



Beat Sheet

The Newsletter of the Colorado Spider Survey

Denver Museum of Nature and Science, Zoology Department,
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Arachnology Lab Update

Good news for the DMNS Arachnology Lab – Paula Cushing and her colleague at Eastern Connecticut State University, Matt Graham, received a \$1M grant from the National Science Foundation to study camel spiders!

The title of the grant is “North American camel spiders (Arachnida, Solifugae, Eremobatidae): systematic revision and biogeography of an understudied taxon. This four year project will revolutionize the study of this component of the planet's biodiversity by training young biologists, including high school students, undergraduates, graduate students, and a postdoctoral scholar. They will use state-of-the-art molecular tools to better understand the evolutionary relationships among species in the most common and diverse group of camel spiders in North America, the Eremobatidae.

Another goal of the project is to use camel spiders as a model system to explore how Earth history events have influenced the evolution and assembly of species in desert communities.

This grant leverages the only remaining expertise on North American camel spiders, particularly DMNS Research Associate, Jack Brookhart, to excite a new generation of scientists who will move this field forward. An innovative and interactive online identification guide, the Camel Spiders of North America, will be developed to enable scientists, naturalists, educators, and others to identify and learn about these little-known animals. The guide will provide a resource for a broad audience and will support the development and expansion of an informative new website on camel spider biology

(<http://www.solifugae.info/>). As part of this NSF grant, the Arachnology lab welcomes two graduate students – doctoral student, Erika Garcia, and master’s student Ryan Jones.



NSF Grant Team (left to right): Erika Garcia, Jack Brookhart, Warren Savary, Lance Herrera, Paula Cushing, Matt Graham, Ryan Jones.

This first summer of the grant, Paula, Ryan Jones, undergraduate student, Lance Herrera (shown above), and a high school student who worked for his 2nd year in the arachnology lab, Felix Channiago (not shown) conducted fieldwork in the deserts of Utah, Arizona, and New Mexico. The Cushing team traveled over 2000 miles in June and again in July collecting camel spiders. In August Matt Graham and his undergraduate student, Michelina Pinto, traveled throughout California collecting these arachnids. All in all it was a successful start to this exciting grant!

Upcoming Events

Friday, September 28th, 11:00 a.m.–noon: Paula’s colleague Brent Hendrixson will be giving a talk in Ricketson Auditorium on the west side of the Museum. His talk is titled “Tarantulas of the United States.” Brent is an expert on these arachnids. The lecture is free; but unless you are a museum member, it is best to contact Paula so

she can give you instructions how to enter the museum for the lecture. Contact Paula to register for this free lecture at Paula.Cushing@dmns.org.

If you are a DMNS museum member, you can show your member card and go straight to Ricketson Auditorium for the lecture.

Brent will talk about the natural history of tarantulas in the U.S. and will give an overview of some research he has done on their challenging taxonomy.

General Arachnology Class, October 1, 3, 8, 10 from 6:30 – 8:30 p.m. at the DMNS: Paula will be teaching General Arachnology at the museum. There will be a cost to this eight hour class. If you are interested in receiving information on this course, either email Paula or continue to check the following website where details will be posted soon: <http://www.dmns.org/learn/adults/classes/>

Arachnology Gift Idea

Nature photographer, Gil Wizen, produces framed arachnid art including framed molted exuviae of Amblypygi (whip spiders). You can buy his work from his website at <http://gilwizen.com/>.

Arachnologist and manager of the arachnid listserv, Dustin Wilgers, has published and illustrated a children's book on his favorite organisms, *Savanna Spider, Super Scientist, Goes to School*. Check out Dustin's work at: <https://squareup.com/store/dustin-wilgers/>

Jillian Cowles has just published *Amazing Arachnids*. This book covers all aspects of arachnid biology and includes over 750 beautiful photographs. You can find more information at: <https://press.princeton.edu/titles/11293.html>

Arachnids in the News

Ticks fed on feathered dinosaurs. In December 2017, Enrique Peñalver and colleagues published a paper in *Nature Communications* about 99 million-year-old Cretaceous amber tick specimens in the extinct family Deinocrotonidae that seemed to have been living in the nest of a feathered dinosaur. One of the ticks was engorged with blood and feathers from the dino nest were present in the amber.

New spider species named after Bob Marley. In December 2017, Barbara Baehr and colleagues named a new spider collected from the coral reefs in Australia *Desis bobmarleyi*, after the famous

singer whose song "High Tide or Low Tide" inspired the authors since the spider lives in a "high tide low tide" habitat.

Spider silk company raises \$123 million. In January, it was reported that a start-up biotech company that makes spider silk from microbugs raised a whopping \$123 million supporting its endeavor to mass-manufacture material with the same strength and elasticity as spider silk.

18 new species of pelican spiders described. In January Hannah Wood and Nikolaj Scharff described 18 new species of pelican spiders from Madagascar. These tiny and bizarre spiders have enormously long chelicerae and a cephalothorax that is shaped like a high skinny neck (google pelican spiders). These spiders are specialized araneophages (they only eat other spiders). Since their prey can bite back, it is thought that pelican spiders peculiar adaptations enable them to bite their dangerous prey from a distance.

Mesozoic Uraraneida have spinnerets and a tail. In an article that was published in February, Dying Huang and colleagues reported on two fossil spider-like arachnids from the Mesozoic that had segmented abdomens, spinnerets with well-defined silk spigots, modified male pedipalps, spider-like chelicerae, and a whip-like telson or tail similar to uropygids (vinegaroons).

Flattie spiders (Selenopidae) have the fastest leg-driven turning maneuver of any land animal. In a February article in the *Journal of Experimental Biology*, Yu Zheng and Sarah Crews published on the exceptional ability of flattie spiders (Selenopidae) to re-orient their entire bodies in order to quickly lunge for prey that are approaching the spider from any angle. These spiders have eight laterigrade (sideways oriented) legs positioned at different angles that can spring out suddenly to spin and attack any prey approaching from any direction.

Collecting spiders using four-wheel-drive engine vibrations! Robert Raven of Brisbane, Australia, discovered that the vibrations produced by a rumbling four wheel drive vehicle are overwhelmingly attractive to spiders in the vicinity. When he left his old diesel 4 WD vehicle idle on sand on a hot day, "spiders that normally will not move in the daylight, are running towards the car. They are highly disturbed." Robert doesn't quite understand the reason for this phenomenon but if readers of the *Beat Sheet* have noticed eight-legged passengers in or on your cars, it may be your

rumbling motor that has pulled them in.

World's oldest known spider passes to the great silk-lined burrow in the sky at age 43. In May it was reported that a trapdoor spider, *Giaus villosus* (Idiopidae) living in the Australian outback died at age 43. The well-known arachnologist, Barbara York Main, had been following this spider since 1974. Barbara named the individual "Number 16." Barbara monitored the trap door spider population in the region for over 42 years. A report about this population was published by *Pacific Conservation Biology* and can be found at:

<http://www.publish.csiro.au/pc/pdf/PC18015>

Training your jumping spider to jump. Aeronautical engineer, Mostafa Nabawy and colleagues published a paper in May in *Scientific Reports* showing just how jumping spiders can jump up to 2 to 5 body lengths. They showed that, for short range jumps, salticids use low angled trajectories, minimizing flight time; for longer jumps, the take-off angles are steeper, minimizing the energy cost of transport. They further showed that jumping spiders largely utilize dynamic muscle contraction rather than hydraulic pressure (or pumping hemolymph into the legs).

Travelers: leave your service arachnids at home. In May, American Airlines Group, Inc. prohibited certain types of emotional support animals "including amphibians, spiders, goats, ferrets, insects, snakes...." etc. The *Beat Sheet* editor realizes this will be a blow to newsletter readers!

Fossil tick's terrible, horrible, very bad day. In a summer issue of *Cretaceous Research*, Jason Dunlop and colleagues reported on a Cretaceous (about 100 Million Year Old) Burmese amber tick from Myanmar that was caught and wrapped in silk by an ancient spider before being caught in the sticky sap of a tree and fossilized forever. This represents one of the oldest examples of an Ixodida tick ever recorded as well as the first and oldest evidence of an interaction between ticks and spiders.

Spiders use electric fields to balloon. In the July issue of *Current Biology* Erica Morley and Daniel Robert reported that ballooning spiderlings take advantage of the global atmospheric electrical fields to take off on their great aerial voyage. The authors found that spiders' mechanosensory hairlike setae are activated by weak atmospheric electrical fields. These stimuli may elicit ballooning behavior – a long distance dispersal

strategy that many spiders use to fly to a new habitat.

Participant News

Jeff Stephenson, CSS participant and DMNS Collections manager noticed that we have magnets on the door of the arachnology lab adorned with pictures of ticks. Jeff wrote, "Tick magnets? Very funny. I might be reading too much into it but, 'What can you say about those male arachnologists? Why, they're just TICK magnets, the whole lot of them....'"

Alicia Sprague wrote in February about an "Arachnology 101" presentation she gave for Colorado State University's Professional Development Institute. She said, "Overall, the session was wonderful! I had so much fun teaching about our wonderful arachnid friends and sharing my passion with others, and had a full class of about 27 – 30 folks...The CSU Bug Zoo brought some beautiful scorpions and I had my tarantulas and black widows, so lots of live specimens for folks to look at and enjoy!" Thanks to Alicia for being such a great arachno-ambassador!

Amie Perea wrote about her young (12 year old) daughter, Talia doing her very own arachno-outreach. Amie wrote in March, "Talia compiled and presented [a] pretty impressive...25 minute PowerPoint presentation for her class on combating fear and misunderstanding in regards to spiders. She discussed basic biology, ecological benefits of spiders, and important scientific work being done on spider silk and concluded with why spider conservation is an important element to that. She did not do this as an assignment, but as an additional project as part of their "genius hour" time for kids who have finished their work to pursue passion projects. Then she introduced her class to the Lucas the Spider videos on YouTube (if you haven't heard of this character, yet, he is a pretty cute ambassador for arachnids)." The editor of the *Beat Sheet* thinks that Talia rocks as an arachno-ambassador extraordinaire!

Janis Weisbrot wrote in March about a visit to the crypt of Westminster Abbey. Janis said, "I kept looking for the spider that a staff member in the crypt of Westminster Abbey had described to me. Met the Abbey's head gardener a few year ago; she knew what it was – *Segestria florentina* – and pointed out its tube webs amidst the ancient stones where she'd tried to offer it lily leaf beetles. No sale, she said. Spider chucked the beetles back out..." Only faithful readers of the *Beat Sheet* visit

Westminster Abbey looking for spiders!

Robert Mollenkopf sent an interesting email in June. He said, “Recently, I stumbled on a video you [Cushing] were part of from The Brain scoop called ‘Camel Spiders: Neither Camels, nor Spiders.’ I thought that maybe you might be interested in an experience of mine with my first interaction with camel spiders. It was most likely an average size, maybe 3 to 4 inches in length. I was stationed in Dhahran, Saudi Arabia, during the end phase of Desert Storm, April 1991. I was with the U.S. Air Force as a C-130 Airlift Aircraft Maintenance Specialist (Aircraft Mechanic). One night at around 2 or 3 a.m. we were doing a refuel operation on one of our C-130 Hercules aircraft which involves one person at the rear of the aircraft fueling the aircraft and one supervisor standing 50 feet directly in front of the nose of the aircraft. The reason for the 50 feet is because the intercom system cable is 50 feet long which allows the supervisor to talk to the refueling person in the rear of the aircraft. While doing the refuel, I was the supervisor standing off the nose. Part of the job is to pay attention to the landing gear as it pops and settles due to the load of fuel coming aboard. Now comes the camel spider part, I promise. While watching the nose wheel well, I noticed something white fall from inside to the ground just forward of the tires. Being as it was 2 or 3 a.m. I could not make out what it was so I just kept looking to see if more stuff would fall. The next thing I saw was the same white thing start coming toward me pretty fast. It made a perfectly straight line towards my right foot. Now before it made it to my right foot, the intercom cable was on the ground between myself and the camel spider. When it ran into the cable, I watched it ‘bite’ it. It did no damage to the cable but immediately stopped and ran over the cable towards my right foot again. I picked my foot up and kind of spun around in a half turn watching it as I did. To my surprise, while still running, [it] curved around to follow my foot. My lack of knowledge in camel spiders and instinct drove me to step on it. My 6 foot 200 lbs did seemingly little to it. It came after my leg again. I ended up having to stop the refueling process until we could stop the thing from chasing me. It was quite hilarious as well as a little intimidating. Unfortunately, the only choice we had was to kill it; it just would not stop.”

Robert continued, “I thought you might like to hear about this kind of experience as I, like most people, would not believe it happening under typical

circumstances. I have no way of knowing what caused the entire event to happen. I also am not trying to vilify the camel spider. It was an enlightening experience and definitely introduced me to something I had never known existed.”

Robert further noted that “all powered items on the plane, except the necessary refueling items, are turned off, so no lights, except personal flashlights, during refuel. We were actually on hard asphalt at the time; I think it may have just been lucky in where it fell under my boot – under the arch?”

The *Beat Sheet* editor has said it before, but it does seem that there is good reason to call camel spiders the “Spawn of Satan”!

Dennis Radabaugh wrote in July, “Greetings – last Sunday I gave a talk, ‘In Defense of Spiders’ to the Central Colorado Humanists Society based in Salida. About 130 people showed up and they were interested and responsive.”

Miscellany

Thanks to all *Beat Sheet* readers (and others) who sent interesting news from your own arachno-adventures! Keep on sending these in to the editor (Paula.Cushing@dmns.org).

The DMNS maintains an Arachnology Fund that is used to support student research and volunteer activities. Donations are always welcome. If interested, make checks out to DMNS – Arachnology Fund and send them to Paula Cushing, Denver Museum of Nature & Science, Zoology, 2001 Colorado Blvd., Denver, CO 80205.

Social media savvy readers, there are several arachnid-related Facebook pages you might be interested in joining: American Arachnological Society Facebook page, Supporters of Desert Research, and Solifugae Facebook page. Also check out the society websites:

<http://www.americanarachnology.org/>

<http://arachnology.org/>

Also check out the DMNS Arachnology collection data at:

[\[bugs.org/portal/collections/harvestparams.php\]\(http://scan-bugs.org/portal/collections/harvestparams.php\)](http://scan-</p></div><div data-bbox=)

As always, if you would like to stop receiving the *Beat Sheet*, just email Paula and asked to be removed from the “arachnophile” list.