survival, of spiders. However, webs are energetically expensive to make, and therefore under strong selection to minimize damage from prey capture and the environment. The overwhelming majority of web research has been completed on the two-dimensional orb web, while mostly ignoring the three-dimensional webs spun by many other spiders. Calymmaria are a genus of small, brown spiders in the family Cybaeidae, who spin conical webs, unlike any other spider. The goals of this study were to quantify genus-wide phenotypic variation of Calymmaria webs, and to assess web variation between diverse locations and environments. We explored features of web shape and size alongside the influence of four different environmental variables (precipitation, UV exposure, wind speed, elevation) across twelve populations. Analysis of web morphology indicated that within the genus, web size varied based on location and environment, while web shape variation occurred throughout all populations, but was not impacted substantially by location or environment. Our results revealed wind speed as the only significant environmental contributor to variation in web size, with smaller webs tending to occur in areas with higher wind speeds. This suggests that within Calymmaria communities, web size may be an important trait that could potentially lead to population-level phenotypic divergence.

Talk Session 1 | Ecology

PAX6 HOMOLOGS ARE REQUIRED FOR PATTERNING BOTH VISUAL SYSTEMS OF THE DADDY-LONGLEGS PHALANGIUM OPILIO

Ethan Laumer, Sophie Neu, **Benjamin Klementz**, Pranil Panda, Emily Setton, Prashant Sharma

University of Wisconsin-Madison; University of Wisconsin-Madison; University of Wisconsin-Madison; University of Wisconsin-Madison, University of Florida; University of Wisconsin-Madison

The evolution of visual systems has compelled numerous investigations of developmental processes underlying eye patterning across Bilateria. It is well-established that Pax6 homologs play a conserved role in eye fate specification at the top of the retinal determination gene network (RDGN). In Arthropoda, the two Pax6 homologs are required for development of both median and lateral eyes. Curiously, Pax6 homologs do not appear to maintain this function in well-studied chelicerates. It was proposed that Pax2 may have subsumed the role of eye fate specification, a hypothesis predicated upon the observation that one spider Pax2 copy is expressed in the lateral eyes during embryogenesis. However, no functional data are available for any Pax homologs across Chelicerata. Here, we interrogated the expression and function of Pax2 and Pax6 homologs in the daddy-longlegs Phalangium opilio. We show that Pax6A and Pax6B are expressed early in the developing head lobes of P. opilio, whereas Pax2 is not expressed until after downstream RDGN members are activated. Silencing of Pax6A, Pax6B, and Pax2 individually had no effect on eye development. Double knockdown of Pax6 homologs resulted in an array of median eye defects, spanning losses of cells to total eye loss. Gene expression assays showed that depletion of the two Pax6 copies resulted in absence of the vestigial median and vestigial lateral eyes. These data are consistent with a conserved role for Pax6 homologs in patterning both visual systems, while comprising the first functional data for Pax6 genes in any chelicerate.

Talk Session 2A | Evolution, Genetics & Genomics

POST-MORTEM PALPAL BULB SPERM RECOVERY AND SHORT-TERM IN VITRO STORAGE IN TARANTULAS

Leon Krause, Kate Archibald, Monica Stoops, Taylee Pratt, Sarah Jenkins, Eileen Hebets

Omaha's Henry Doorly Zoo & Aquarium; University of Nebraska, Lincoln

Assisted reproductive technologies (ARTs) in the zoological field typically focus on megavertebrate species. While entomological and apicultural researchers have developed innovative techniques for sperm collection, preservation, and instrumental insemination in insects of key economic importance, similar techniques are lacking for arachnids such as tarantulas, which are mainstay exhibit animals across zoological institutions. By improving the scope of available ARTs for tarantulas, zoo conservationists can better perform targeted, science-forward breeding management.

A host of techniques for post-mortem sperm collection and storage were trialed in eleven tarantula males from six species, coincident with natural post-maturity senescence. Whole packaged coenospermia were successfully collected from palpal bulbs up to ten days post-mortem. Electrostimulation of pedipalps produced slight muscle activation but no emission in post-mortem specimens. Manual extrusion of sperm by squeezing the palpal bulbs had variable success depending on species bulb morphology, but one successful extrusion resulted in over 60,000 total coenospermia recovered. Dissection and ultrasonication or grinding of the palpal bulbs in solution was the most reliable method of post-mortem sperm collection, with a mean of over 150,000 total coenospermia collected per palpal bulb in quality specimens. Higher recovery success was attributable to specimen quality, particularly the level of desiccation. Multiple sperm suspension media were deemed osmotically appropriate for sperm. Grace's Insect Medium provided in vitro support for encapsulated *Phormictopus atrichomatus* sperm, with 27.0% of coenospermia still containing greater than 50% living sperm when assessed at day seven of room temperature storage, representing only a 14.7% loss of initial viability.

Lightning Talks | Other

THERMAL HYSTERESIS IN MARYLAND-CAUGHT WOLF SPIDERS

Margot LaBorie*, Maya Kirchner, Jenna Pruett

St. Mary's College of Maryland

Many animals have adapted to survive below-freezing temperatures using antifreeze proteins (AFPs) or ice binding proteins (IBPs). These proteins work to keep the circulatory medium (hemolymph or blood) from freezing by lowering the freezing point without altering the melting point (Thermal Hysteresis, or TH). Animals known as "freeze avoidant" use AFPs to prevent freezing, while "freeze tolerant" animals can survive some external freezing with IBPs inhibiting the growth of ice crystals internally. Wolf spiders (Lycosidae) across the world have been found to use either AFPs or IBPs. Some species have been found to use both. It is unknown whether wolf spiders in Maryland create either of these proteins, how effective they may be, or any effects they may have on the spider's overall health and longevity. To test for the presence of anti-freezing components, thirty wolf spiders were caught and exposed to decreasing temperatures until 0° celsius in order to promote the production of antifreeze components. All spiders (both in the treatment group and control group, which did not experience 0° C) displayed presence of IBPs, but TH range varied among individuals. Individuals exposed to the cold thermal regime and individuals who ate consistently tended to have a higher TH range. Results from this study suggest that IBP production is a plastic response to prior thermal exposure and nutritional state.

Talk Session 6 | Morphology, Physiology & Development

PHYLOGENOMICS OF PLEXIPPINE JUMPING SPIDERS (SALTICINAE, PLEXIPPINI, PLEXIPPINA)

Kiran Marathe*; Wayne P. Maddison

University of British Columbia

The subtribe Plexippina, which includes familiar genera such as Plexippus, Hyllus, and Evarcha, is taxonomically challenging. High species diversity, conservative body form, and relatively simple genitalia complicate taxonomic work. Using ultraconserved element (UCE) data, we resolve relationships across the subtribe and clarify chaotic generic limits. We recover eight major clades. Most named genera require substantial taxonomic adjustment to restore monophyly. Several widely-recognised Asian genera such as Hyllus, Pancorius, Plexippoides, Thyene are non-monophyletic and will need to be re-delimited. Given the controversy over fragmenting Evarcha into multiple genera (rejected by WSC but followed by Metzner), we focus on that clade;

our data shed light on its internal structure and generic boundaries. This improved phylogenetic resolution enables recognition of morphological synapomorphies and supports forthcoming morphological revisions. We confirm the monophyly of Plexippini and of its two subtribes, Harmochirina and Plexippina, with one key modification: the ant-like Eburneana, previously interpreted as harmochirine, is resolved as sister to both subtribes, consistent with harmochirine-like epigynal pockets being a synapomorphy of the tribe. African Dasycyptus and Asian Vailimia together form the sister to the remaining plexippines, within which South Asian Ghatippus is the subsequent sister to the rest. Overall, lineages with especially distinctive body forms tend to be monophyletic, whereas those with more generalized body forms are frequently non-monophyletic.

Talk Session 3 | Systematics

FACTORS INFLUENCING SEX-BASED MOVEMENT PATTERNS IN THE BANDED GARDEN SPIDER, ARGIOPE TRIFASCIATA (FORSKAL, 1775)

Brandon Marrone, Brandi Pessman, J Colton Watts, Eileen A Hebets

University of Nebraska - Lincoln

Movement is a fundamental ecological process shaping how individuals acquire mates, secure resources, and navigate heterogeneous landscapes. In species with extreme sexual size dimorphism, such as the orb weaving spider *Argiope trifasciata*, males and females are predicted to experience different movement pressures driven by reproductive roles. We examined how individual traits and environmental conditions jointly influence movement across sexes. Across two field seasons, we used intensive mark-recapture methods to quantify natural movements of individuals within mapped prairie plots. We tested long standing predictions of the gravity hypothesis, which posits that smaller males benefit from enhanced mobility to reduce the costs of mate search. Despite strong theoretical support, within species variation in male size did not predict movement frequency, number of webs visited, or distance traveled. Local competitive environments, measured as Web Sex Proportion, similarly failed to explain male movement. These findings suggest that male mobility in *A. trifasciata* is not shaped by size based energetic constraints or perceived competition, challenging assumptions of the gravity hypothesis. We also addressed female movement, historically assumed to be rare in mature individuals due to strong web site fidelity. Contrary to this understanding, females frequently relocated, often taking over webs previously occupied by conspecifics. Female movement is highly responsive to fine-scale abiotic conditions. Females abandoned their webs for another nearby web on dry days, they disappeared from the study site entirely on high wind days, and reestablished on a different web on hotter days associated with higher prey capture and reduced web integrity.

Talk Session 4B | Ecology

EFFECTS OF LIGHT AND NOISE ON COURTSHIP AND MATING IN THE WOLF SPIDER ALLOCOSA PANAMENA

Macarena Gonzalez, Ryan Snyder, **Rowan McGinley**

Smithsonian Tropical Research Institute, Instituto de Investigaciones Biológicas Clemente Estable; Smithsonian Tropical Research Institute, Butler University; Smithsonian Tropical Research Institute

Communication is often critical for survival and reproduction as it can facilitate essential activities, such as coordinating social behaviours, deceiving prey, and deterring predators. However, animals inhabit environments that can change across space and time, potentially altering the transmission and detectability of communication signals. Some animals may have evolved signals that allow them to communicate across various environmental conditions, while others may have become specialized for communicating efficiently within a narrow range of conditions. Wolf spiders (Lycosidae) often use a combination of substrate-borne vibrations, visual signals and/or chemical signals to communicate during courtship. Different species can inhabit different microhabitats and may be active at different times of day, making them interesting subjects for studies of how the environment affects signal evolution. *Allocosa panamena* is a small soil-dwelling wolf spider that inhabits the rainforests of Panama. Field and laboratory observations suggest that *A. panamena* is diurnally active. To examine the effects of light intensity and noise on the communication of *A. panamena*, we ran mating trials under different light intensities (bright, dim or no light) or in the presence or absence of loud noise. We found that neither light intensity nor noise affected mating success, suggesting that this species is well equipped for communication across a broad range of conditions.

Talk Session 2B | Behavior

CORNICUDIABOLA: THE HORNED DEVIL SPIDERS FROM SUBTERRANEAN HABITATS IN EASTERN USA

Marc A. Milne, Curt W. Harden, Rodrigo Monjaraz-Ruedas

University of Indianapolis; West Virginia Department of Agriculture; Natural History Museum of Los Angeles County

A new genus, *Cornicudiabola* Milne gen. nov. (Araneae, Linyphiidae: Erigoninae), supported with phylogenomic analyses using ultraconserved elements, is erected to hold three species, one of which was described from a female in 1886 as *Erigone infernalis* Keyserling and again from a female in 1898 as *E. albescens* Banks. Herein we re-describe the female, describe the male, and designate *E. albescens* as a junior synonym of *E. infernalis* syn. nov., and transfer this species to the new genus as *Cornicudiabola infernalis* Keyserling comb. nov. The other two species are new to science: *C. draneyi* Milne sp. nov. and *C. hardeni* Milne sp. nov. All three species are from caves, shallow subterranean habitats, and/or deep decaying leaf litter in the eastern United States. Many of the specimens within this genus were collected from deep soils using subterranean pitfall traps (pipe traps), a lesser-known collection technique, especially outside of Europe.

Talk Session 5A | Systematics

WHAT A LONG STRANGE TRIP IT'S BEEN: BIOGEOGRAPHY OF DISPERSAL-LIMITED MEGAHEXURA SPIDERS (MYGALOMORPHAE: MEGAHEXURIDAE)

Rodrigo Monjaraz-Ruedas, Marshal Hedin

Natural History Museum Los Angeles County, San Diego State University

Here we explore a unique biogeographic situation where instead of animal populations dispersing over the landscape, observations are best explained by the landscape itself moving, carrying animal populations. In western central California the landscapes west of the San Andreas fault, over the Pacific Plate, include the geologic backbone of the Santa Lucia, Sierra de Salinas, Gabilan and Santa Cruz mountains. In the early Miocene Salinia was adjacent to the southern Sierra Nevada and northwestern Mojave, in a region we call the "San Emigdio–Tehachapi nexus (SETN)". Salinia was subsequently captured by the Pacific Plate, with right-lateral slip migration displacing these terranes northwestwards over 300 km, most rapidly since the formation of the San Andreas fault approximately 10 Ma. We hypothesize that a migrating Salinia has played a fundamental role in the biogeographic history of dispersal limited Megahexura mygalomorph spiders, and use phylogenomic and population genomic data to test multiple predictions of a Salinia hypothesis. Phylogenomics strongly supports three primary lineages in Megahexura, with a common ancestor that diverged approximately 10 Ma. The SETN region is reconstructed as origin center for Megahexura, and one lineage resides mostly on ranges with Salinian basement rocks. In the Santa Lucia Range, phylogenetic directionality proceeds from north to south. SETN is also the center of origin for Megahexura populations currently occupying the Transverse Ranges, some of which have expanded northwestwards. Overall, these results are consistent with a compelling Salinian biogeography and represent a possible example of Neogene speciation driven principally by plate tectonics.

Talk Session 2A | Evolution, Genetics & Genomics

BEHAVIOR, BIOMECHANICS, AND NEUROPHYSIOLOGY: THE INFLUENCE OF SHIFTING ENVIRONMENTS ON HAWAIIAN TETRAGNATHA

Kathryn Nagel

University of California, Berkeley

A central challenge in evolutionary biology is understanding how organisms diversify in response to the complex, and often conflicting, pressures of competition and environmental change. Isolating the drivers behind specific adaptations is complicated by evolutionary histories and development and morphological constraints. We can alleviate these challenges by studying localized adaptive radiations. Using Hawaiian long-jawed orb weavers (genus *Tetragnatha*), I examined how a single behavioral shift from web-building to a cursorial predation style results in a suite of interconnected physiological, morphological, and behavioral adaptations. Closed-system respirometry revealed that cursorial species exhibit significantly higher resting metabolic rates than their web-building counterparts, reflecting the heightened baseline demands of a free-ranging lifestyle. Scanning and transmission electron microscopy of leg sensilla demonstrated that the elongated leg spines characteristic of cursorial species function as mechanosensory structures and physical aids during prey capture. Kinematic and energetic analyses provided clear evidence for the intermittent use of pendulum mechanics during suspensory locomotion. In parallel, my development as an early career education

also required adaptation to the rapidly changing world. From navigating the pandemic to new AI tools, each challenge prompted diversification in teaching and interacting with students.

Early Career Symposium | Other

ON THE VASTNESS OF SPIDER MEDICINE

Havah Neti

Seedia

Folk traditions and mystical threads lead us toward a unified theory of Spider Medicine and interspecies transmissions from arachnid to human. Spiders, scorpions, and ticks have much to teach us beyond the disciplines of biology and ecology. This ongoing project weaves narratives of the remedial rhythm of la Pizzica Tarantata, the simple prophecies of Ngam Du, Unci Iktomi and Sweat Lodge, seizure treatment in Traditional Chinese Medicine, and the deeper meaning of the Itsy Bitsy Spider.

Lightning Talks | Other

DISENTANGLING THE ROLE OF GROWTH IN SEQUENTIAL TARSOMERE FORMATION IN THE HARVESTMAN PHALANGIUM OPILIO

Sophie M. Neu*, Nithya Atla, Madeline Koebrick, Prashant P. Sharma

University of Wisconsin-Madison

Prehensile legs have evolved multiple times in the arthropod tree of life, but their developmental genetic basis has never been explored. In Opiliones, the prehensile leg is established by sequential addition of repeated units called tarsomeres, the articles of the tarsus which confer exceptional flexibility to the Opiliones leg. The number of tarsomeres varies from one leg pair to the next and correlates positively with leg length, suggesting that differential growth underlies the number of tarsomeres formed on each leg. However, tarsomere counts are also strongly conserved in many arthropod clades (and especially insects), suggesting a role for phylogenetic inertia and/or developmental constraint during their specification. To test the hypothesis that tarsomere counts are a function of differential growth in eupnoid harvestmen, rather than hard-wired during development, we used gene silencing and small molecular inhibitor experiments in the model organism *Phalangium opilio* to inhibit limb growth and generate shorter appendages. We performed (1) RNA interference against the Hox gene *Deformed*, which is linked to the differential growth of the antenniform leg of Opiliones (the second walking leg pair); (2) RNA interference against the Nk-family gene *clawless*, which is required for patterning the palp and leg tarsi; and (3) microinjection of the Wnt inhibitor C59. We show that inhibition of growth results in a smaller number of tarsomeres patterned, with severity of effect negatively correlated with tarsomere count, which supports the hypothesis that variable tarsomere counts are established and evolve via modulation of the mechanisms that control differential growth.

Talk Session 6 | Evolution, Genetics & Genomics

FUNCTIONAL AND ECOLOGICAL DIVERGENCE IN SYMPATRIC MADAGASCAN PELICAN SPIDERS

Mariela Oviedo-Diego, Hannah Wood

Smithsonian National Museum of Natural History

Madagascar is one of the world's most extraordinary biodiversity hotspots and a natural laboratory for studying processes that generate species diversity. Pelican spiders (Archaeidae), an ancient Madagascan lineage characterized by elongated chelicerae used to capture other spiders, exhibit remarkable diversity in trophic morphology and frequent sympatry across montane forests. We focused on three genetically differentiated populations within *Eriauchenius workmani* that co-occur in sympatry despite low levels of gene flow, suggesting incipient speciation. Previous work revealed greater morphological disparity in allopatry and narrower niche occupancy in sympatry, patterns consistent with ecological character displacement. Here, we examined ecological and functional divergence among sympatric and allopatric populations. During field expeditions to Ranomafana (high sympatry) and Andasibe National Parks (allopatry) we quantified microhabitat use, prey-size preference, and prey-capture kinematics across multiple populations. Using ecological observations and high-speed videography, we tested whether sympatric populations exhibit niche partitioning and shifts in resource use and predatory performance relative to allopatric populations. Sympatric populations displayed distinct predatory dynamics despite partial microhabitat overlap. One population selected larger prey

and performed slower strikes, whereas other populations exhibited faster and more explosive strikes while targeting smaller prey. In contrast, allopatric populations occupied broader microhabitat ranges and showed reduced angular acceleration relative to sympatric populations. Together, these patterns suggest relaxed ecological constraints in allopatry and increased niche partitioning in sympatry, consistent with early-stage ecological divergence. Our findings provide insight into how ecological interactions may shape performance evolution and morphological diversification in Madagascan pelican spiders.

Talk Session 2A | Evolution, Genetics & Genomics

EFFECTS OF CANNIBALISM RISK ON THE ONTOGENY OF RISK-AVERSE BEHAVIOR IN JUMPING SPIDERS

Yihang Park*, Eileen A. Hebets

University of Nebraska-Lincoln

Predation is a major selective force shaping prey behavior. While numerous studies have examined prey responses to varying levels of predation risk to balance survival with other life tasks, it remains unclear whether similar responses occur in victims of cannibalism—where predator and prey are conspecifics. Within cannibalistic populations, potential prey may adjust their behavior to balance foraging effort and anti-predator vigilance in response to varying risks of cannibalism. Furthermore, due to the common size differences between cannibals and prey (i.e., larger individuals are more likely to be a cannibals against smaller prey), an ontogenetic shift in prey behavior in response to cannibalism risk is hypothesized as individuals grow from small potential victims to larger potential cannibals. In this longitudinal laboratory study, we used the highly cannibalistic bold jumping spider, *Phidippus audax*, to test: 1) whether lifelong exposure to different levels of cannibalism risk (None vs. High) alters vigilance, foraging effort, and visual response to conspecific cannibals; and 2) whether these behavioral patterns shift as individuals mature from juvenile to adult. Our study design additionally allows us to explore the effects of size asymmetry on cannibal and victim behavior and to examine sex differences in behavior in response to cannibalistic risk. This latter opportunity – i.e. to explore sex differences in the ontogeny of risk-related behavior – is possible due to our longitudinal design, as immature spiders cannot be sexed.

Talk Session 7 | Behavior

COMPARATIVE MITOGENOMICS OF WOLF SPIDERS (ARANEAE, LYCOSIDAE) FROM FOUR CONTINENTS.

L. Brian Patrick

Dakota Wesleyan University

Spider mitogenomics has gained increasing attention in recent years with several papers comparing mitogenomes widely across families. A recent study compared mitogenomes across the subfamilies of Lycosidae, but all of the specimens were from a single country (China). To date, no study has compared mitogenomes of spiders within a limited number of genera but from a worldwide perspective. Here I compare the mitogenomes of 19 species from 10 genera of wolf spiders (Lycosidae) from four continents. Specifically, 5 species in 2 genera from the US, 5 species in 4 genera from Australia, 3 species in 1 genus from Israel, and 6 species from 5 genera from South Africa. The gene order is largely conserved, with the notable exception of *Hogna ferox* (Lucas, 1838). Additionally, when comparing the ratio of nonsynonymous to synonymous codon changes for protein coding genes between species, there is geographic variation in the ATP8, NAD2, and the NAD4 genes, and significant nucleotide divergence based on geographic region. These results indicate that different geographic regions favor different protein sequences, potentially due to differences in latitudinal variation in climate.

Talk Session 2A | Evolution, Genetics & Genomics

RARITY IN REPRODUCTIVE BIOLOGY: ARACHNIDS AS INSIGHT

Alfredo Peretti, Mariela Oviedo Diego, Eileen Hebets

Universidad Nacional de Córdoba, National Museum of Natural History, University of Nebraska–Lincoln

The peculiarities of arachnid reproductive biology have long sparked interest due to their curious characteristics. In this context, we propose using rarity as an explicit analytical tool to integrate phenotypic diversity, lineage comparisons, and shifts in the historical interpretation of reproductive traits. We develop a framework that distinguishes three axes of rarity: dimension, level of expression, and driver. Using examples from spiders, scorpions, and solifuges, among other groups, we examine phenomena such as certain copulatory behaviors and some types of sexual cannibalism through the lens of these axes. By integrating biological processes, comparative context, and historical components, this approach reveals how rarity emerges and why it is informative. Importantly, we show that rarity is not a fixed property, either biologically or epistemically. From a biological perspective, the frequency and expression of traits can shift across evolutionary time, ecological contexts, and population dynamics, causing traits to become rare or common depending on context. From an epistemic perspective, traits once considered exceptional have proven to be widespread, whereas others once assumed to be general are now recognized as rare. This framework highlights the importance of rarity for understanding the evolution of reproductive strategies in arachnids, as well as for recognizing historical biases and shifts within the discipline.

Plenary | Behavior

LOVE IN THE FAST LANE: RAPID PHYSIOLOGICAL SENESCENCE AT SEXUAL MATURITY IN MALE COLORADO BROWN TARANTULAS (APHONOPELMA HENTZI)

Spencer Poscente**

Eastern Michigan University

Sexual dimorphism in longevity represents a striking example of natural selection favoring reproductive success over survival. In the Colorado brown tarantula (*Aphonopelma hentzi*), females live beyond three decades while males survive only 5–10 years, experiencing rapid senescence upon reaching sexual maturity. Despite evidence that elevated metabolic rates contribute to this decline, no study has tracked how these changes progress throughout the mating season. We hypothesized that males collected at different timepoints would show progressive physiological decline due to accumulated reproductive costs. We collected sexually mature males ($n=86$) from southeastern Colorado at three timepoints during their mating seasons (August, September, October) in 2024 and 2025. Using open-flow respirometry, we measured metabolic rates and calculated metabolic scope (the ratio between maximum and minimum rates, reflecting physiological flexibility). We also tracked locomotory performance via video-tracking software, monitored body condition index, and recorded survival. Results revealed significant differences across collection periods: mid-season males exhibited the highest metabolic flexibility before declining substantially by October. Locomotory performance showed parallel declines, and survival differed dramatically across collection periods, with October males surviving a median of 41 days compared to 126 days for August males — a three-fold difference. Notably, late-season males maintained elevated resting metabolic rates despite declining maximum capacity, suggesting males sustain energetically costly mate-seeking readiness even as physical condition deteriorates. These findings demonstrate that metabolic, locomotory, and body condition metrics serve as reliable senescence indicators, providing mechanistic insight into extreme sexual dimorphism in aging.

Talk Session 6 | Morphology, Physiology & Development

AN AUTOMATED DATA ACQUISITION AND ANALYSIS PIPELINE TO QUANTIFY ARACHNID BEHAVIOUR USING A FREE AND OPEN SOURCE SOFTWARE

João Felipe Rugine*; Rodrigo Hirata Willemart; André Maia Chagas

Universidade de São Paulo

Animal behavior can be described qualitatively through direct observation or quantitatively by measuring parameters such as distance traveled within an arena. Traditionally, both approaches rely heavily on manual observation and annotation, making them time-consuming, error-prone, and susceptible to observer bias. In this context, video recording combined with automated image-analysis pipelines provides a faster, more standardized, and reproducible alternative for behavioral quantification. However, commercial systems

designed for behavioral tracking are often expensive and dependent on proprietary software and non-standardized data formats, limiting reproducibility, data sharing, and adaptation to different experimental models. Examples include EthoVisionXT, ObserverXT, and BehaviorAtlas.

Here, we describe a custom behavioral analysis pipeline developed in Bonsai-RX. Compared with other open-source platforms, such as LabGym and DeepLabCut, Bonsai-RX requires neither high computational power nor advanced expertise in IA and machine learning. The routines were applied to videos of 96 scorpions exposed to different essential oil concentrations inside experimental arenas. Automated tracking was used to quantify distance traveled, movement speed, spatial preference, and body orientation. The data generated by the software were further processed to produce trajectory plots, mean velocity measurements, individual and treatment-level displacement analyses. Tasks that would traditionally require weeks of manual observation were reduced to minutes of automated processing. Bonsai-RX generated standardized datasets that could be directly compared across independent studies. Finally, both the hardware setup and software routines can be openly shared, reused, and adapted to address new experimental questions and animal models.

Talk Session 7 | Behavior

THE SCORPION'S SECRET: MICROBIOMES THRIVING IN NATURE'S MOST HOSTILE COCKTAIL

Carlos E. Santibanez-Lopez, Grace Morin, Adam Kleinschmit, Matthew R. Graham, Barbara Murdoch
Western Connecticut State University, Western Connecticut State University, University of Dubuque,
Eastern Connecticut State University, Eastern Connecticut State University

Animal venoms have long been regarded as microbiologically sterile environments, hostile to bacterial life by virtue of their low nutrient availability and high concentrations of antimicrobial peptides. Yet recent studies of venom and venom-producing tissues across diverse taxa have begun to challenge this assumption, revealing the presence of structured microbial communities. Here, we present the first characterization of the venom microbiome using the secreted venom itself, rather than the venom gland or surrounding tissue, in two scorpion species sampled across the geologically heterogeneous Mojave and Great Basin deserts: *Paruroctonus becki* (Vaejovidae) and *Anuroctonus phaidactylus* (Anuroctonidae). Using 16S rRNA amplicon sequencing, we assess whether scorpion venom harbors bacteria, characterize the composition and diversity of these bacterial communities, and test whether microbiome structure varies across geography. To broaden our taxonomic scope, we further leverage publicly available RNAseq datasets to perform taxonomic profiling of non-host reads across both scorpion parvorders. Together, our results reveal a surprisingly complex and taxonomically diverse bacterial community within scorpion venom, with community composition varying across species and geography — reframing venom not merely as a weapon, but as an ecological habitat.

Talk Session 5B | Silks & Venoms

NATURAL HISTORY, HEAT, AND HUMIDITY: PSEUDOSCORPION BEHAVIOR IN THE TROPICS

Laura Segura Hernández

Smithsonian Tropical Research Institute

Environmental factors are known to be one of the most influential forces in ecology and evolution, and as with many other traits, they have direct impacts on animal behavior. However, this effect is not unidirectional, as behavioral responses can also influence the environmental conditions experienced by organisms. As part of the work I am currently developing, I aim to understand how both biotic and abiotic environmental factors influence pseudoscorpion behavior, as well as how behavioral responses can be adaptive (or not) to changing environments. Most of my current work has focused on the Panamanian populations of the social pseudoscorpion *Paratemnoides nidificator*, a species that lives in groups of variable size and exhibits highly social behaviors such as cooperative hunting. Here I will present data on the natural history and physiological tolerance to different environmental factors for this species, as well as how different factors affect their dispersal (phoresy) and social behaviors.

Early Career Symposium | Behavior

BEYOND PARALYSIS: SELECTION BY WASPS (PEPSIS SP.) AND RECOVERY BY PARASITIZED TARANTULAS (APHONOPELMA HENTZI)

Cara Shillington

Eastern Michigan University

As parasitoids on tarantulas, female tarantula-hawk wasps (*Pepsis* spp.) paralyze tarantulas (hosts) and lay a single egg and the developing larva eats the tarantula. Larvae with larger hosts have larger body sizes and increased fitness. Anecdotal reports suggest that tarantulas can recover from this paralysis but little is known about the duration or the “recovery” period. I collected 18 paralyzed tarantulas over two nights in southeastern Colorado in August 2025. Paralyzed individuals were found as they were dragged by wasps along roads between 9-11pm; the majority were females and juveniles even though this was the start of the mating season and mature males were actively out of their burrows in search of females. Paralyzed animals were retrieved when they were left by the wasps which routinely dropped the tarantula and circled around (sometimes for >20-min), before returning to the paralyzed individuals. Tarantulas were returned to the lab and maintained until they overcame paralysis or died. Body condition indices (BCI), metabolic rates (MRs) and voluntary locomotion were measured and compared between paralyzed and non-paralyzed individuals and throughout the “recovery” period. Three months after retrieval, many paralyzed animals had some locomotory capacity and were able to capture prey. Females and juveniles molted but males died by January 2026. BCIs were higher in paralyzed animals but MRs were similar to non-paralyzed individuals. These higher BCIs and the larger numbers of females and juveniles suggest that wasps are capturing animals from their burrows rather than encountering and subduing active males.

Talk Session 5B | Morphology, Physiology & Development

MORPHOLOGICAL STASIS IN AN ANCIENT LINEAGE: CLIMATE, HABITAT, AND THE MACROEVOLUTION OF BODY SIZE AND SHAPE IN WHIP SPIDERS (AMBLYPYGI)

Paulo Mateus Martins, Gabriela A. Galvão, Thiago Gonçalves-Souza, Diogo B. Provete & Gustavo S. de Miranda

University of Notre Dame, Universidade Federal Rural de Pernambuco, University of Michigan, Universidade Federal de Mato Grosso do Sul, Gothenburg Global Biodiversity Centre, University of Oklahoma

The arachnid order Amblypygi (whip spiders) originated over 330 million years ago and displays a remarkably conserved body plan despite occupying highly heterogeneous environments worldwide. This morphological stasis presents an evolutionary paradox, as lineages with broad ecological breadth and wide geographical distributions might be expected to undergo phenotypic divergence in response to environmental variation. Yet the macroevolutionary mechanisms sustaining this conservatism remain poorly understood. Here, we investigated the evolutionary dynamics of body size and shape of Charontidae, the most speciose whip spider family, by disentangling the relative contributions of macroclimatic gradients, habitat-specific pressures, and shared evolutionary history. Using Bayesian Phylogenetic Generalized Linear Mixed-effects Models alongside comparisons of alternative macroevolutionary models, we found that habitat was the primary driver of body size variation, with cave-dwelling species averaging roughly 22% larger carapaces than surface-dwelling counterparts, while climate and space explained negligible variance. Body size showed a moderate phylogenetic signal consistent with Brownian motion, whereas body shape lacked a clear signal, suggesting stronger stabilizing selection on form. Notably, evolutionary rates did not differ among habitats for either trait. A positive directional trend in body size through time aligns with Cope-Depéret’s rule, while the inverse relationship between size and mean annual temperature echoes Bergmann’s rule. Together, these results suggest that charontid whip spiders employ a conservative “jack-of-all-trades” strategy, maintaining a broadly versatile, gradually size-expanding phenotype that facilitates ecological generalism across diverse habitats without requiring pronounced morphological divergence or risking the constraints of extreme specialization.

Talk Session 5A | Systematics

DNA METHYLATION IN BLACK WIDOW SPIDERS: THE EPIGENOME OF AN URBAN PEST

Marissa France*, Katharine Smas*, Anthony Barley and J. Chadwick Johnson

Arizona State University; Barrett, the Honors College

Urbanization is a primary stressor that alters community structure and challenges organisms to respond to new conditions. DNA methylation is a genetic process that alters genetic codes to play a role in stress

response, development, and adaptation. These methylation patterns may explain why some species tolerate urban disturbance. Western Black Widow spiders (*Latrodectus hesperus*) are a pest species of medical importance often forming dense urban infestations in alleyways and backyards. We hypothesize that urbanization triggers DNA methylation variation (“epimutations”). We predict spiders collected from urban habitats will display heightened methylation in comparison to their desert counterparts. 3 adult female spiders were collected from both urban and desert populations in October 2025. These 6 spiders have been sent to our colleagues lab in Buffalo, New York to await testing. Using Oxford Nanopore long-read sequencing, genome-wide methylation patterns will be quantified from the cephalothorax. Ultimately, we will sample at least 10 spiders from each habitat, representing at least 3 different collection sites within each habitat. Once we receive the results, we will compare methylation across development and possibly sexes. Future directions include manipulating urban heat island stress in the lab to explore if that specific urban stressor heightens methylation.

Lightning Talks | Evolution, Genetics & Genomics

REVISITING NOCTURNALITY IN THE OGRE-FACED SPIDER: EVIDENCE FOR FACULTATIVE DIURNAL FORAGING

Jay Stafstrom

Indiana University

Animals benefit from possessing sensory systems well-suited to their environmental niche. However, the enhancement of a sensory system to perform well in a specific niche may come at the cost of performance in other niches. For example, nocturnal animals with visual systems adapted for dim light environments may struggle to perform well in bright day light. A textbook example of this is the ogre-faced spider (*Asianopis subrufa*). Pioneering work by Blest, Land, and colleagues first illustrated the supreme sensitivity of ogre-faced spider eyes, while also documenting a daily cycle in retinal morphology and physiology, where photoreceptors degrade at sunrise and resynthesize at sunset. These circadian sensory alterations match activity patterns of predatory behavior, where *A. subrufa* transform into motionless stick-mimics during daylight hours, only becoming active hunters following sunset. Unsurprisingly, the ogre-faced spider has been a posterchild for visually mediated nocturnal behavior. Here, contrary to foundational work, I show present-day *A. subrufa* are facultatively diurnal in foraging behavior. First, I report the frequency and ecological correlates of diurnal foraging in natural populations. I then show the effects of diet and lighting environment on the propensity for *A. subrufa* to forage during the day. Taken together, we present a foundation to understanding the causes and consequences of this shift away from strict nocturnality to facultatively diurnal behavior.

Talk Session 2B | Behavior

INTEGRATIVE TAXONOMY FOR INCONGRUENT TOPOLOGIES: REVISING NEW ZEALAND NEOPILIONIDS

Pietro Tardelli Canedo*, Shahan Derkarabetian, Gonzalo Giribet, Gustavo Hormiga

The George Washington University; San Diego Natural History Museum; Museum of Comparative Zoology, Harvard University; The George Washington University

The prevalence of polymorphism and morphological convergence across Opiliones has long confounded naturalists. Many opilionid taxa have historically been circumscribed solely based on descriptive taxonomy, and subsequent phylogenetic analyses often show that many such groupings are non-monophyletic. However, taxonomic revision of these organisms is complicated by conflicting phylogenetic hypotheses, oftentimes specific to a data class. One such case is Neopilionidae (Opiliones: Eupnoi), a circum-Antarctic family whose polymorphic cheliceral weaponry has been receiving increased attention. Early neopilionid descriptions failed to recognize such instances of polymorphism, and there is still a poor understanding of the intraspecific variation of neopilionid morphology. Furthermore, comparisons between the family’s molecular and morphological phylogenetic hypotheses yield taxonomic incongruencies for New Zealand species of *Forsteropsalis* and *Pantopsalis*. Here, we utilize recent advances in arachnid phylogenomics to generate phylogenies for New Zealand neopilionids using ultraconserved elements (UCEs). We further expand the taxon sampling of previous phylogenetic endeavors by concatenating our data into a total evidence analysis with published morphological and molecular datasets. Both genomic and total evidence phylogenies support the hypothesis inferred from molecular data, remaining robust even when greatly increasing the weight of morphological data. Despite the absence of a strong phylogenetic signal, our study’s integrative approach allows us to leverage the information content of morphological characters by mapping them onto the optimal

molecular tree and identifying the synapomorphies supporting our taxonomic revision. Overall, our study highlights how integrative approaches can sharpen our understanding of a taxonomic group whose morphological diversity remains poorly understood.

Talk Session 3 | Systematics

FIGHTING CHRONOS: EJACULATE ECONOMICS AND THE SENESCENCE ENIGMA IN TWO MODELS OF SEMELPAROUS ARACHNIDS

David Eduardo Vrech, Catalina Simian, Mariela Anahí Oviedo-Diego, Paola Andrea Olivero, Alfredo Vicente Peretti.

CONICET-UNC

Most studies on arachnid reproductive ecology focus on spiders, overlooking diverse evolutionary strategies in other lineages. This study contrasts examples of Scorpiones and Solifugae to understand how males manage ejaculate economy and senescence during a single reproductive season. In scorpions, continuous sperm production entails significant energetic costs. Successive matings in *Bothriurus bonariensis* reduce ejaculate volume but drastically increase the number of transferred spermatozoa, indicating a terminal investment strategy under sperm competition. Furthermore, seasonal tracking of *Urophonius achalensis* reveals that late-season males suffer severe testicular atrophy and reduced sperm viability. Isolated males exhibit the exact same viability decline, suggesting true physiological senescence rather than mere reproductive exhaustion, with high-condition males experiencing the steepest senescence trade-offs. In contrast, the solifuge *Titanopuga salinarum* presents a radically different strategy. Males undergo spermatogenesis only as juveniles, relying on a single, finite sperm reserve throughout adulthood. While their total sperm count predictably depletes over the season, their sperm viability remained exceptionally high (over 97%) until the end of their lives. This indicates remarkable cellular stability and a unique physiological mechanism to avoid sperm senescence despite chronological aging. By comparing these divergent models, we highlight the evolutionary tension between maximizing reproductive success and managing biological aging, encouraging the incorporation of non-spider models to expand our understanding of sexual selection and reproductive ecology in arachnids.

Talk Session 2B | Behavior

CHARACTERIZING A NOVEL TOXIN IN THE VENOM OF THE SICARIID SPIDERS

Finn Watson*, Lindy Gewin, Matt Cordes, Greta Binford

Lewis and Clark College

The family Sicariidae express members of the gene family SicTox in their venoms. These toxins cause loxoscelism in humans, and rapid, immobilizing toxicity in insect prey. SicTox variants make up more than 50% of the proteins found in *Loxosceles* and *Sicarius* venom, implying an important role in prey capture. While SicTox isoforms are typically phospholipase Ds (PLDs), one clade within the family shows no such activity and has remained enigmatic. Recent sequence studies and computed structures point towards members of this venom-expressed clade losing PLD activity and gaining new phosphoinositol-specific phospholipase-C (PI-PLC) activity, a toxic mechanism unreported in any animal venom up until now. In this study we tested for PI-PLC activity in a member of this clade via a cell based glycerophosphatidylinositol anchor (GPI anchor) release assay. We also investigated the biological relevance of PI-PLC activity via injection of model prey items in isolation and in combination with other SicTox PLDs. We report evidence of novel PI-PLC activity with potential synergy with other venom expressed SicTox contributing to toxicity on insect prey.

Talk Session 3 | Silks & Venoms

HERITABLE BACTERIAL SYMBIONTS OF LITTER DWELLING SPIDERS ON AN ELEVATIONAL GRADIENT

Jen A. White, Greta J. Binford, Marc A. Milne

University of Kentucky; Lewis and Clark College, University of Indianapolis

Arachnids are prone to infection by maternally inherited symbionts, many of which are capable of manipulating host reproduction to favor their own spread. These symbionts, however, are often thermally sensitive, with warm temperatures reducing their ability to manipulate their hosts, and reducing their rates of vertical transmission. We have hypothesized that this thermal sensitivity should generate geographic patterns of

symbiont prevalence along latitudinal or elevational gradients. Here we test this hypothesis using spiders collected at three elevations in the Chiricahua Mountains of Southeastern Arizona. Spiders were collected from soil and leaf litter, sorted by morphotype, and identified using both morphological and molecular characters. We collected 164 spiders, representing at least 20 species, primarily in Linyphiidae, Theridiidae, Phrurolithidae, and Lathyidae. Seven species were represented at more than one elevation, allowing direct comparison of symbiont infection at different elevations. We selected a subset of 110 specimens, extracted DNA, amplified bacterial 16S sequences, and compiled the microbiome samples into a library that is currently in queue at the sequencing facility. The majority of samples came back with positive 16S amplification, indicating that most specimens had associated bacteria for comparison. We are excited to see the results and share them once sequencing is complete.

Talk Session 4B | Ecology

POSTERS

SILK AND SENESCENCE: COMPARATIVE GENOMICS OF LIFESPAN VARIATION IN SPIDERS

Carly Adamec, Dr. Sandra Correa-Garwhal

Suffolk University

Aging is a fundamental biological process, yet the genetic basis of lifespan variation remains poorly understood in many arachnid lineages. While most spider species exhibit relatively short annual life cycles, some taxa display substantially longer lifespans, suggesting underlying evolutionary differences in pathways associated with cellular maintenance and stress resistance. This project establishes a comparative genomic framework for investigating lifespan variation across spider species using publicly available genomic resources and emerging sequencing data. Current efforts focus on selecting representative short- and long-lived taxa, compiling lifespan and genomic resource data, and identifying candidate genes associated with conserved aging-related pathways, including oxidative stress response, DNA repair, autophagy, metabolism, and protein homeostasis. Comparative analyses of these pathways will provide preliminary insight into genomic patterns associated with longevity across spider lineages. By leveraging natural lifespan diversity in spiders, this work contributes to broader efforts to understand the evolution of aging in invertebrates.

Poster Session B 32

LEAF LITTER ARANEAE IN SOUTHERN CALIFORNIA SKY ISLANDS

Rachel Allingham, Dean Dixon, Tobias Hays, Milena Marino, Shahan Derkarabetian

Leaf litter (the accumulated layers of fallen leaves on forest floors) is an important microhabitat within an ecosystem, where soil-dwelling invertebrates and other organisms, such as fungi and bacteria, aid in decomposing the litter into soluble nutrients. The invertebrate fauna of this ecosystem is unique and very diverse. Despite this, little is known about this microhabitat across the world, especially in southern California. Due to the arid climate of southern California, microhabitats containing moisture tend to contain many dispersal limited taxa. Similarly, “sky islands”, or high elevation habitats fragmented from the dominant low elevation habitat, can be hotspots for biodiversity and endemism; especially dispersal limited arthropods. Taken together, many of these sky island, leaf litter-inhabiting taxa are largely unknown, and contain many undescribed species. We aimed to further our knowledge of the taxa living in these communities by collecting leaf litter samples from multiple high elevation mountains across southern California, with a primary interest in the arachnids. In this poster, we present our preliminary findings focusing only on Araneae. We present some diversity statistics and make note of some notable findings, including new records and new species.

Poster Session B 24

FIELD STUDY OF LEUCAUGE VENUSTA DEMOGRAPHY

Skyler Babbitt*, Breeauna Clark, Morgan Corley, A. Danielson-Francois

University of Michigan - Dearborn

We conducted a field study of the demographics of the orbweaver *Leucauge venusta* in a late succession beech-maple forest in southeast Michigan from May through July 2025. We observed spiders daily (weather permitting) during daylight hours and recorded their stage of maturity at 88 marked web sites. We observed that penultimate males and females emerged at approximately the same time in the spring and the Operational Sex Ratio (OSR) became briefly male-biased and then strongly female-biased as the season progressed. The adult stage had an evenly balanced OSR of 1:1 at first before becoming strongly female-biased. At both penultimate and adult stages, females were observed persisting at a web site in the field twice as long as males. This finding suggests that males develop faster than females and are likely to suffer higher adult mortality. We examined persistence at the 88 web sites and found that the persistence at a location ranged from 0 - 19 days with a median of 6 days. Both penultimate and adult females had more consecutive days on their webs than males at any stage, which is consistent with male orbweavers developing more quickly and upon adulthood quickly leaving their webs to seek mates.

Poster Session A 15

ARACHPOCALYPSE! AN INTEGRATION OF HOMEBREW ARACHNIDS INTO D&D

Xander Banister

Southeast Community College

The poster presentation is primarily about spicing up the arachnid representation in Dungeons & Dragons, gone about by presenting 5 different homebrew options to add into a game of D&D. 1 spider beast not directly tied with Lolth, representing the unique family of Uloboridae and their lack of venom glands, 2 variations of tick like creatures to represent both soft and hard ticks respectively, 1 magic item ring based heavily on *P. macropalpis*' mind boggling speed, and 1 summonable familiar based on the pack hunting methods of *P. nidificator*. The spider and the ticks will include full stat blocks that can be edited by player and DM alike, to their wants and whims. The goal of this is to introduce players into a wider world of arachnids, and hopefully expand their view on spiders and such past that of the "evil" stereotype base D&D mythology perpetuates around them, seen in Lolth and a majority of spider adjacent creatures in the game being labeled as evil leaning.

Poster Session B 2

THE SPIDER (ARANEAE) FAUNA OF OHIO

Richard Bradley

The Ohio State University at Marion and the Museum of Biological Diversity

The spider fauna of Ohio is poorly known, but perhaps better known than some states. Careful work on spider diversity in Ohio began with William Morton Barrows (1883-1946) who was on the faculty at Ohio State University between 1909 and 1946. What remains of his collection is housed at the Museum of Biological Diversity on the OSU campus. His 1924 list included 306 species. In 1988 Joseph Beatty estimated that 410 species were known from Ohio at that time. I initiated the Ohio Spider Survey in 1994, an effort that is ongoing. The current number of described species known for Ohio is 701. Of those 106 (15%) have not been recorded recently (since the beginning of the Ohio Spider Survey). A total of 146 (21%) species have been added to the list since 1994. I am aware of at least six additional species that are believed to be undescribed. The current database of Ohio spider collection is available online. A dedicated group of volunteers is gradually working to identify, catalog, and digitize all our information. This poster presents the historical trajectory of our knowledge of spider diversity in Ohio, as well as the ongoing digitization project.

Poster Session B 38

TESTING CUTICULAR HYDROCARBONS AS CANDIDATE REFUGE CUES IN AMBLYPYGIDS USING MINIMALLY INVASIVE SAMPLING METHODS

Patrick Casto, Travis Worst, Sidney Ley, Vern Bingman, Danielle Wiegmann

Bowling Green State University

Amblypygids can return to previously occupied refuges, and previous behavioral observations suggest that self-derived chemical cues may contribute to refuge recognition or localization. However, the chemical identity of these cues remains unknown. Cuticular hydrocarbons are common arthropod surface compounds involved in recognition and communication, making them plausible candidates for persistent chemical traces associated with refuges. This project used gas chromatography–mass spectrometry to evaluate whether cuticular hydrocarbons can be detected from amblypygid-associated samples using minimally invasive sampling approaches designed to preserve the live animal while approximating natural cue deposition. Initial trials focused on assessing low-yield biological samples with filter paper and prepared polydimethylsiloxane disks. Early samples did not produce clearly detectable hydrocarbon profiles. This does not eliminate cuticular hydrocarbons as possible refuge cues, but it indicates that any recoverable signal from minimally invasive samples is low relative to the current detection limits. The next analyses compare whether more concentrated extracts produce detectable hydrocarbon profiles to clarify sample-yield limitations and compound identification from this novel extraction method. Although preliminary, this work links the search for self-derived refuge cues in amblypygids with the development of minimally invasive methods for sampling surface compounds from live arachnids, an approach that may be valuable when destructive sampling is impractical or undesirable.

Poster Session A 35

FUNCTIONAL CHARACTERIZATION OF SPIDER CIRCADIAN CLOCK GENES WITHIN AND ACROSS SPECIES

Justin Cheetham*, Nadia Ayoub, Natalia Toporikova, Thomas C. Jones, Darrell Moore, and Jessica Petko

Penn State York; Washington and Lee University; Washington and Lee University; East Tennessee State University; East Tennessee State University; Penn State York

Circadian rhythms are daily patterns of behavior and physiology that are precisely timed by intracellular molecular clocks and entrained by environmental cues. These clocks are composed of independently evolved transcription–translation feedback loops within each eukaryotic kingdom. In animals, the proteins Clock and Cycle form a transcriptional activator during the day, while several of their transcriptional targets (*cry2*, *period*, *timeless*) act as repressors of this activity at night. While most animals exhibit an endogenous circadian period close to 24 hours with little intraspecific variability, some spider species display extreme periods (18–29 hours) and broad intraspecific variation based on locomotor assays. To begin characterizing the transcription–translation feedback loop dynamics underlying these divergent behavioral patterns, we are testing spider orthologs of clock, cycle, period, timeless, and *cry2* from eight spider species for their roles in circadian-regulated gene expression using luciferase reporter assays. A cross-species analysis of these transcriptional activators and repressors will allow us to assess functional conservation and divergence, providing insight into the extent of co-evolution among these proteins.

Poster Session A 17

LEUCAUGE VENUSTA MATE GUARDING BEHAVIOR

Morgan Corley, Skyler Babbitt, Breeauna Clark, **A. Danielson-Francois***

University of Michigan - Dearborn

We conducted a field study of the common orchard spider, *Leucauge venusta*, to determine whether males targeted penultimate or adult females (or both) for mate guarding. Our study site was a late successional beech-maple forest in southeast Michigan. We observed spiders May – July, 2026. We found that adult males typically guarded both penultimate females and adult females. Males were observed guarding adult females twice as often as penultimate females. However, a majority of females in both stages were unguarded in our population. We calculated the operational sex ratio (OSR) for penultimates and adults throughout the study. At

the start of the season the OSR for penultimates was at a balanced 1:1 ratio and then briefly male-biased before becoming strongly female-biased. The OSR for adults was also fairly even at the start of the season and then became female-biased. The OSR patterns we observed suggest that penultimates of both sexes emerge at approximately the same time but males develop slightly faster. The high proportion of unguarded females (of both stages) suggests that adult males scramble to find females to guard and have higher mortality than females.

Poster Session B 14

PHYLOGENOMICS AND BIOGEOGRAPHY OF POECILAEMULA (OPILIONES: COSMETIDAE): A NEW SPECIES FROM PACIFIC COSTA RICA AND THE ROLE OF THE TALAMANCA CORDILLERA

Anderson DeChiaro, Daniel N. Proud

Moravian University; Moravian University

Opiliones (harvesters) are the third most diverse group of arachnids, with 6,902 species described worldwide. Cosmetidae, one of the largest harvester families (724 described species, hundreds undescribed), is endemic to the Neotropics and exhibits exceptional diversity across Central and South America. The combination of high species richness, limited dispersal ability, and ancient evolutionary origins makes Cosmetidae an ideal system for investigating Neotropical biogeographic patterns and speciation mechanisms. Here, we describe a new species of *Poecilaemula* from Costa Rica and resolve its phylogenetic position using ultraconserved elements (UCEs) and comparative morphology. The phylogenomic analysis placed *Poecilaemula* sp. nov. as sister to a clade comprising (*P. iching* + *P. signata*), thus representing a basal divergence within the genus. The new species exhibits diagnostic morphological features including distinctive dorsal coloration with interconnected lateral patches forming a reticulated pattern, and males bear a comb-like row of fused tubercles on metatarsus IV. Biogeographically, *Poecilaemula* species exhibit allopatric distributions across Costa Rican and Panamanian lowland tropical forests, with the Talamanca Cordillera serving as an apparent barrier to gene flow. *Poecilaemula* sp. nov. is restricted to Pacific lowland forests on and near the Osa Peninsula, while *P. iching*, *P. signata*, and *P. eutypa* occur exclusively in lowland forests on the Caribbean versant. This geographic partitioning suggests that the uplift and persistence of the Talamanca Cordillera facilitated vicariant speciation, isolating the Pacific lineage from its Caribbean congeners. Our results provide further evidence that the Talamanca Cordillera has been a major driver of allopatric speciation in lowland Neotropical arthropods.

Poster Session A 25

EXPLORING THE DIVERSITY OF POECILAEMULA (OPILIONES: LANIATORES: COSMETIDAE): REDIAGNOSIS OF THE GENUS WITH THE DESCRIPTION OF A NEW SPECIES

Anderson DeChiaro* & Daniel N. Proud

Moravian University

In this project, I identified a new species of Cosmetidae from Costa Rica. To do this, I will examine and illustrate the specimen collected from a previous fieldwork. This process involves digital imaging, documenting unique traits, and preparing genomic data for inclusion into research collections. I studied specimens, but also I will be generating genomic data using ultraconserved elements (UCE's). These are shared segments of DNA that provide insight into species' evolutionary relationships. The data created, I will analyze to test different hypotheses on how different groups of harvestmen have evolved and how they dispersed across the Caribbean.

Poster Session B 26

TISSUE-SPECIFIC CYCLING OF CLOCK GENES REVEALS ENDOGENOUS CIRCADIAN REGULATION IN SPIDERS

Isabel Duarte*, Hallie McMurdie, Karim Abualnaja, Natalia Toporikova, Thomas Clarke, Nadia Ayoub

Natalia Toporikova, Thomas Clarke, Nadia Ayoub – Washington and Lee University

Circadian rhythms regulate daily physiological and behavioral cycles and persist without light cues, maintaining endogenous free-running periods close to 24 hours. Spiders are atypical because their free-running periods

vary widely across species and individuals. Despite this, the molecular pathways underlying spider circadian rhythms remain poorly understood.

Tissue-specific RNA sequencing was used to identify cycling gene expression patterns and examine six candidate clock genes in two spider species, *Agelenopsis pennsylvanica* and *Metazygia wittfeldae*. *A. pennsylvanica* were captured and reared to adulthood, while *M. wittfeldae* were captured as adults. Adult females were monitored for five days under constant darkness to determine free-running periods before transcriptomic analyses. Individuals were then entrained for one week under 12:12 light-dark conditions. Under LD conditions, individuals were dissected every four hours across six time points. Under DD conditions, individuals were dissected every four hours for 36 hours across nine time points. Brain, eye, and silk gland tissues were collected for RNA sequencing.

Thousands of cycling transcripts were identified in each tissue under LD conditions, with peak expression occurring earliest in the eyes, followed by the brain and silk glands. *Cry2* cycled in the brain, while *Period* cycled in the eyes and silk glands, suggesting distinct tissue-specific regulation of circadian clock components. Importantly, *Cry2* and *Period* continued cycling under DD conditions after removal of light cues, indicating endogenous circadian regulation. The number of cycling transcripts was approximately fivefold lower in DD than LD conditions. Preliminary LD analyses identified additional cycling clock-network candidates involved in spider circadian regulation. These findings demonstrate tissue-specific circadian gene expression in spiders and suggest molecular clock variation contributes to species-specific behavioral rhythms.

Poster Session B 40

PREDATION AND COMPETITION AMONG URBAN ARTHROPOD PESTS: A CAGE MATCH BETWEEN BLACK WIDOWS AND BARK SCORPIONS

Katharine Smas, **Marissa France**, Kaila Eltze, Tatum Yoon, Ali Nelson & J. Chad Johnson

Arizona State University; Barrett, the Honors College

Intraguild predation (IGP), predatory interactions between organisms sharing prey, can play a key role in shaping ecosystems. Western Black Widow spiders and Bark Scorpions are venomous arthropod “pest” predators that share prey and commonly overlap in urban habitats. Female BLWs and SCPs of both sexes were collected in March 2026 at multiple urban sites across Phoenix, AZ. Arthropods were weighed weekly (mg) and fed a standardized diet for 2 weeks, before experiments began. 3 separate treatments included, “IGP”: BLW & SCP paired together, “SCP”: SCP housed alone and “BLW”: BLW housed alone. Location, activity, foraging success, and IGP were monitored twice daily between 7:00-10:00 AM and PM. Weights were obtained 24 hours after IGP and weekly for 4 weeks. Body mass at collection was heavily biased towards SCPs. Our results showed that in 20 IGP pairings, predation always (20/20) occurred by the same arthropod, a BLW (mean latency: 123.6 hrs., range 4-360 hrs). 24 hours following IGP, predators gained 69.5% and prey lost 22.4% of body mass. BLW mass gain was cut in half when competing with SCPs. This IGP had material benefits with BLWs doubling mass after SCP consumption. Additionally, BLWs were more limited by interspecific competition than SCPs were. As such, BLWs may serve as stronger population control over SCPs than vice versa, a result that has implications for pest control in urban ecosystems. Future directions include conducting these experiments in larger (4x2 m.) outdoor enclosures.

Poster Session A 29

A SCORPION INSPIRED CAR THAT NAVIGATES BY FAMILIARITY.

Douglas D. Gaffin

University of Oklahoma

Sand scorpions are a useful model for deriving principles of navigation by familiarity using a local sensor. Immediately after digging its burrow, a sand scorpion performs a series of learning walks that may facilitate the acquisition of home-directed tastes and touches via its midventral pectines. Later, during subsequent homebound journeys, it repeatedly compares current tastes and textures to the memories acquired via learning walks, using this information to step in the direction of the most familiar memory until it reaches its home. Previously, we have created computer simulations to show proof-of-concept of this navigation process. My goal here is to illustrate the idea with a simple, easily replicated robotic toy car that navigates based on the familiarity algorithm. I expect this robot to not only shed light on scorpion sensory biology but also inspire translational applications involving autonomous navigation within human-built environments.

Poster Session A 1

INTEGRATIVE TAXONOMIC REVISION AND BIOGEOGRAPHIC HISTORY OF YORIMA

Jadon Gonzales*, Marshal Hedin

San Diego State University

As new phylogenomic techniques step into the forefront of evolutionary biology, systematists across the globe can more confidently uncover evolutionary relationships of many taxa on the tree of life. Taxa described using older taxonomic methods may reveal, with the use of phylogenomic analyses, cryptic groups or species that may have otherwise not been described without these advancements. For my master's thesis, I aim to use genomic data to gain a more accurate understanding of the evolutionary history of the California spider genus *Yorima*. Here I present preliminary findings based on ultraconserved element (UCE) loci sequenced from SDSU museum specimens. Preliminary phylogenetic analyses recover all described species of *Yorima* as monophyletic. Additionally, three putative new species from different localities form monophyletic groups.

Poster Session A 21

EVALUATING SPIDER COMMUNITY RESPONSES ACROSS A RESTORATION GRADIENT IN COASTAL REDWOOD FORESTS

Benjamin L Hanlin, Monica M Sheffer

California Polytechnic University, Humboldt; Redwood National and State Parks; Save the Redwoods League; Ferguson Family Research Fund

Coastal redwood forests of northwestern California represent one of the most ecologically significant yet heavily altered forest systems in North America. More than a century of intensive timber harvest has left these forests fragmented into a mosaic of primary (old growth) stands and structurally simplified second growth forests. Some of these second growth systems have undergone experimental restoration thinning, which aims to accelerate the return of structure and ecological functions observed in old growth stands. Despite research on vegetation and vertebrate responses to such treatments, terrestrial arthropod communities, including Araneae (spiders), remain undocumented in this region. Spiders play a critical ecological role as abundant generalist predators, and their adaptability to habitat complexity via an assortment of functional guilds makes them ideal candidates for biomonitoring applications. This study will compare biodiversity, guild structure, and community composition across old growth, unthinned secondary, and thinned secondary coastal redwood forests in Redwood National Park. Using standardized collection methods and morphological identification, this project will generate the first comprehensive baseline survey of spider diversity as it pertains to the xeric redwood ecosystems of the park. Where resources allow, gut content DNA metabarcoding will be incorporated as a secondary analysis to infer an additional realm of arthropod prey diversity, providing further insights into forest disturbance responses and trophic interactions. Findings will inform redwood forest restoration assessments, contribute foundational biodiversity data, and establish potential protocols for long term biomonitoring in coastal redwood ecosystems.

Poster Session A 11

THE SAM NOBLE MUSEUM RECENT INVERTEBRATES COLLECTION: PAST, PRESENT, AND FUTURE

Shelby Hernandez, Dr. Gustavo Silva de Miranda

Sam Noble Oklahoma Museum of Natural History; University of Oklahoma

Established in 1899, the Recent Invertebrates Collection within the Sam Noble Oklahoma Museum of Natural History (OMNH-RI), University of Oklahoma, is located in Norman, Ok, and contains over 500,000 specimens, with about 30% of the specimens in the phylum Arthropoda. The collection has been overseen by a handful of curators, with the most historical being Dr. Harley P. Brown, a world authority on riffle beetles and water penny beetles (Coleoptera). As of 2025, the collection is in a new period of progression with clear goals established (digitalization, growth, and accessibility), the return of official personnel (curator, collection manager), and a community of volunteers. Ongoing effort has been put towards digitally transcribing data from specimens into databases with the goal of cataloging and digitizing the entire collection while also making it openly available in digital platforms (e.g., GBIF and iDigBio). Currently, the OMNH-RI has 158,225 specimens digitized (including 2,867 types), with most of the collection composed of Arthropods within the classes Insecta (145,400 occurrences) and Arachnida (3,340 occurrences). The arachnid family better represented is

Lycosidae (e.g., Schizocosa, Rabidosa, Pardosa), followed by Araneidae (e.g., Araneus, Argiope, Neoscona), Salticidae (e.g., Phidippus, Pelegrina, Hentzia), Thomisidae (e.g., Xysticus, Misumenops, Diaea) and Tetragnathidae (e.g., Tetragnatha, Leucauge, Meta). The countries better sampled are the US, the Philippines, and Brazil. The American states with the highest collecting effort are Oklahoma, Texas and Illinois. We welcome expert visits for arachnid identification and encourage deposits of type and non-type material as we continue to grow and organize the Recent Invertebrates Collection.

Poster Session A 31

THE WEB BETWEEN US: USING CHILDREN'S PICTURE BOOKS TO REFRAME ARACHNOPHOBIA IN EARLY CHILDHOOD

Brielle Holland**

University of Nebraska–Lincoln

Arachnophobia is one of the most widely accepted and socially normalized fears, often reinforced by media, family reactions, and cultural stereotypes. Children are often taught to be scared of spiders before they are taught to understand them. My project introduces the development of an educational children's book centered on reframing fear into curiosity. The story follows a little black dog named Kodi who is scared of everything, including spiders. After encountering a spider in his backyard, Kodi must come face to face with this fear and stop running away. He initially reacts with panic but with conversation, the spider reveals that they're just as scared of being stepped on as Kodi is of being bitten.

My hope for this project is that I can expand on it and reach out to other similar phobias, like being scared of insects (bees, grasshoppers, etc), reptiles, rodents, the list goes on. The purpose is to encourage children and their caregivers to reconsider their perceptions of, in this case, spiders, and other misunderstood animals. Rather than presenting spiders as dangerous or frightening, the book emphasizes coexistence and the importance of questioning fear-based assumptions. These fears should be approached with empathy rather than shame.

Poster Session

BEHIND THE DOOR: LONG-TERM BURROW MONITORING OF TRAPDOOR SPIDERS IN A NATURAL RESERVE

Emma E. Jochim*, Iris Quayle, Jason E. Bond

University of California, Davis

Although their high levels of endemism make trapdoor spiders ideal taxa for studying evolutionary processes such as adaption to changing environments, their fossorial, highly cryptic, and sedentary nature may inhibit studies of their ecology and natural history. Incorporating these types of data with systematic studies can provide a more complete picture of a group's evolution and ecology. However, studies of this nature are woefully lacking in the infraorder Mygalomorphae (trapdoor spiders, tarantulas, and their kin), particularly when compared to those for more easily observed Araneomorph spiders. In this study, burrows of the trapdoor spider *Promyrmekiaphila clathrata* were monitored over three years at Quail Ridge Natural Reserve in Napa Co., California to gather data on growth rates, mortality, and responses to changes in local environment. The area in which these burrows are located is part of the University of California's Natural Reserve System and is well suited for long-term studies of this type to be conducted. Because trapdoor spiders are particularly long-lived, an individual may experience drastic changes in climate and its habitat throughout its lifetime. We found that growth rates were not always linear, with most growth occurring from late winter to early spring. Surprisingly, we also observed instances in which burrow size decreased, typically following heavy rainfall or habitat disturbance.

Poster Session A 3

IMPROVING ACCESSIBILITY AND INVESTIGATIVE POWER OF COLLECTIONS DATA USING R SHINY APPLICATIONS

R. Ryan Jones

Denver Museum of Nature & Science

Natural history collections data are often critical for understanding ecological, evolutionary, and population genetics questions and understanding traits within and between taxon. Many, but not all natural history collections provide online access to their collections databases, providing highly accessible data to researchers worldwide. However, for many taxa, especially arachnids, an accessible and comprehensive all-in-one resource for trait and taxonomic data remains relatively elusive. Enter R Shiny, which allows for the creation of reactive data dashboards that can amplify the power of collections data to explore a wide variety of questions, produce publication-ready plots, and perhaps most importantly, allow coding-naïve people to utilize collections data to inform their own work. Here I demonstrate the kinds of analyses that may be useful for your research/collections staff/volunteers or students and how you may leverage R Shiny to make your data, and its insights, widely accessible.

Poster Session B 16

FILLING THE GAPS AND WIDENING THE WEB: ADDRESSING INATURALIST BIAS IN ALABAMA SPIDER OBSERVATIONS THROUGH STRUCTURED SAMPLING AND UNDERGRADUATE RESEARCH

Jason R. Jones*, Josephine Wright, & Tayea Myles

University of North Alabama

Alabama is home to at least 632 documented species of spiders, yet fewer than half are currently represented in state observations on iNaturalist. Existing observations also exhibit strong guild-level bias, with orb weavers and other active hunters disproportionately represented due largely to high numbers of observations from the families Araneidae and Salticidae, while ground active hunters, sheet web weavers, and space web weavers remain comparatively under-documented. To address these biases and improve representation of Alabama's spider fauna, we initiated a two-pronged project with substantial undergraduate involvement. In April 2026, a long-term pitfall trapping study targeting epigean spider assemblages was established across three habitats within a local park in northwestern Alabama, with two undergraduate researchers assisting in specimen collection and identification. Additionally, a senior-level arachnology course of 10 students at the University of North Alabama conducted standardized collecting in a lowland hardwood forest at the same site using methods outlined by Coddington and colleagues. Several students also completed expanded independent collections as part of a required course project. Specimens from all collections are being photographed and uploaded to the iNaturalist project "The Spiders of North Alabama," providing improved documentation of under-represented spider groups and a regional identification resource for community scientists.

Poster Session B 20

INVESTIGATING SPERM STORAGE BEHAVIOR IN DOLOMEDES SPIDERS

Jillian Kurovski*, Eileen Hebets

University of Nebraska Lincoln

Dolomedes spiders present a fascinating system through which to study reproductive behavior across the stages of mating. In the Nearctic clade, two closely related species, *D. tenebrosus* and *D. scriptus*, have been found to exhibit contrasting mating patterns (polyandry/monogyny, monandry/polygyny, respectively) and 'extreme' mating behavior including obligate male death and sexual cannibalism. My research focuses on post-copulatory reproductive behavior in Dolomedes such as cryptic female choice and sperm competition, specifically exploring how they may influence morphological and behavioral traits. Comparing these contrasting mating systems, I investigate sperm storage patterns in females by counting the number of sperm transferred by the male versus sperm stored by the female to understand if certain male traits are correlated with increased or decreased sperm storage in the female. I predict there will be evidence of cryptic female choice via correlative sperm storage patterns in the polyandrous mating system of *D. tenebrosus* and not in the monandrous *D. scriptus*. Additionally, I am investigating the movement of sperm across time in the female reproductive tract via histology to understand if females are mediating sperm movement as a form of cryptic female choice. I will present and discuss preliminary findings.

Poster Session B 22

DOPAMINE SIGNALING DISRUPTION LEADS TO MEMORY DEFICITS IN THE WHIP SPIDER, PHRYNUS MARGINEMACULATUS

Sidney T. Ley*, Gabriella H. Wolff, Nicholas A. Brown, Patrick Casto, Nicholas R. Gookin, Daniel D. Wiegmann, Verner P. Bingman

Bowling Green State University, Case Western Reserve, Bowling Green State University Bowling Green State University Bowling Green State University Bowling Green State University

Amblypygi (whip spiders) are arachnids that rely heavily on olfaction for navigation and shelter localization. Laboratory studies demonstrate that *Phrynus marginemaculatus* forms both short- and long-term memories for odors associated with shelter access. While dopamine function in the whip spider nervous system remains poorly understood, comparative neurobiology suggests that dopamine signaling may contribute to olfactory memory formation. To test this, subjects were trained on an associative olfactory learning paradigm, injected with physiological saline or the dopamine receptor antagonist SCH-23390 (SCH), and tested for memory retention 24 hours later. Saline-injected controls demonstrated significant associative memory retention ($n = 10$, $p = 0.039$ versus chance), whereas SCH-treated animals failed to exhibit significant memory retention ($n = 10$, $p = 0.892$). Performance differed significantly between groups on test day ($p = 0.016$). No significant differences in locomotor activity were observed between treatments ($p > 0.05$), indicating that dopamine antagonism impaired memory without altering general activity. To examine dopaminergic organization within the whip spider nervous system, immunohistochemistry was additionally performed on brain tissue. Preliminary staining revealed dopamine-associated immunoreactivity within higher-order sensory processing regions implicated in olfactory integration and memory. Together, these findings support a role for dopamine signaling in olfactory memory formation in *P. marginemaculatus*.

Poster Session B 10

TEMPERATURE DEPENDENT ALTERNATIVE SPLICING OF THE CIRCADIAN REGULATOR PERIOD IN PARASTEATODA TEPIDARIORUM

Ava Maliszewski*, **Maria Ramirez-Carrillo***, Nadia Ayoub, Natalia Toporikova, Thomas C. Jones, Darrell Moore, and Jessica Petko

Penn State York; Penn State York; Washington and Lee University; Washington and Lee University; East Tennessee State University; East Tennessee State University; Penn State York

Alternative splicing is a key mechanism for expanding proteomic diversity and fine-tuning gene function. This form of regulation has been demonstrated to play a key role in adjusting insect circadian clock systems to shifts in temperature. In the spider, *Parasteatoda tepidariorum*, the core circadian gene period exhibits extensive transcript diversity at both the 5' and 3' end of the transcript. However, the environmental dependence and functional consequences of this splicing complexity remain unknown. Here, we test whether period splice isoforms produce proteins with distinct regulatory effects on the core circadian transcriptional feedback loop. Using a luciferase reporter assay in cultured cells, we assess the ability of different Period protein isoforms to inhibit Clock/Cycle-mediated transcriptional activation. We further examine whether temperature acts as an environmental regulator of period splicing, motivated by prior observations that cold exposure can alter alternative splicing patterns in spiders and other ectotherms. Together, these experiments link transcript diversity in the spider circadian gene to functional variation in transcriptional repression and test temperature-dependent regulation of splicing as a potential mechanism for environmental modulation of the circadian clock.

Poster Session B 34

VARIATION IN POST-TRANSLATIONAL MODIFICATION OCCUPANCY ACROSS AGGREGATE SPIDROINS SUGGESTS CONTRIBUTIONS TO GLUE PERFORMANCE IN ARANEOID SPIDER WEBS

Hallie McMurdie*, Isabel Duarte Karim Abualnaja, Ryan Boyd, Richard Baker, Sandra Correa-Garhwal, Thomas Clarke, Brent Opell, Kyle Friend, Nadia Ayoub

Washington and Lee University, Washington and Lee University, Washington and Lee University, American Museum of Natural History, Suffolk University, Washington and Lee University, Virginia Tech University, Washington and Lee University

Spiders in the superfamily Araneoidea produce capture silk coated with an aqueous adhesive glue that enables prey retention under dynamic mechanical stress. The performance of this glue depends on a balance of adhesion, cohesion, and extensibility, that are thought to arise from aggregate spidroins (AgSp1, AgSp2, and AgSp3) and associated glue proteins. Post-translational modifications (PTMs), particularly glycosylation and phosphorylation, may play important roles in tuning these material properties.

Using mass spectrometry of capture spiral silks, we identified PTMs and mapped modification sites onto full-length (14 species with whole genomes) or partial-length (4 species with transcriptomes) aggregate spidroin sequences. We aligned repeated motifs within individual sequences to examine whether amino acid chains are consistently modified across repeats and across species. Building upon this approach, we are now quantifying the frequency of modification at individual amino acid positions to investigate how the percent frequency of PTMs at that position may relate to experimentally observed biomechanical properties of spider glue.

Our preliminary findings suggest that glycosylation may contribute to adhesive performance, while phosphorylation may play a role in maintaining cohesion. Conserved PTM patterns across species further indicate that these modifications are likely non-random and may contribute to the functional tuning of spider glue. By integrating proteomic and biomechanical analyses, this work advances our understanding of how molecular-level variation contributes to the remarkable performance of biological adhesives.

Poster Session A 43

THE USE OF MICROHABITATS BY ARACHNIDS IN DIFFERENT HABITATS OF SOUTH TEXAS

C. Neal McReynolds

Texas A&M International University

Microhabitat use by arachnids in different habits was studied on the TAMU campus. The three habitats were blackbrush-guajillo habitat, blackbrush-mesquite habitat and Yucca habitat. In each habitat, wolf spiders and striped bark scorpion had the highest relative abundance. Several arachnids including wolf spiders, tarantulas and sunscorpions were only or mainly on the ground. The striped bark scorpion used multiple microhabitats in the different habitats. The microhabitat use for scorpions varied with habitat and size class. The relative plant density in the different habitats influenced microhabitat use by arachnid groups including striped bark scorpion, raptorial spider guild (e.g., green lynx spider), western spotted orb we spider, other orb web spiders and other web spiders (e.g., black widow spider).

Poster Session A 39

EVALUATING THE REPEATABILITY OF CAVE COLONIZATION IN APPALACHIAN NESTICUS (ARANEAE, NESTICIDAE)

Regina Minjares-Grajeda, Adams C Dean

Iowa State University

A central question in evolutionary biology is whether similar environments produce repeatable morphological evolution or whether outcomes are shaped by historical contingency. Because caves impose consistent ecological pressures, they offer natural systems for testing this problem. The Appalachian region, a global hotspot of cave biodiversity, harbors exceptional subterranean diversity, including the spider genus *Nesticus* Thorell, 1869 (Araneae, Nesticidae), which includes multiple cave and surface species and provides a powerful framework for evaluating evolutionary repeatability.

Here, we investigated the evolutionary history of cave-dwelling in Appalachian *Nesticus* to determine the number of independent transitions to cave life within the genus. Using ultraconserved element (UCE) genomic data from Hedin and Milne (2023), we reconstructed a species-level phylogeny and estimated divergence times under a Bayesian framework with a conservative biogeographic calibration. Habitat evolution was analyzed

using continuous-time Markov models (Mk framework), with ancestral states reconstructed via maximum likelihood and Bayesian stochastic mapping. To address ecological uncertainty, analyses were conducted under both binary and three-state habitat coding schemes.

Maximum likelihood and Bayesian analyses were congruent, recovering the topology of Hedin and Milne (2023) with strong support. Divergence estimates placed the split of Appalachian *Nesticus* from non-Appalachian congeners in the Late Miocene–Pliocene (3.61–9.06 Ma), with diversification during the Latest Miocene–Pliocene (2.64–5.73 Ma). Under the binary model, equal rates (ER) was favored, with a non-trogomorphic root and three independent cave transitions. The three-state model also supported ER, reconstructing an epigean root and identifying at least nine independent transitions to cave-associated habitats, indicating repeated and independent colonization of subterranean environments within Appalachian *Nesticus*.

Poster Session B 12

UTILIZING THE SPIDER EXPOSURE PATHWAY TO ESTIMATE MERCURY CONTAMINANT RISK TO ARACHNIVOROUS BIRDS IN THE KALAMAZOO RIVER AREA OF CONCERN

Jaclyn R. Mowry*, Tiffany A. Schriever

Western Michigan University

Mercury is a toxic metal found in urbanized aquatic environments that can cause lowered reproductive success and motor skill deficiencies in animals. Mercury is released into the atmosphere by anthropogenic activities and settles into terrestrial and aquatic ecosystems. The Kalamazoo River Area of Concern has documented mercury contamination in fish tissues and sediments, resulting in fish consumption advisories. Our study investigates a different pathway- the movement of mercury from aquatic to terrestrial food webs via emergent aquatic insects, riparian spiders, and arachnivorous birds. Emergent insects and riparian spiders are consumed by birds, presenting a risk of mercury accumulation through the spider exposure pathway. We sampled 8 sites in the Kalamazoo River AOC ranging in fish mercury content. At each site we collect sediment, aquatic insects in larval and emergent forms, and two families of riparian spiders, Tetragnathidae, which prey mostly on aquatic insects and Araneidae, which feed on both terrestrial and aquatic insects. Mercury concentrations were compared between spider taxa and among river sites. We used spider methylmercury values to calculate a risk quotient to bird species in various stages of development, including multiple passerine and falcon species. We hypothesize that birds with high percentages of spider consumption will have higher risk quotients, and that Tetragnathidae will have higher concentrations of mercury than Araneidae. Most research evaluates fish contamination, but our study stresses the importance of the spider exposure pathway when assessing potential ecological and environmental risk, particularly for birds.

Poster Session B 42

THE ROLE OF ORNAMENTATION AND VISION IN THE COURTSHIP OF THE WOLF SPIDER SCHIZOCOSA TRISTANI

Sayith D. Padilla-Silva*, Rowan H. McGinley

University of Panama; Smithsonian Tropical Research Institute

Animal communication is often critical for survival and reproduction, and animals make use of multiple sensory modalities to communicate effectively. In wolf spiders (Lycosidae), males produce vibrational signals to court females, while various species also display conspicuous ornamentation on their forelegs. In the Neotropical species *Schizocosa tristani*, males possess white markings on their legs whose function has not yet been investigated. We evaluated the hypothesis that these markings act as visual signals during courtship. We manipulated the appearance of males by applying white or black makeup to their legs, and conducted mating trials with females. The trials were conducted under semi-natural conditions, both day and night, to examine how these putative signals function under different light intensities. Three variables were recorded: copulation success, latency to copulation, and sexual cannibalism. The white treatment significantly reduced the probability of copulation and increased copulation latency compared to the control group, suggesting that females detect subtle differences in the optical properties of the altered signals. The black treatment showed no significant differences. Time of day did not affect mating success and neither time of day nor leg treatment affected the probability of sexual cannibalism. In a complementary experiment in total darkness, the effects of leg treatments disappeared, suggesting that the treatments acted visually. These results support the idea that the white markings serve as ornamentation relevant to reproductive success in *S. tristani*. We are currently following up these results with eye occlusion experiments to examine the role of female eyes in this system.

Poster Session A 7

Poster Session B 41

University of California, Davis, University of California, Davis, University of California, Davis, University
of California, Davis, University of California, Davis, University of California, Davis, University of

California, Santa Cruz, University of California, Santa Cruz, University of California, Santa Cruz, University of California, Santa Cruz, University of California, Santa Cruz, University of California, Los Angeles, University of California, Los Angeles, University of California, Davis

We present a reference genome assembly for the trapdoor spider *Aptostichus stephencolberti*. This species, described in 2008, is endemic to the highly fragmented coastal dune habitats of Northern California from Monterey to the San Francisco Bay Area. Trapdoor spiders are ideal taxa for landscape scale genomic studies owing to their extreme site fidelity and limited dispersal capabilities; these same characteristics make them prone to extinction. Dune habitats along California's coast are a diverse yet fragile ecosystem, sensitive to shoreline development, rising sea levels, and invasive species. Genomic studies of species like *A. stephencolberti* can reveal novel areas of endemism and high conservation value that may not be evident in species with wider ranges and greater dispersal capabilities. As part of the California Conservation Genomics Project, we constructed the *A. stephencolberti* reference genome from high quality long-read sequences, scaffolded with proximity ligation Omni-C data. The primary assembly comprises 551 scaffolds spanning 3.63 Gb pairs, a scaffold N50 of 62.2 Mb pairs and BUSCO completeness of 95.6%. We estimate 52 chromosomes yet find no TTGAA telomere repeats. Expanding the telomeric repeat search to other spider genomes suggests that the repeat has been lost from all spiders. Automated annotation using the NCBI refseq pipeline and RNAseq data from whole adults finds 14,067 genes with a BUSCO annotation completeness of 95.56%. This resource, the first for family Euctenizidae will facilitate future study and resulting conservation actions of *A. stephencolberti* and other *Aptostichus* sp. populations associated with the rapidly changing California coastal dune ecosystem.

Poster Session B 30

CAUGHT IN THE WEB: BUILDING SPIDER LITERACY THROUGH DIGITAL AND HANDS-ON OUTREACH

Becca Robertson, Jen White

University of Kentucky

Spiders are ecologically important, abundant, and familiar to the public, yet they are often misunderstood, misidentified, and viewed primarily through fear-based narratives. Improving "spider literacy" requires more than correcting misconceptions; it requires accessible, engaging, and evidence-based educational materials that meet audiences in the spaces where they already seek information. Social media and short-form digital content offer an increasingly important opportunity for entomologists and arachnologists to connect with broad audiences, especially when paired with classroom-ready resources and hands-on learning experiences. This poster explores the development of a spider literacy outreach framework that integrates short-form digital content, printable infographics, lesson plans, and informal science education materials. These resources are designed to help learners distinguish spiders from insects, recognize medically significant species, understand spider ecology, and build curiosity in place of fear. The project also connects digital outreach with in-person entomology education through youth Entomology courses, such as Camp Hill Middle School's Outdoor Education Program at Camp Canadensis, where students engage with preserved specimens, live arthropods, and collection-based activities. This poster presents the goals, structure, and planned assessment of this outreach approach, and includes QR codes to provide access to teaching materials, infographics, and digital resources for educators, students, and outreach practitioners. By combining social media communication with reusable educational tools, this project highlights how spider literacy can be advanced through both digital and hands-on learning environments.

Poster Session A 5

FUNCTIONAL DIVERGENCE AND LOSS OF THE LIGHT-DEPENDENT CIRCADIAN MODULATOR CRY1 IN SPIDERS

Jeniann Rodriguez Rosa*, Maryyam Usman, Nadia Ayoub, Natalia Toporikova, Thomas C. Jones, Darrell Moore, and Jessica Petko

Penn State York; Penn State York; Washington and Lee University; Washington and Lee University; East Tennessee State University; East Tennessee State University; Penn State York

Circadian rhythms are ~24-hour cycles in behavior and physiology driven by conserved transcription-translation feedback loops and synchronized to environmental light cues. In many animals, the photoreceptive protein Cryptochrome 1 (Cry1) undergoes light-dependent degradation, providing a mechanism for environmental entrainment of the circadian clock. However, the function and evolutionary history of Cry1 in

spiders remain poorly understood. To assess light sensitivity of spider Cry1, we expressed *Parasteatoda tepidariorum* CRY1 in cultured *Drosophila* cells and conducted a light time-course assay followed by western blot analysis. Unlike canonical insect Cry1, spider Cry1 did not exhibit light-dependent degradation over time, suggesting functional divergence in light responsiveness. We are presently analyzing light dependent degradation of Cry1 from additional spider species. To place this result in an evolutionary context, we performed phylogenetic and comparative genomic analyses across diverse spider lineages. We find that Cry1 is absent from multiple haplogynes, consistent with an ancestral loss within this clade. In contrast, Cry1 is retained in most orb-weaving spiders, except for *Frontinella pyramitela*, indicating a second, independent loss. Together, these results demonstrate repeated loss and functional divergence of Cry1 across spiders, suggesting that light input pathways to the circadian clock are evolutionarily labile in this group.

Poster Session B 18

REPELLENT AND LETHAL EFFECT OF THE LAVENDER ESSENTIAL OIL TO THE YELLOW SCORPION *TITYUS SERRULATUS* (BUTHIDAE)

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Universidade de São Paulo; Universidade de São Paulo, Cidade Universitária

Scorpions are responsible for a growing number of accidents in urban environments, with an estimated 1.2 million envenomation cases occurring worldwide each year. Increasing urbanization and the destruction of green areas have contributed to this rise, as some scorpion species are highly adapted to anthropized environments. Their low metabolic rate allows survival for months without food, while the abundance of arthropod prey, absence of natural predators, and, in some species, parthenogenetic reproduction facilitate large population outbreaks. Current control measures have proven insufficient to contain this increase. In addition, there is limited evidence supporting the use of pesticides for scorpion control, as well as growing concerns regarding environmental contamination and impacts on non-target organisms.

In the present study, we evaluated lavender essential oil as a potential new tool for controlling the yellow scorpion *Tityus serrulatus*. We tested two application methods, spray and droplet exposure, using concentrations of 1%, 10%, 50%, and pure essential oil (100%) diluted in 70% ethanol. The oil produced both repellent and lethal effects. Higher concentrations elicited stronger responses, including spasms, pedipalp cleaning behavior, and prolonged locomotion, while confined exposure also resulted in mortality.

To our knowledge, this is the first study investigating essential oils as a potential tool for scorpion control. Future studies should evaluate larger-scale applications, persistence of the oil's effects, and responses in other scorpion species. These findings may contribute to new public health strategies by providing a low-cost, accessible, and potentially low-impact alternative for managing medically important scorpions.

Poster Session A 31

COMPARATIVE TRANSCRIPTOMIC ANALYSIS REVEALS SIGNATURES OF SELECTION FOR ORB-WEAVING BEHAVIOR IN SPIDERS

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Johns Hopkins University; University of Florida; Johns Hopkins University

Spiders (Araneae) are responsible for one of the most captivating and intricate examples of animal architecture in the natural world: the web. But only certain groups of spiders weave the familiar spiral-shaped orb web, and the evolutionary origin of orb-weaving has left arachnologists tangled in a debate for the past decade. Since phylogenetic studies rejected the long-held belief that orb-weavers were monophyletic, two competing hypotheses have emerged: that the cribellate (dry) and ecribellate (sticky) orb webs arose independently and convergently, or that the ability to weave the orb originated with web-spinning common ancestors of all extant orb-weavers and was subsequently lost in many non-orb-weaving descendants. Attempts to reconstruct the ancestral state of the orb web have reached conflicting conclusions as a result of disagreements about the species phylogeny and the definition of orb-weaving. As a potential solution to this phylogenetic impasse, we tested orthologous genes from across the genomes of 98 species of spiders for evidence of both convergent positive selection and relaxed selection corresponding to the orb-weaving phenotype, the patterns that we would expect to be caused by each of the competing hypotheses on the origins of the orb. Using a permutation-based approach, we also compared the odds of gene loss and duplication between orb-weavers and non-orb-weaving spiders and identified genes whose copy number differ significantly between the two phenotypic groups. Through these analyses, we integrate the evolutionary history

and genetic basis of orb web-associated traits, providing unique insights into the emergence of complex behavior.

Poster Session B 6

DE NOVO GENOME ASSEMBLY OF THE DARK FISHING SPIDER DOLOMEDES TENEBROSUS HENTZ, 1844 (ARANEAE: DOLOMEDIDAE)

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University of Oklahoma, University of Oklahoma, University of Nebraska–Lincoln

Spider genomics has advanced rapidly in recent years, yet reference quality assemblies remain unavailable for most families. Here, we report the first genome assembly of *Dolomedes tenebrosus* Hentz, 1844, a large semi-aquatic hunter notable for its striking reproductive behaviors, including sexual cannibalism and male obligate death during sperm transfer. While males are monogynous, females can mate multiple times, and patterns of paternity are unknown for this species. Aiming to generate a reference genome for downstream paternity analysis and further genomic analyses, we produced a PacBio HiFi sequencing dataset and assembled it using Hifiasm. This yielded 967 contigs spanning 2.43 Gb, with a contig N50 of 23.3 Mb. BUSCO assessment against the Arachnida database (n = 1,123) returned 98.2% complete gene content (C: 98.2% [S: 95.2%, D: 3.0%], F: 1.7%, M: 0.1%). The assembled 2.43 Gb reflects diploid-level sequence retention; k-mer profiling placed the haploid genome size at ~1.59 Gb, with heterozygosity of 1.59%. Scaffolding against the chromosome-level *Pisaura mirabilis* (Clerck, 1757) assembly placed 97.5% of the assembled sequence across 15 chromosome-scale scaffolds (N50 = 167 Mb), approaching Hi-C-based assemblies in contiguity. Sequencing and assembly of additional Nearctic *Dolomedes* species is underway to characterize genomic variation underlying the morphological, physiological, and behavioral diversity of the genus. Together, these resources will support comparative arachnological research and broaden our understanding of spider evolution.

Poster Session A 9

POPULATION STRUCTURE OF THE WIDESPREAD COMMON HARVESTER, PHALANGIUM OPILIO (OPILIONES, EUPNOI)

Erin G. Singdahlsen, Sophie R. Moeller, Prashant P. Sharma, Sarah L. Boyer

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Phalangium opilio is the world's most widespread opilionid, occurring across Europe and Asia, and now established in North America, South America, Australia, and New Zealand. Despite this global footprint, fundamental questions about its biographic history remain uncertain. The species is conventionally treated as native to Europe, but this hypothesis has not previously been tested. We performed phylogeographic and population genetic analyses of the mitochondrial locus COI locus to characterize the genetic structure and diversity of *P. opilio* across its range. By analyzing genetic variation and phylogeographic patterns among populations at different spatial scales we hope to assess the evidence for the native Eurasian hypothesis, and gain a more definitive understanding of the biogeographic history of *P. opilio*. We hope to shed light on the dispersal mechanisms - possibly human-mediated, natural colonization, or both - which have led to one of the most cosmopolitan arachnid species ranges known.

Poster Session A 27

EXAMINING SPIDER MORPHOLOGY THROUGH CHELICERAE MUSCLES

Kiley Smith, Cori Black, Jeffrey Shultz, Hannah Wood

Smithsonian National Museum of Natural History

The orientation of spider chelicerae has shifted over the evolutionary history of spiders and has been categorized into three discrete forms: parallel, opposing, and in an intermediate position. While these categories have been useful for classifying spiders, the detailed morphology of this transition and functional repercussions have never been examined. To understand these variations in spider morphology, we performed micro-CT scans of four specimens, each representing a major group and the different chelicer categories. The resulting digital image stacks were used to place landmarks at relevant areas in order to model muscle function for seven different muscles that operate the chelicer bases. Results showed an overall conserved plan of muscle origin, although some shifts in both area of muscle origin and insertion points were observed.

These changes may correspond to functional shifts. Since muscle layout was conserved across spiders, our results imply that cheliceral reorientation occurred at the fang joint, rather than the cheliceral base, and that differences in cheliceral use are due to neuromuscular plasticity among spiders, rather than skeletal-muscular anatomy.

Poster Session A 13

INVESTIGATION OF SPECIATION DYNAMICS AND SPECIES LIMITS IN THE CALIFORNIA TURRET SPIDER, *ATYPOIDES RIVERSI* (MYGALOMORPHAE, ANTRODIAETIDAE)

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Utah Valley University; San Diego State University; University of California, Davis

Cryptic speciation remains a significant challenge in systematics, in that considerable ambiguity exists in distinguishing population structure from species limits. In cryptic speciation, lineages undergo genetic divergence and become reproductively isolated, but without apparent phenotypic or ecological divergence. Here, we explore speciation dynamics and species limits in the turret spider *Atypoides riversi*, a California endemic mygalomorph species that is morphologically conserved and known to be a complex of deeply divergent, allo- and parapatrically distributed genetic lineages. Distributed throughout the Coast Range and Sierra Nevada Mountains of Northern California, *A. riversi* is mostly restricted to mesic habitats. *Atypoides riversi* exhibits extreme low vagility, with notable exceptions of lineages that underwent long distance dispersal across the Central Valley, a now inhospitable barrier. Using subgenomic data obtained via target enrichment (UCEs), we conduct concatenation and coalescent-based phylogenomic analyses to infer the *A. riversi* species tree. We explore gene flow dynamics across lineages to attempt to discern where speciation may be incipient, imminent, or complete. In light of the resolved and robust species tree, we evaluate morphological variation across lineages for additional evidence of speciation and validation of species limits. This study increases our recognition of the cryptic biodiversity in the California Floristic Province that is in need of further exploration.

Poster Session A 23

FUNCTIONAL DIVERGENCE AND LOSS OF THE LIGHT-DEPENDENT CIRCADIAN MODULATOR CRY1 IN SPIDERS

Jeniann Rodriguez-Rosa*, Maryyam Usman, Nadia Ayoub, Natalia Toporikova, Thomas Jones, Darrell Moore, and Jessica Petko

Circadian rhythms are ~24-hour cycles in behavior and physiology driven by conserved transcription–translation feedback loops and synchronized to environmental light cues. In many animals, the photoreceptive protein Cryptochrome 1 (Cry1) undergoes light-dependent degradation, providing a mechanism for environmental entrainment of the circadian clock. However, the function and evolutionary history of Cry1 in spiders remain poorly understood. To assess light sensitivity of spider Cry1, we expressed *Parasteatoda tepidariorum* CRY1 in cultured *Drosophila* cells and conducted a light time-course assay followed by western blot analysis. Unlike canonical insect Cry1, spider Cry1 did not exhibit light-dependent degradation over time, suggesting functional divergence in light responsiveness. We are presently analyzing light dependent degradation of Cry1 from additional spider species. To place this result in an evolutionary context, we performed phylogenetic and comparative genomic analyses across diverse spider lineages. We find that Cry1 is absent from multiple haplogynes, consistent with an ancestral loss within this clade. In contrast, Cry1 is retained in most orb-weaving spiders, except for *Frontinella pyramitela*, indicating a second, independent loss. Together, these results demonstrate repeated loss and functional divergence of Cry1 across spiders, suggesting that light input pathways to the circadian clock are evolutionarily labile in this group.

Poster Session A 19

POTENTIAL COSTS OF MATING: FLUCTUATING DIMENSIONS AND ASYMMETRY IN SCORPION SPERMATOPHORE PRODUCTION

Paola Andrea Olivero, Mariela Anahí Oviedo-Diego, **David Eduardo Vrech**, Alfredo Vicente Peretti
CONICET-UNC; National Museum of Natural History, Smithsonian Institution; CONICET-UNC;
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Reproduction entails substantial energetic investment, particularly in species with indirect sperm transfer, where spermatophore production may involve important energetic demands. In male scorpions, the sequential production of spermatophores during the reproductive season offers a useful framework to examine dynamic changes in morphological precision. In the promiscuous scorpion *Bothriurus bonariensis*, males produce spermatophores composed of fused hemispermatothecae that could exhibit developmental instability under potential cumulative energetic constraints. We investigated whether successive matings generate variation in dimensions and fluctuating asymmetry (FA) of spermatophore traits. Sixteen adult males were allowed to deposit three pre-insemination spermatophores in consecutive matings with different females, and eight bilateral traits were measured and compared. FA was quantified as absolute left-right differences, and log-transformed linear models were used to assess variation across spermatophores and among traits. Our results show that certain spermatophore regions, particularly distal and basal structures, shift in size across reproductive events. Additionally, traits such as the dorsal fold and distal lamina width exhibited increased FA. Because these structures are involved in mechanical coupling and sperm transfer, heightened asymmetry could potentially affect functional performance during mating. A negative association between FA and trait size further indicated that larger structures were proportionally more symmetrical. These findings reveal both trait-specific and within-male variation in morphological stability, suggesting possible energetic trade-offs between spermatophore production and developmental precision. Overall, this study provides evidence that reproductive effort in male *Bothriurus bonariensis* could be associated with energetic constraints that may influence spermatophore structural integrity and developmental stability.

Poster Session B 28

COMPARING THE CONCENTRATIONS OF MICRONUTRIENTS IN INSECTS AND SPIDERS

Shawn Wilder, Colton Herzog
Oklahoma State University

Cannibalism occurs in many species of spiders. Consuming conspecifics is hypothesized to be a high quality diet due to a higher similarity in nutrient composition between conspecifics than heterospecifics. However, the relative quality of cannibalism likely depends on the degree of differences between the nutrient content of conspecifics and other prey, including insects. We compared the micronutrient content (i.e., 15 elements) of three species of spiders with four species of insects to test if spiders consistently differed from insects in their micronutrient content. A PCA on CLR-transformed data showed separation in nutrient space between the three species of spiders and four species of insects. Furthermore, the PCA also showed significant separation among spider species and among insect species. Comparisons of concentrations of individual elements revealed that there were no elements that consistently differed between insects and spiders. Our results suggest that there is significant variation in the concentrations of a wide range of micronutrients both within and among insects and spiders. Given this variation, cannibalism would provide a spider with a diet that is compositionally more similar than consuming heterospecific prey. However, variation in micronutrient composition among spider and insect species suggests that spiders may also be able to meet their nutritional requirements through a diverse diet that does not include cannibalism. Additional studies are needed to determine the micronutrient requirements of spiders, as different elements may vary in their importance for growth, survival, and reproduction.

Poster Session B 8

BRINGING A MUSEUM COLLECTION TO A BROADER AUDIENCE

Paula E. Cushing, **Kotomi Yoshida**, Steve Schilling
Denver Museum of Nature & Science

The Arachnology collection at the Denver Museum of Nature & Science (DMNS) was established in 1998 when Paula Cushing was hired as the Curator of Entomology. Her title quickly morphed into the Curator of Insects and Spiders and then into the Curator of Invertebrate Zoology. In 1999, she initiated the Colorado Spider

Survey (CSS). The DMNS arachnology collection began with two significant donations: from Bea Vogel, first president of the AAS and a transfer of arachnids from the Colorado State University arthropod collection. Specimens donated from other colleagues, from Cushing through her own fieldwork, and through CSS participants have grown the collection from near-zero vials in 1999 to over 70,000 vials (nearly 50,000 of which are identified and databased) 27 years later. The DMNS arachnology data has been online-accessible since its inception. Cushing established an efficient system for specimen processing, curation, and identification by training and utilizing the skills, dedication, and enthusiasm of paraprofessionals recruited through the CSS. Beyond the specimen provenance data, the DMNS team is now publishing high quality images of collection holdings to a worldwide audience through various online portals (<https://ecdysis.org/>; <https://www.gbif.org/>; and <https://dmns.netx.net/portals/public/#page/home>). Our obligation as museum professionals is to digitize our holdings to bring data and images off our shelves and into the digital world. We are in the midst of a biodiversity crisis – it is difficult to assess the impact of this crisis on arachnids if the data from museum holdings is inaccessible.

Poster Session B 4

SUBSTRATE EFFECT ON PREY CAPTURE IN TWO FISHING SPIDER SPECIES

Ozzy Youngblood, J. Colton Watts, Eileen Hebets

University of Nebraska Lincoln

When similar species coexist in a given environment, their niche specificity often differs, dispelling competition and allowing for cohabitation despite similar roles. This can lead to major behavioral differences, despite close evolutionary relations and similar appearances. The *Dolomedes* genus is known to inhabit freshwater shores. Their proximity to water has led to behavioral adaptations that vary across species. Behaviors include diving, superior water locomotion and consumption of small fish. Two species found in Northeastern North America, *Dolomedes triton* and *Dolomedes striatus*, despite occupying similar geographic range and sharing a genus classification, differ greatly in morphology and phylogenetic placement, namely in *D. striatus*' smaller size. Little is known about *Dolomedes striatus*' ecological role or behavior, while comparatively, *Dolomedes triton*'s ecological role has extensive support as a semiaquatic predator. In this study, *Dolomedes triton* cricket capture count was compared to *Dolomedes striatus*', across two different substrates (water or filter paper) to determine the impact of water on capture success. *Dolomedes triton* exhibited enhanced capture count on water substrate compared to dry solid, while *Dolomedes striatus* capture counts were consistent across both substrate types, indicating that the impact of substrate is different between these two species.

Poster Session A 33