



# American Arachnological Society

## 25th Annual Meeting: A Spider Odyssey

Keene State College

July 7-11, 2001

**Please note** that this page was reconstucted from the Keene Meeting materials. Listings are alphabetically by last name of the person who presented the material at the meeting. Also, unfortunately, I do not have have the time to italicize the scientific names, except in titles. --  
*knp*

## Abstracts

**James Arnold**

### Ingestion in Spiders

**James Arnold**

**W.Va. Arachnid Survey, Marshall University, Huntington, W.Va.**

**Abstract:** This is a report of preliminary microanatomical studies of mouthparts in several labidognaths and one orthognath spider considered from the standpoint of food manipulation and the consequences of a liquid diet. Structurally, the chelicerae, pedipalps, labrum, and labium, their appendages, and their integumentary ornamentation all bear features consistent with a dependence upon liquid food. When spiders feed, soft tissues of the prey are extracted from skeletal and other inert matter by cyclically flooding the food mass with digestive fluids. Simultaneously the mass is alternately kneaded by the chelicerae against the rigid pedipalp coxae or the juices pressed out and ingested. Pathways for collection of fluids and their conveyance between chelicerae and mouth are provided by mats of wettable setae on the labrum, labium, and pedipalp coxal lobes. The dorsal plate of the pharynx bears a plate of numerous, closely interlocked transverse lamellae enclosing a space continuous with the esophagus. The liquid fraction of the puri $\frac{1}{2}$ e passes through while solids are accumulated and cast out for reprocessing or disposal. In the animals studied the pharyngeal musculature appears able only to alter the shape and attitude of the pharynx. Swallowing and fluid regurgitation appear possible only through the action of the proventricular pump.

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**Jason Bond**

**Systematics of the trapdoor spider genus *Aptostichus* Simon (Araneae: Mygalomorphae: Cyrtaucheniidae)**

**Jason Bond  
The Field Museum of Natural History**

**Abstract:** This systematic study describes 28 morphologically distinguishable species of the predominately Californian trapdoor spider genus *Aptostichus* Simon, 1890, twenty-five of which are newly described. Using 72 quantitative and qualitative morphological characters I propose a preliminary phylogeny for this genus. A parsimony analysis in which all characters were equally weighted resulted in 76 trees of equal length (212 steps, CI = 0.38, RI = 0.72). Alternative solutions were explored using implied weights for an array of concavity function constants. Analyses with steep to moderate concavity functions ( $k = 2-4$ ) resulted in nine trees of equal length (216 steps, CI = 0.38, RI = 0.72). The preferred tree topology (implied weights,  $k = 2$ ) recovers four monophyletic *Aptostichus* species groups. This phylogenetic hypothesis indicates that "adaptations" favoring the invasion of the very arid desert habitats of southern California may have evolved multiple times in the *Aptostichus* clade. The remarkable amount of relative taxonomic diversity, its distribution across the unique Californian Floristic Province, and the existence of both desert and non - desert species in three of the four species groups makes this genus an ideal candidate for the study of the evolutionary ecology of desert arthropods.

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**Sarah Bradbury**

**Presence of Harvestmen Protect Brussels Sprouts from Insect Pest Damage**

**Sarah Bradbury, Alan Cady**

**Department of Zoology, Miami University, Oxford Ohio 45056; Department of Zoology,  
Miami University, Oxford Ohio 45056**

**Abstract:** Chemicals are commonly used to protect crops and garden produce from insect pests. Many gardeners use alternative ways to increase yields such as biological control, where natural predators and parasites reduce pest numbers, lowering the need for chemicals. Endemic generalist predatory arthropods (spiders, predaceous ground beetles, harvestmen; order Opiliones) are available for biological control and pre-adapted to live in gardens. Little is known of harvestmen life histories, and their potential as biocontrol agents has not been explored. These arachnids are abundant, ubiquitous, and are scavengers and predators (Halaj & Cady, 2000). Since there is some evidence that harvestmen may help control leafhoppers (Dixon & McKinlay 1989) and lepidopterans (Ashby 1974), promotion of their numbers and activities may permit reduced pesticide use by gardeners. Studies during summer 2000 at the Ecology Research Center at Miami University showed that the presence of harvestmen in

experimental enclosures protected young brussels sprout plants from damage by early instars of common lepidopterous and aphid pests. Twenty experimental enclosures enclosing brussels sprout plants, (ten enclosures with and ten without harvestmen present) were maintained and observed. Plants in enclosures holding harvestmen had greater growth, less damage, and greater biomass. A supplementary energy source (sectioned earthworms & mealworms) was a controlled variable within the experimental design, and it was given twice a week. Harvestmen remained longer in the enclosures with the supplement, producing greater plant biomass than the enclosures without supplement. (Ashby, J. 1974. A study of the arthropod predation of *Pieris rapae* L. using serological and exclusion techniques. *J. Appl. Ecol.* 11:419-425.; Dixon, P. & R. McKinlay. 1989. Aphid predation by harvestmen in potato fields in Scotland. *J. Arachnol.* 17:253-255; Halaj, J & A. Cady. 2000. Diet composition and significance of earthworms as food of harvestmen (Arachnida:Opiliones). *Am. Midl. Nat.* 143:487-49)

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**Richard Bradley**

**Comparing Spider Assemblages Among Habitats.**

**Richard Bradley**  
**Dept. EEO Biology, Ohio State University**

**Abstract:** The spider assemblage at any particular locality likely reflects the history of the site as well as the ecology of the spider species. Spiders were captured using visual searches, pit-fall traps, and litter extraction. For this analysis, comparisons were made among six different localities representing tall grass prairie and three forest types. Species-list similarity was computed using the Morisita-Horn index. Assemblage similarity was also compared by categorizing the spiders by their foraging guild and body size. The size distribution of spiders was similar at all sites. Foraging guild composition at the forest sites was consistent, and distinct from the prairie site. Few clear patterns emerged from the analysis of species-list similarity indices. In particular, there seems to be little direct similarity between the spider species captured and the overall vegetation classification of the site.

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**Chris Brown**

**Surface density and nocturnal activity in an assemblage of scorpions from west Texas**

**Christopher Brown, John Davis, Daniel O'Connell, Daniel Formanowicz**  
**SUNY College at Fredonia, Fredonia, NY; Urban Fish and Wildlife Office, Cedar Hill, TX;**  
**University of Texas at Arlington, Arlington, TX; University of Texas at Arlington,**  
**Arlington, TX**

**Abstract:** Gary Polis has suggested that scorpions are an ecologically important component of

arid ecosystems because of their high diversity and high density. However, many of the data on which this hypothesis is based come from studies of a single ecomorphotype (relatively large burrowing species) living in a single habitat type (sandy deserts). Here we look at a scorpion assemblage from a different habitat, rocky desert thornscrub, in which the majority of individuals do not burrow. We studied surface density, nocturnal activity, and biomass at a site in the trans-Pecos region of west Texas at Chandler Independence Creek Preserve. A total of 8 species of scorpion co-occur at this site: one buthid, *Centruroides vittatus*; one diplocentrid, *Diplocentrus* sp.; and 6 vaejovids: *Pseudouroctonus apacheanus*, *Paruroctonus gracilior*, *Vaejovis waueri*, *V. coahuilae*, *V. crassimanus*, and *V. russelli*. This number is comparable to other arid North American sites. The three numerically dominant species, *C. vittatus*, *V. waueri*, and *Diplocentrus* sp., composed >98% of all individuals during daytime searches, while *C. vittatus* accounted for >90% of individuals active at night. Of these, only *Diplocentrus* sp. burrows. Surface density and biomass were generally highest in spring and fall, particularly for *C. vittatus* and *V. waueri*, although temperature had little effect on these patterns. Species diversity and evenness, as measured by the Shannon indices, were higher than most other scorpion assemblages. However, population- and community-level densities and biomasses were 1-2 orders of magnitude lower than has been reported for other arid-zone scorpion assemblages. Thus, scorpions are likely to be less important in community function here than at sandy desert sites, if importance is a function of density and biomass. We suggest that scorpion importance therefore is dependent upon habitat type and the ecology of the individual species.

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**Chris Buddle**

**Experimentally testing for exploitative competition with *Pardosa moesta* and *P. mackenziana***

**Chris Buddle**  
**Miami University**

**Abstract:** Few field-based experimental studies have tested directly for exploitative competition with young stages of cursorial spiders. *Pardosa moesta* Banks and *Pardosa mackenziana* (Keyserling) coexist within the leaf-litter of deciduous forests in central Alberta, their life-cycles are nearly identical, and young instars are of a similar size and weight. Therefore, there exists the potential for inter- and/or intraspecific exploitative competition to play a role in governing populations of these species. An experiment was designed in which *P. moesta* and *P. mackenziana* spiderlings were stocked at natural and 2 x natural densities, and in different combinations (single or both species present), in a series of 0.25 m<sup>2</sup> arenas placed on the forest floor. Spiderling mass gain and survival, and changes in the prey base (*Collembola*) were measured over a six-week period (late July until mid-September). Results provided no support for exploitative competition as survival and mass gain of spiders was unaffected by the experimental treatments. High rates of mortality suggest that factors such as cannibalism and intraguild predation may play a role in this system. Treatments containing spiderlings also contained significantly fewer *Collembola* compared to control arenas that were not stocked with *Pardosa*. This result further supports the importance of cursorial spiders in leaf-litter food webs.

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**Alan Cady**

**Discrete Habitat Refugia in Corn to Promote Generalist Predatory Arthropods and Increase Yield**

**Alan Cady, John Usis  
Miami University; Youngstown State Univ.**

**Abstract:** The generalist predatory arthropods occupying crop fields are potential agents of biological control. The endemic species comprising this predator community are finely adapted to their specific microclimates and ecosystems. Unfortunately, conventional tillage and harvesting operations are cyclical and destructive events, forcing the native generalist predator community to re-colonize these fields each year. Supplying discrete habitat refugia is a simple and inexpensive means of reducing the impact agricultural operations exert on populations of predatory arthropods in agroecosystems by providing them places to live and reproduce. Since these small piles of straw placed between crop rows had an effect on spider populations in soybeans (Halaj et al. 2000), the influence of refugia in corn could be greater considering the drier, more open structure of corn. Six one-third hectare conventionally-tilled fields were planted with corn. Ten discrete straw habitat refugia of two sizes (1X0.5 m & 2X0.5 m) were systematically positioned in each plot along with 2 control sites. Pitfall traps were placed along cardinal coordinates; 4 traps at 2-m from the refugium and 4 traps at 5-m away. Preliminary results indicate there were more spiders around sites near a refugium than at control sites, and spider numbers did not differ between 'close' or 'far' pitfall traps nor between large or small refugia. Corn yields in sites with refugia were significantly higher than at control sites. (Halaj, J, A. Cady, and G Uetz. 2000. Modular habitat refugia enhance generalist predators and lower plant damage in soybeans. *Environ. Entomol.* 29(2):383-393)

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**Paula Cushing**

**Natural History of an Ant Hunting Spider in the Family Zodariidae from Colorado**

**Paula E. Cushing, Richard G. Santangelo  
Denver Museum of Nature and Science; Denver Museum of Nature and Science**

**Abstract:** In 1999, two Colorado Spider Survey participants, Nina Shilodon and Steven Bonham, collected the first zodariid recorded from this region. This spider appears to be the same species, *Zodarium rubidum*, introduced to Pennsylvania from Europe and recorded from there in the 1960's by Bea Vogel. Like other members of this genus, this species constructs igloo-shaped stone retreats under rocks and feeds on ants. Spiders were kept in the laboratory and details of the prey capture behavior recorded including initial and subsequent reactions of ants to the bites of the spider. In nearly all instances, reaction to the spider's bite was immediate

and resulted in complete paralysis of the ant.

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**Bruce Cutler**

**Yet another subspecies of *Philodromus rufus* (Araneae: Philodromidae)**

**Bruce Cutler  
University of Kansas**

**Abstract:** The *Philodromus rufus* species complex consists of two species in North America. *P. exilis* is monomorphic, males do not vibrate the front legs during courtship, is found in southeastern Canada and northeastern United States, and is a conifer dweller. *P. rufus* is a widespread Holarctic species, males vibrate the front legs during courtship, and are found predominantly on woody vegetation of various types. Three Nearctic subspecies are distinguished by color pattern and have essentially mutually exclusive ranges. Except for a few records in the Appalachian Mountains of North Carolina, earlier records indicate that the species is absent from the area south and east of a line from northern Nebraska to northern Virginia. One characteristic is that in all the previously known subspecies, the lateral margins of the carapace are darker than the central portion. About ten years ago specimens of a *Philodromus* genitally identical to *P. rufus*, with males vibrating the front legs during courtship, were collected in Kansas. However, the coloration is very different. The carapace is uniform light brown with a small amount of dark pigment around the eyes, and two dark brown marks beneath the opisthosomal overhang. The opisthosomal pattern is complex and resembles that of several species in the *P. aureolus* species group such as *P. keyserlingi*. Cross-breeding experiments with *P. rufus* vibrans from Maine and Minnesota, produced viable F1 spiderlings. This new subspecies has also been collected in Arkansas, Georgia, Mississippi and North Carolina, localities non-overlapping with the other subspecies.

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**Eric Edwards**

**The Day of The *Thiotima***

**Eric Edwards, Robert Edwards  
United States Postal Service; Retired**

**Abstract:** A discussion of the attempt being made by the authors to raise the Ochyroceratid *Thiotima radiata* Petrunkevitch from egg to adulthood and thence to egg and next generation. There is the possibility that this spider is parthenogenetic, as no males have ever been identified or found in often populous aggregations.

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**Victor Fet**

***Euscorpius balearicus* Caporiacco, 1950, stat. nov.: molecular (allozymes and mtDNA) and morphological data support the existence of an endemic scorpion species on the Balearic Islands (Scorpiones: Euscorpiidae)**

**Benjamin Gantenbein, Michael E Soleglad, Victor Fet  
Zoological Institute, Population Genetics, University of Berne; Marshall University**

**Abstract:** The geographic variation of the circum-Mediterranean distributed scorpion species *Euscorpius carpathicus* (L.) was traditionally analysed using morphological characters such as trichobothrial patterns, which resulted in 23 valid subspecies; however, the validity of these subspecies remains unclear. Here, we focus on *E. carpathicus* populations from the Western Mediterranean and provide new molecular evidence that the populations from the island of Mallorca (Balearic Islands, Spain) represent a highly divergent lineage, which is separated from *E. carpathicus* populations from the mainland of France (Vaucluse) and Italy (Liguria and Piemonte). This divergence is confirmed by morphological analysis. Moreover, allozyme and mtDNA divergences (about 10%) confirm our expectation that the Balearic island populations became isolated from the mainland about 5 Ma BP since the refilling of the Mediterranean Basin and, therefore, have to be considered autochthonous. This hypothesis is additionally supported by the comparison of the genetic differentiation between artificially transplanted island populations and mainland populations in the congeneric species *E. flavicaudis*. The phylogenetic species concept (PSC) is applied to elevate the taxon *E. carpathicus balearicus* Caporiacco, 1950 to the species rank.

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**Matthias Foellmer**

**Sexual cannibalism and its consequences for male *Argiope aurantia***

**Matthias Foellmer  
Concordia University**

**Abstract:** Spiders of the genus *Argiope* are famous for their sexual cannibalistic habits and their pronounced sexual size dimorphism. Whether a male is at risk of facing a cannibalistic attack depends on whether he encounters a penultimate female close to the final molt (with which the male tries to copulate during her molt) or whether he encounters an already adult female that may attack him. Here, we investigate sexual selection operating on male phenotypes in the situation of a male encountering an adult female in the species *Argiope aurantia* using a controlled laboratory experiment. We introduced one virgin male to a virgin female and distinguished between five selection episodes: male crossing the web; first courtship; first insertion; second courtship; and second insertion. Males were at greatest risk of

being attacked during the first insertion (75 out of 97), and 22 (29.3%) of the attacked males were killed. This was also the only episode where significant patterns emerged. Male leg length (measured as the combined length of patella and tibia of the first leg), but not prosoma width significantly predicted the likelihood of being attacked, with males that have longer legs being at greater risk. However, long insertion durations and (over and above) small ratios of male size to female size were significantly associated with the risk of being killed. Overall during this episode, this led to significant selection favoring short insertion duration. Additionally, a male's fate may be determined more by the size of the female he encounters than by his own.

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**Matthew Foradori**

**The Relation Between the Outer Cover of the Egg Case of *Argiope aurantia* (Araneae: Araneidae) and the Emergence of its Spiderlings**

**Matthew Foradori, Jacqueline Kovoov, Myung-Jin Moon, Edward Tillinghast  
University of New Hampshire; Laboratoire de Zoologie et d'Arthropodes, M.N.H.N.-  
C.N.R.S; Department of Biological Sciences, Dankook University; University of New  
Hampshire**

**Abstract:** To emerge from the egg case, spiderlings must penetrate a tightly woven outer cover composed primarily of large-diameter cylindrical gland fibers and small-diameter fibers, likely of aciniform gland origin. They accomplish this using enzymatic digestion and mastication to form a communal hole in the outer cover. The involvement of proteolytic enzymes in this process was demonstrated by zymography of spiderling homogenates and washes made from the edges of holes. The specific source(s) of the proteases is unknown, but histological examination of spiderling sections indicates that the digestive tract, venom glands, and gnathocoxal glands are all functioning at the time of emergence from the egg case. Observations on edges of holes indicate that spiderlings are able to solubilize the small-diameter fibers completely, but cylindrical gland fibers only partially. In the outer cover, cylindrical fibers are composed of numerous fibrils embedded within a matrix. Spiderlings appear to be unable to solubilize the fibrils, but digestion of the matrix allows the spiderlings to push the fibrils aside to create the opening.

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**Douglas Gaffin**

**Synaptic interactions within peg sensilla of scorpion pectines: what do they mean and where do we go from here?**

**Douglas Gaffin  
University of Oklahoma**



**Abstract:** Pectines are unique, midventral sensory appendages that help direct mating and food-finding behaviors in scorpions. Dense two-dimensional arrays of bimodally sensitive (chemical and mechanical) peg sensilla form the primary sensory structures on pectines. Several qualities of peg sensilla make them well suited to electrophysiological investigation, including accessibility, stability of extracellular recordings, hardness of the animals, and ease with which spiking cells can be identified and categorized. Cross-correlation analysis of spontaneous neural activity shows signs of synaptic interactions between sensillar neurons in all species examined to date (*Paruroctonus mesaensis*, *Hadrurus arizonensis*, *Centruroides vittatus*) representing three families and two superfamilies. Both excitatory and inhibitory interactions have been observed, as well as possible dyadic synaptic arrangements. Computer simulations of cross-correlograms are consistent with experimental data and may help provide additional insight into functionality of synaptic connections. Such intra-sensillar interactions, coupled with the topographic order of peg sensilla and their CNS projections, may allow scorpions to precisely resolve microfeatures of chemical stimuli. Additional questions that can be addressed via electrophysiological techniques include whether synaptic interactions extend between adjacent sensilla, whether mechanosensory cells interact with chemosensitive cells, and how these synaptic circuits function under specific chemical and mechanical stimulation.

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**Matthew Greenstone**

**Spider Predation: Species-specific Identification of Gut Contents by Polymerase Chain Reaction**

**Matthew Greenstone, Kevin Shufan**  
**US Department of Agriculture, Agricultural Research Service; US Department of Agriculture, Agricultural Research Service**

**Abstract:** We used primers for aphid mitochondrial COII to detect remains of the corn leaf aphid, *Rhopalosiphum maidis* (Fitch), in guts of juvenile striped lynx spiders, *Oxyopes salticus* Hentz. Spiders fed the bird cherry-oat aphid, *R. padi* (L.), were negative. A preliminary experiment suggests that the half-life of aphid DNA detectability for spiders under fluctuating field temperatures is at least 12 h. The assay is cost-competitive with ELISA employing monoclonal antibodies.

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**Matt Greenstone**

**AIBS and BioScience: Opportunities for Arachnologists and for AAS**

**Matthew Greenstone**  
**American Institute of Biological Sciences**

**Abstract:** AIBS is an association of biologists and biological societies. It publishes a journal, BioScience, that is a prime venue for papers in organismal biology, ecology, and environmental science. AIBS also sponsors BioOne, an e-publishing venture that posts the articles in journals of member societies on the web. AIBS and BioScience offer unparalleled opportunities for arachnologists to reach a wider audience, for AAS to increase its clout, and, through BioOne, an opportunity to increase the citation impact factor of the Journal of Arachnology.

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**Anya Hawthorn**

### **How does cribellar thread stick to smooth surfaces?**

**Anya Hawthorn, Brent Opell  
VA Tech; VA Tech**

**Abstract:** Cribellar thread is a dry, fuzzy capture thread that sticks to rough or setose surfaces by entangling small irregularities using a mechanical interlock mechanism like that of Velcro. It also sticks to smooth surfaces by unknown mechanisms, the most likely being van der Waals, (London dispersion) and hygroscopic forces. Tentative support for these mechanisms is provided by comparison of *Hyptiotes cavatus* (Araneae: Uloboridae) capture thread stickiness on a smooth substrate under different relative humidities. A significantly higher stickiness in a high humidity environment suggests a hygroscopic mechanism, and the residual stickiness in a very low humidity environment suggests the action of van der Waals forces. Hydrophilic groups that would facilitate the attraction of moisture for hygroscopic adhesion have a high surface energy which is lost fairly quickly to contaminants in the air. Additional support for a hygroscopic mechanism comes from the observation that cribellar thread lost 55% of its stickiness after 2 months. This is 75% of the loss in stickiness due to aging reported after 14 months. Measurements of *H. cavatus* thread made from light and electron micrographs were used to compute the surface area of cribellar fibril contact. Equations describing hygroscopic and van der Waals forces were used to model the force produced by this area, and these values were compared with the measured stickiness of the thread.

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**William Hickman**

### **A Study of the Spider Fauna at a Reconstructed Prairie in Ohio**

**William Hickman, Richard Bradley  
Ohio State University; Ohio State University**

**Abstract:** Spiders were collected from the reconstructed prairie on the Ohio State University's Marion Regional Campus, Marion County, Ohio using pitfall traps, sweep nets and hand collecting techniques. A total of 997 specimens were collected representing 18 families, 74 genera and 116 species. Comparisons were made of species richness and

abundance with data from other Midwestern tall grass prairies as well as other published studies from similar habitats in North America. The spiders used in this study were collected in six years following a spring burn treatment and five years without a spring burn. The current study analyzes species richness and abundance patterns, as well as the influence of burn treatment on spider activity.

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**Linden Higgins**

**Mortality risk of rapid weight gain**

**Linden Higgins  
Univ. Massachusetts**

**Abstract:** Female *Nephila clavipes* from univoltine populations have greatly reduced reproductive success if they grow slowly and reach maturity late in the growing season. Although such fitness costs are expected to select for rapid weight gain, several authors have presented models and data describing physiological costs of rapid weight gain. In order to test the hypothesis that there are inherent costs of rapid increases in mass, laboratory-reared *N. clavipes* juveniles were randomly assigned to receive daily feedings ranging from 2.5% to 23% of their initial weight. Spiders receiving higher amounts of food grew more quickly but were more likely to die at or immediately before the next molting cycle. These results indicate that there may be inherent physiological costs of rapid weight gain. In opportunistic feeders such as spiders that tend to gorge when prey are abundant, this could present a real cost to a common foraging strategy.

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**Sean Higgins**

**Ground-dwelling spider diversity and colonization of fragmented habitat.**

**Sean Higgins, Ann Rypstra, Chris "Spike" Buddle  
Miami University; Miami University; Miami University**

**Abstract:** Human induced fragmentation of the earth's landscapes affects biological diversity, interspecific interactions, and ecosystem processes. Species have differential abilities to colonize and to compete with one another and those factors drive the complement of species in an area. Recolonization of isolated habitat fragments following disturbance is an important component of local biological diversity. We tested for the effect of an established arthropod community and the nature of the bordering habitat on the colonization of habitat patches in an agricultural ecosystem. Three islands of spider habitat (6 x 6 m) were created in each of six soybean fields by covering the ground with straw mulch and planting weeds. In each field, a 3.5 m border of landscape cloth, tilled ground or no disturbance surrounded the islands. Islands in

three of the fields were sprayed with the insecticide Sevin early in the season to reduce the resident fauna. We measured the effects of these manipulations across three grades of habitat matrix quality by investigating abundance, richness, species diversity, and community structure of ground spiders sampled using pitfall traps.

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## **Maggie Hodge**

### **It's a spider-eat spider world: Does the risk of predation shape a Florida scrub wolf spider community?**

**Maggie Hodge**

**Department of Biology, The College of Wooster, Wooster, OH 44691**

**Abstract:** Intraguild predation (IGP) refers to predatory interactions between different species which use similar resources. Because most spiders are generalist predators on arthropods, different species may interact as both competitors and predators, making them model organisms for the investigation of intraguild predation. The goal of this study was to examine the potential for IGP interactions between two species of *Hogna* sympatric in scrub habitats in Florida: *H. osceola* (the larger species) and *H. ceratiola*. Since hunger is a factor affecting the likelihood of IGP, a measure of food limitation was obtained for each species. Laboratory measures found that spiders are not near satiation, and only 8-10% of spiders collected on a given evening had prey, indicating that food is available in a limited supply. Spiders are capturing prey that are smaller than themselves, even when these prey are other spiders. Between 8% (*H. ceratiola*) and 21% (*H. osceola*) of the diet of each species consists of other spiders. Between 50% (*H. ceratiola*) and 100% (*H. osceola*) of the spider prey taken represented cannibalism or IGP on the other species. Discriminant analysis of habitat use by the two species found that *H. osceola* tends to forage in vegetation, whereas *H. ceratiola* tends to forage on open sand. The two species overlap, however, in their use of leaf litter. Since leaf litter was found to have more insect prey than open sand, I designed field enclosure experiments to examine the role of interspecific interaction on ground substrate preference. When alone in enclosures, *H. osceola* preferred leaf litter and *H. ceratiola* showed no distinct preference for either substrate. When both species shared the enclosure, *H. osceola* retained their preference for leaf litter while *H. ceratiola* exhibited a distinct preference for sand. In addition, *H. ceratiola* gained significantly less weight when with *H. osceola* than they did when in enclosures by themselves, indicating a potential interference effect of *H. osceola*. These results suggest that habitat use by *H. ceratiola* may be mediated by IGP interactions with *H. osceola*.

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## **Paul Klawinski**

### **Effect of Disturbance and Elevation on Patterns of Spider Species Richness**

**Erin Mickelwaite, Paul Klawinski**

**Cooke College, Rutgers University; William Jewell College**

**Abstract:** In Caribbean ecosystems, hurricanes alter forest structure which may affect the number and relative abundance of spider species. In September of 1998, hurricane Georges passed over Puerto Rico, greatly altering forest structure in the Luquillo Mountains. In June 1999 and June 2000, we collected spider diversity data in four forest types in the Luquillo Mountains using the Coddington protocol. Forests are distributed at increasing elevations from Tabonuco (lowest) to Palo Colorado, Palm and Dwarf (highest). We found a total of 76 species across both years. Diversity was highest in Tabonuco and Palo Colorado forest, was lower in Palm forest and lowest in Dwarf forest. The relative abundance of species varied across years with *Leucauge regnyi* composing 60% of the total in 1999 but only 9% of the total in 2000. In 1999, *L. regnyi* was caught more often in ground searches relative to 2000. In 1999, *Theridiosoma nechodoma* was the second most abundant spider on the mountain but increased in abundance in 2000. Hurricane Georges altered the physical structure of the understory making understory habitat more suitable for *L. regnyi* in the summer of 1999. After one year, understory growth (a result of succession) led to a more crowded understory which favored the dominance of the smaller theridiosomatid *T. nechodoma*. Spider communities respond very quickly to large scale disturbances and changes in habitat structure. The Coddington protocol, typically used for rapid assessments of spider diversity, can be used effectively for long-term monitoring of spider communities.

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**Nancy Kreiter**

**Does geographical isolation in pond islands lead to reproductive isolation in populations of the fishing spider *Dolomedes triton*?**

**Nancy Kreiter, Maria Blotny, Laura Elliott  
College of Notre Dame; College of Notre Dame; College of Notre Dame**

**Abstract:** Fishing spiders of the genus *Dolomedes* are largely dependent on water and experience desiccation in a very short period when deprived of a source of water. This and other lines of evidence suggest that *Dolomedes triton* may not disperse far from their natal pond or lake. The resultant geographical isolation provides an interesting model to explore questions about reproductive behaviors and signals that may be subject to selection in isolated populations. Male *D. triton* were caught from a single pond near Laurel, Maryland. These males were randomly paired in the laboratory with newly molted females from either (1) the same pond as the male, (2) a pond located within 5 miles of the male's pond, or (3) a distant pond located more than 60 miles from the male's pond. Interactions between males and females were videotaped and the behaviors coded by observers. Preliminary analysis of this ongoing study indicate that some components of male courtship are dampened when paired with females from other ponds, even those from the nearby pond. The findings of this study may implicate chemical or behavioral mechanisms of reproductive isolation between populations of *D. triton*.

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## Sam Marshall

### The structure of tarantula defensive displays and its relation to alternative defensive strategies

Sam Marshallsd, Richard Blatchford  
Hiram College; Hiram College

**Abstract:** We examined the structure of the defensive display of eight theraphosid genera exposed to two levels of aversive stimulus in the laboratory. The genera were selected to represent divergent clades in the Theraphosidae. The genera tested were *Aphonopelma* (Theraphosinae), *Avicularia* (Aviculariinae), *Pterinochilus* (Harpactirinae), *Heterothele* (Old World Ischnocolinae), *Holothele* (New World Ischnocolinae), *Hysteroocrates* (Eumenophorinae), *Phlogius* (Selenocosmiinae) and *Cyriopagopus* (Ornithoctoninae). We tested 75 individual spiders. The spiders were either subjected to a repetitive puff of air (puff test) or prodded with a blunt probe (prod test). All behaviors were video taped for later analysis. Eight distinct behaviors were observed and described. The topology of the ethograms for the prod test was more complex than for the puff test for all taxa. We analyzed the frequency of the expression of the eight behaviors observed for all individual specimens in the prod test using a hierarchical cluster analysis. Examination of the dendrogram showed two major clusters. One of these contained 24 of the 25 urticating-hair bearing specimens (*Aphonopelma* and *Avicularia*) in addition to 17 of those taxa that lacked an urticating hair defense. This clustering pattern was probably explained by the lack of escalation of the defensive display to a more aggressive defense by *Aphonopelma* and *Avicularia*. Apart from this, there were no obvious topological similarities between the dendrogram and current phylogenies for the Theraphosidae.

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## Neal McReynolds

### Factors influencing the activity of the scorpion, *Centruroides vittatus*, in the Tamaulipan Biotic Province, Texas.

Neal McReynolds  
Texas A&M International University

**Abstract:** *Centruroides vittatus* (Scorpiones: Buthidae) on the campus of Texas A&M International University in the Tamaulipan Biotic Province was investigated to determine factors influencing scorpion activity and habitat selection. Scorpion activity differed significantly with changes in season (activity lower in cooler months of November-February) and temperature (activity higher at higher temperatures). However, there was no significant difference in activity with factors such as the lunar cycle or humidity. The microhabitats used by active scorpions included the ground, small trees (e.g., blackbrush, *Acacia rigidula*), shrubs (e.g., coytillo,

Karwinskia humboldtiana), cacti (e.g., prickly pear, Opuntia engelmannii), and grasses. The microhabitats selected by the scorpions were significantly different with changes in season and temperature. More work is required to understand why these factors effect scorpion activity and habitat selection.

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## **Brent Opell**

### **A preliminary study of New Zealand Amaurobioides**

**Brent Opell**  
**Department of Biology, Virginia Tech**

**Abstract:** Amaurobioides is one of 53 Anyphaenidae genera, and New Zealand's only representative of this family. The 11 described species of Amaurobioides have a Gondwanan distribution. A single species is known from Chile, South Africa, and Tasmania and eight species are known from New Zealand. These spiders are restricted to the splash zone of rocky marine coasts, where they construct tubular silken retreats in crevices and hunt as sit-and-wait predators. This preliminary study of New Zealand Amaurobioides is based on specimens collected from 15 sites on the east and south shores of the South Island and 14 sites in the north of the North Island. Both morphological data (external and internal female genitalic features) and molecular data (12S, 16S, and ND1 mitochondrial DNA sequences) identify two major clades: one containing individuals from the southern South Island, and one containing individuals from both the North Island and the South Island's central and northern regions. These clades may date from the Oligocene, when the North and South Islands were small and widely separated. These preliminary data raise questions about species boundaries. Nine ND1 haplotypes are identified in 23 individuals from the South Island. These populations encompass the ranges of the mainland species *A. martimius*, and *A. picunus*, an endemic species from Stewart Island off the South Island's southern tip. A nested clade analysis links *A. picunus* with northern *A. martimius* populations, but separates this clade from a clade comprised of southern populations of *A. martimius* that are geographically closer to Stewart Island.

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## **Matt Persons**

### **A comparison of visually and chemically mediated acquired predator recognition in the wolf spider *Rabidosa rabida* (Araneae: Lycosidae)**

**Ben Eiben, Matt Persons**  
**Susquehanna University; Susquehanna University**

**Abstract:** Adults of the wolf spider *Pardosa milvina* are predators of spiderlings of the larger co-occurring wolf spider *Rabidosa rabida*. Previous studies demonstrated that some wolf spiders

show effective antipredator behavior (reduced movement) in the presence of silk and excreta from other species of wolf spider, yet the mechanism of predator recognition remains unclear. We investigated the ability of naïve juvenile *Rabidosa* to display antipredator behavior through 24-hr exposure to chemical cues or visual cues of *Pardosa*. Spiders were exposed to one of several predator treatments (N = 20/treatment): 1) only predator visual cues, 2) predator chemical cues only, 3) both visual and chemical cues combined, 4) a positive chemical control (cricket excreta), and 5) a negative control (no previous exposure). Each trial consisted of an initial movement test, a 24-h predator sensory treatment, a second movement test, and finally a predation experiment with actual *Pardosa* to assay the effectiveness of the spiderling's response. *Rabidosa* reduced movement on substrates impregnated with *Pardosa* chemical cues irrespective of prior exposure. However, treatments involving 24-h exposure to *Pardosa* chemical cues illicit increased antipredator behavior and increased survival time in the predation portion of the experiment relative to visual cues only, excreta from crickets, or *Pardosa* cues without prior exposure. Results suggest spiderlings possess innate predator recognition that is enhanced by experience and that recognition occurs through chemical rather than visual means.

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## Matthew Persons

### The effects of pedipalp loss on the courtship and mating behavior of *Pardosa milvina* (Araneae: Lycosidae).

Erin Lynam, J.C. Owens, Matthew Persons

Susquehanna University; Susquehanna University; Susquehanna University

**Abstract:** Males of the wolf spider, *Pardosa milvina*, actively wave their pedipalps during courtship of females. Pedipalp loss is more common among adult males than females. Field surveys indicate that 3% of all adult male *P. milvina* wolf spiders have missing pedipalps (N = 228). We investigated the effect of pedipalp loss on courtship and mating behavior in *P. milvina*. Virgin males were randomly divided into four treatments: left pedipalp removed (N=36), right pedipalp removed (N=34), both pedipalp's removed (N=33), or intact males (N=36). We then paired each male with a randomly selected virgin female. We recorded time to initiate courtship, courtship duration, time spent mounted on the female, mounting success, and courtship intensity as measured by leg waves/min or body shakes/min. There was no significant difference in mounting success of males among treatments. However, pedipalp loss reduced courtship intensity which is significantly associated with mating success. Intact males suffered fewer predatory attacks by females than palpectomized males. Loss of the left pedipalp resulted in significantly less intense courtship, higher female aggression levels, and delayed onset of courtship compared to males missing the right pedipalp. We conclude that *P. milvina* exhibits biased pedipalp use during courtship and that pedipalp waving may function in reducing female aggression.

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## Simon Pollard



**Secondary sexual characters in *Thorelliola ensifera* (Araneae: Salticidae): a jumping spider with horns**

**Simon Pollard, Robert Jackson**

**Canterbury Museum, Rolleston Avenue, Christchurch, New Zealand; Department of Zoology, University of Canterbury, Christchurch, New Zealand**

**Abstract:** Male-male competition appears to have led to the evolution of armaments in some male salticids. These structures are usually exaggerated forms of the chelicerae or parts of the anterior cephalothorax of conspecific females. Male *Thorelliola ensifera* have two dorsally curved horns formed from two macrosetae projected forward from below the anterior medial eyes. In conspecific females two smaller mechanoreceptive setae are located in the same position as the male's macrosetae. The basal segments of *T. ensifera*'s chelicerae are also sexually dimorphic. In females the anterior surfaces are convex, while the males are concave and consequently have ridges on their lateral borders. During contests, size-matched males lock horns for 2-3 sec in what appear to be contests of strength. Since the male's horns are probably enlarged mechanoreceptors, it seems likely that they can transfer information about the strength of opponents when the horns are locked together. The horns have a band of curved grooves approximately one third from their bases and these may function to maintain the opponent's horns in a locked position during contests. Most contests appear to be resolved by locking horns and only 25% of contests escalate to lengthy tactile displays with extensive contact of horns, chelicerae, palps and legs.

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**Ken Prestwich**

**Aerobic Metabolism During Recovery from Maximal Exercise in Araneomorph Spiders**

**Ken Prestwich, Melissa Cunningham, Sarah Gibbs**

**College of the Holy Cross; College of the Holy Cross; College of the Holy Cross**

**Abstract:** Spiders may exert themselves maximally during forced activities such as escape from predators or perhaps prey capture. Although we have some understanding of biochemical events during maximal exercise and in recovery, technical limitations have, until recently, prevented us from measuring respiratory gas exchange during recovery in araneomorph spiders. We will present continuous, simultaneous measurements of O<sub>2</sub> consumption, CO<sub>2</sub> elimination, and the respiratory exchange ratio, R, in lycosids and filistatids recovering from two minutes of forced, maximal activity. At 25 C these spiders needed over one hour to recover from the two minute exercise. Peak O<sub>2</sub> consumption occurred early during recovery and was six times resting values for members of both groups. However, absolute values of O<sub>2</sub> consumption were greater in lycosids. O<sub>2</sub> consumption decayed exponentially and by the end of one hour it was twice pre-exercise rates. Highest rates of CO<sub>2</sub> release occurred early in recovery and were over 50% greater than peak rates of O<sub>2</sub> consumption. Early in recovery R values approached

1.6. These exceptionally high values are due both to high CO<sub>2</sub> production (high aerobic metabolism during recovery) and CO<sub>2</sub> being driven from the body by increased [H<sup>+</sup>] from d-lactic acid produced during exercise. The rate of CO<sub>2</sub> release decreased exponentially such that after one hour R was below resting levels. These results are similar to those reported for theraphosids. They emphasize the potential pitfalls of using CO<sub>2</sub> to estimate metabolism in active spiders and they underscore the low aerobic capacities of some, perhaps most, spiders.

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**David Richman**

### **The Influence of Brush Invasion on Spider Communities in an Arid Environment**

**David Richman, Mary Whitehouse, David Hu**

**New Mexico State University; David Ben Gurion University; New Mexico State University**

**Abstract:** Spiders were used as an indicator taxon to test the differences in community composition between degraded and natural arid lands in Chihuahuan Desert grassland. Spiders were sampled from 15 5x5-m plots and 14 marked shrubs (a total of 6 mesquite, 4 creosote and 4 tarbush plants) during two different seasons (October-November 1999 and April-May 2000) at sites on the Jornada Experimental Range (USDA), in Doña Ana County, New Mexico using pitfall traps and timed searches. A total of 967 spiders were collected (557 in October-November and 410 in April-May). The spiders were identified to species, whenever possible. We found no evidence of spider diversity differing consistently between sites. However, there were some significant differences in the habitat preferences of the common species. Oxyopids (mostly *Oxyopes apollo*), black widow spiders (*Latrodectus hesperus*) and salticids in the genus *Habronattus* were more abundant in grassland plots, while pholcids (especially *Psilochorus imitatus*) and araneids (primarily *Metepeira* spp.) were more abundant in brush invaded sites (probably because brush invaded sites contained animal burrows and large plants which were useful frameworks for web construction). Most other families had scattered distributions.

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**J. Andrew Roberts**

**Male recognition of female reproductive state, but not species, based on chemical cues.**

**J. Andrew Roberts, George W. Uetz**

**University of Cincinnati; University of Cincinnati**

**Abstract:** The silk of spiders often serves a critical function in communication. This research concerns chemically-mediated recognition in the wolf spider *Schizocosa ocreata* (Hentz). Previous studies have shown that male *S. ocreata* exhibit courtship behavior with equal frequency when paired with conspecific, or a closely related ethospecies, *S. rovneri* (Uetz & Dondale), females and/or their silk, raising questions about species recognition. Here, we test

hypotheses about male recognition of female chemical signals at the inter- and intra-species levels. Male *S. ocreata* show decreased courtship display with washed conspecific female silk, orb weaver (*Metepeira*) silk, and filter paper controls, suggesting that males recognize chemicals in silk. However, male *S. ocreata* respond with equal frequency to conspecific and closely related, but heterospecific, *Schizocosa* silk. Detailed analysis of male display behavior in response to silk of female conspecifics and silk from *S. rovneri* reveal no significant differences. These results suggest that species recognition by males within the *S. ocreata* clade may not be based entirely on chemical cues. However, behavior of males does vary in response to the silk of (conspecific virgin) females of different reproductive states. Males display with greater frequency and exhibit higher rates of courtship behaviors when presented with the silk of virgin adult females vs. the silk of juvenile or mated females. Moreover, the intensity of male courtship display varies with female age post-adult molt, suggesting that females signal potential receptivity with chemical means. Results provide evidence for the importance of chemical communication in a well-studied spider model system.

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**Ann Rypstra**

**A Test For Differential Colonization Ability Of Two Species Of Wolf Spiders.**

**Ann Rypstra, Samuel Marshall  
Miami University; Hiram College**

**Abstract:** The wolf spiders *Hogna helluo* and *Pardosa milvina* (Lycosidae) exhibit a trade-off in competitive and colonization ability (Marshall et al. 2000). The goal of this project was to characterize that trade-off further by determining the relative effects of bordering habitat and the resident arthropod community on the ability of these species to colonize habitat islands. Three islands of spider habitat (6 x 6 m) were created in each of six soybean fields by covering the ground with straw mulch and planting weeds. In each field, a 3.5 m border of landscape cloth, tilled ground or no disturbance surrounded the islands. Islands in three of the fields were sprayed with the insecticide Sevin early in the season to reduce the resident fauna. Densities of *Hogna*, known to be a poor colonizer, were affected by the border habitat with the fewest colonizing the plots surrounded by landscape cloth and the most colonizing islands with undisturbed borders. Densities of *Pardosa* were not affected by the border habitat but were found at significantly lower densities in plots treated with insecticide. These results suggest that *Hogna*'s ability to invade the habitat islands was affected by the intervening habitats. However, as a good competitor and predator its ability to establish itself was not affected by the resident community. *Pardosa* was unaffected by the border but it was negatively affected by the application of insecticide either directly or through a depression of its prey base or both.

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**Richard G. Santangelo**

**Colorado Spider Survey Update**

**Paula E. Cushing, Richard G. Santangelo**  
**Denver Museum of Nature and Science; Denver Museum of Nature and Science**

**Abstract:** The Colorado Spider Survey began in May 1999. Through training workshops and spider biology classes, this project has taught over 400 Coloradans about spiders. Between 40 to 70 of these participants are now collecting spiders throughout the state and sending them to the Denver Museum of Nature and Science for identification and storage. An update on the progress of this project is provided including information about state records for species and species range extensions. The data from this project can be accessed by clicking on the database tab on the Colorado Spider Survey website at <http://www.dmns.org/spiders1.htm>.

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**Andrew Sensenig**

**Elastic mechanisms in arachnid legs**

**Andrew Sensenig, Jeffrey Shultz**  
**University of Maryland; University of Maryland**

**Abstract:** Elastic mechanisms may play an important role in propulsive leg extension in several arachnids including scorpions, harvestmen, pseudoscorpions and sun spiders. Arthrodistal sclerites act as elastic extenders in the scorpion claw and femur-patella joint. We have quantified the roles of hydraulic and elastic mechanisms in scorpion walking legs and their homologous joints in the pedipalp. We are surveying arachnids for elastic mechanisms and to quantify elastic energy storage. To do this, we have used a computer-controlled stepper motor and rotational transducer to construct a device that rotates joints of amputated legs through specified arcs at specified rates. A highly sensitive force transducer measures the force during joint flexion and extension. These force measurements can be used to calculate mechanical energy storage. Based on our results, we are testing hypotheses concerning the biomechanics and phylogenetic distribution of springs in arachnid legs.

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**Jeff Shultz**

**Combined Morphological and Molecular Analysis of Arachnid Phylogeny**

**Jeffrey Shultz, Jerome Regier**  
**University of Maryland; University of Maryland**

**Abstract:** This study combined data from fossils, skeletomuscular anatomy and amino acid

sequences from elongation factor 1-alpha and RNA polymerase II in an attempt to resolve relationships among the arachnid orders. In contrast to a recent study by Wheeler & Hayashi (1998: Cladistics ), which recovered an Araneae+Amblypygi clade, our analysis recovered Pedipalpi (= Amblypygi + Thelyphonida + Schizomida) as the monophyletic sister group to Araneae. Our analysis also tended to recover an Opiliones+Scorpiones clade, and, when fossils were considered, we could not rule out the possibility that Opiliones was derived from within Scorpiones. Despite strong molecular and/or morphological support for the monophyly of most orders (except Acari) and certain ordinal groupings, the basal relationships within Arachnida remain uncertain.

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## **Matt Stephens**

### **Tarantulas prefer used retreats.**

**Matt Stephens, Sam Marshall  
Hiram College; Hiram College**

**Abstract:** We studied the effect of prior residency cues on retreat-site selection in an arboreal tarantula, *Avicularia avicularia* (Araneae, Theraphosidae, Aviculariinae). We presented *Avicularia* with a choice of an artificial retreat that it had been confined to for one week and an artificial retreat that had never been used. We constructed artificial "trees" that consisted of a 1.27 cm diameter 77.0 cm tall PVC tubing trunk with two 3.81 cm diameter, 13.5 cm long PVC tubing retreats oriented vertically on each side of the top of the vertical support. The test trees were anchored in water-filled trashcans to deter the spiders from leaving the PVC test apparatus. Each of 22 test *Avicularia* were confined to each retreat tube for eight days by fiberglass mesh secured with rubber bands. After the eight-day period the *Avicularia* were removed from the tube and the used tube was placed at the top of the apparatus along with a new tube. The *Avicularia* were placed into open cups at water level at the base of the trunk. The following morning the retreat selected by the *Avicularia* was noted. A total of 21 *Avicularia* were tested. The results from two of these were discarded because one spider died, and the other was disturbed while making a choice. Out of the remaining 19, 15 of the *Avicularia* selected their old retreat, and four of the *Avicularia* went into the new tubes. Based on a binomial test with an expectation of random choice this is a significant preference for the used retreat ( $p = 0.01$ ).

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## **Gail Stratton**

### **The Evolution of Neustonic Locomotion in Araneae.**

**Gail E. Stratton, Robert B. Suter, Patricia R. Miller  
Univ. of Mississippi; Vassar College; Northwest Mississippi Community College**

**Abstract:** The specialized rowing gait of Dolomedes (Pisauridae) on the water surface is well-studied and differs from walking in that legs I are held parallel and anterior, legs II and III are moved in parallel, and legs IV are held parallel and posterior. In contrast, while walking, the members of each pair of legs alternate. We mapped two characters, hydrophobicity and ability to row, on cladograms of Araneae and Lycosoidea. We present a comparison of 581 individuals in 192 species with representatives from 34 families of mostly North American spiders. Six of the 34 families of spiders examined have species that adopt a Dolomedes-like gait when on the water surface. The majority of rowers were found in the Lycosoidea, from the families Ctenidae (1 of 3 species studied), Pisauridae (8 of 8 species), Trechaleidae (1 of 1 species), and Lycosidae (27 of 48 species). Other families that have species that can row include Salticidae (1 of 12 species) and Thomisidae (1 of 4 species). A quantitative means of scoring shows that there is very little variability in the rowing of Pisauridae and Trechaleidae. In Lycosidae, variability is much higher both within and between species. Examination of the distribution of the ability to row suggests it evolved in the Lycosoidea. Differences in the variability of rowing suggests there may be selection pressures present for spiders that are more consistently near water.

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**Robert B. Suter**

### **Biomechanical Attributes of the Air-Water Interface**

**Robert B. Suter, Huy Huynh  
Vassar College; Poughkeepsie High School**

**Abstract:** The air-water interface has peculiar properties in large part because water molecules are polar, form inter-molecular hydrogen bonds, and so develop a surface tension wherever they come into contact with air. The biomechanical properties of this interface include its ability to support small hydrophobic objects (e.g., some spiders), to transmit energy and information in the form of waves, to act as a gill, and to entrap small hydrophilic objects. Semi-aquatic spiders such as Dolomedes triton (Pisauridae) make use of all of these properties in their locomotion, prey detection and predator evasion. Relatively simple physical and fluid dynamic models adequately account for the locomotion of pisaurids, but new data indicate that the simplicity is deceptive. It now appears that subtle changes in cuticular chemistry strongly influence the interaction between the spider's leg and the air-water interface, and that semi-aquatic locomotion involves a compromise: decreased hydrophobicity renders the power phase of a stroke more effective in generating thrust, but increased hydrophobicity makes it easier to escape the water's adhesive forces on the return phase of the stroke.

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**Lisa Taylor**

### **Mother-offspring interactions and aggregation in two Amblypygid species**

**Lisa Taylor, Linda Rayor  
Cornell University; Cornell University**

**Abstract:** Extended maternal interactions with offspring, social behavior, and aggregation are extremely rare among arachnids. Contrary to the literature, which describes amblypygids as strictly solitary animals, we observed extensive tolerance, extended mother-offspring interactions, and active aggregation in two species of captive amblypygids: *Damon variegatus* (Family Phrynichidae) and *Phrynus marginemaculata* (Family Phrynidae). We provide evidence of extensive social interaction and active aggregation between mother and offspring *D. variegatus* for 10 months, and continued aggregation of siblings until they reached sexual maturity at 16 months, as well as aggregation in mixed-age groups of *P. marginemaculata*. Aggregation was not observed in adult *D. variegatus* that came together only for courtship and mating. Possible costs and benefits of aggregation were examined: First, we determined that the captive amblypygids did not group merely to take advantage of favorable microclimates within the experimental cages, as aggregations were still found in adult *P. marginemaculata* and immature *D. variegatus* in texturally and spatially 'uniform' environments. Nor did manipulation of food abundance affect an individual's tendency to aggregate or disperse in a group of adult *P. marginemaculata*. To determine whether predation risk was associated with aggregation, we introduced an insectivorous *Anolis* lizard. Instead of evoking defensive aggregation, the large potential predator evoked active predatory investigation. Individuals within groups interacted constantly with their whips, by stroking the bodies of nearby individuals, and oriented their whips in the direction of their neighbors. We conclude that both amblypygid species show high levels of social behavior and tolerance, at least in captive situations.

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**Wu Ting**

**Phylogenetic analyses of molecular and morphological traits indicate cryptic species and the repeated evolution of an ecomorph in Florida's *Geolycosa wolf* spiders**

**Wu Ting, Sam Marshall, Kory Thornburg, Randy Hoeh  
Kent State University; Hiram College; Kent State University; Kent State University**

**Abstract:** Currently, 15 species of *Geolycosa* have been described based on a limited number of morphological characteristics. The state of Florida has nine *Geolycosa* sp., seven living in scrubs and sandhills across the state. The goals of this project are: 1) to estimate the evolutionary relationships among Floridian *Geolycosa* populations and species and between Floridian *Geolycosa* and *Geolycosa* from the rest of the USA and, 2) to examine patterns in the evolution of the two ecotypes of *Geolycosa*: those that build turrets at the entrance of their burrow and those that don't. We used cytochrome c oxidase subunit I (COI) DNA sequences and morphological traits in a cladistic analysis. *Geolycosa* individuals from a total of 63 Florida scrub sites were collected and identified based on morphological characteristics. Total DNAs from 74 individuals representing the species *G. escambiensis*, *G. micanopy*, *G. patellonigra*, *G.*

x. xera, G. x. archboldi, G. hubbelli, G. ornatipes, G. wrighti, G. missouriensis, G. rafaelana, G. turricola, and G. pikei. Results to date suggest that: 1) Floridian Geolycosa are not a monophyletic assemblage, 2) G. xera, G. escambiensis, G. hubbelli, G. patellonigra, and G. micanopy are not valid species in a phylogenetic sense, and 3) the two distinct ecotypes of Geolycosa have evolved repeatedly across the state. We found evidence that the Geolycosa of the entire eastern USA are derived from ancestors in the western Panhandle, and that the pattern of divergence within Florida occurred from west to east.

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**Aaron Tolin**

**Does juvenile *Hogna helluo* (Araneae: Lycosidae) have the ability to detect intraspecific adult cues?**

**Aaron Tolin, Ann Rypstra, Matt Persons  
Miami University; Miami University; Susquehanna University**

**Abstract:** The ability of an immature to detect adults of its own species has important ecological implications. The experiment was designed to test if juvenile *Hogna helluo* can detect chemical cues deposited by adult *Hogna*, such as their draglines and feces. This was done by creating an environment in which two halves of a circular arena was separated by a neutral space, on either side of which variations of treatments were established. Juvenile *Hogna* were subjected to three types of environments; a control where adult cues were not present inside the test area, a second treatment where adult cues were throughout the test area, and a treatment where adult cues were present in one half of the test area. The juvenile *Hogna* were released into the neutral space and its movements were recorded for fifteen minutes using an automated digital data collection system. There were a total of twenty trials for each treatment. Results of the study show that immature *Hogna* move less distance in areas cued by adults as compared to areas that are free of adult cues. Moving around less results in decreased exposure to the environment; this would be advantageous, as the juvenile would be more likely to avoid competition and potential predation with the adult and thus increasing its own survivability. The response to adult evidence by the immatures could affect the overall shift in density of *Hogna* in an area and alter its population dynamics.

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**William Ian Towler**

**Genetic divergence in Central Mexican *Centruroides limpidus* (Karsch, 1879) and *C. infamatus* (C. L. Koch, 1844) (Scorpiones: Buthidae) as revealed by 16S mitochondrial DNA**

**William Ian Towler, Javier Ponce Saavedra, Benjamin Gantenbein, Victor Fet  
Marshall University; Faculty Biología, Universidad Michoacana de San Nicolás de Hidalgo; Institute of Zoology, University of Bern; Marshall University**



**Abstract:** Several species of highly toxic *Centruroides* inhabit Central Mexico. Relationships between common species and subspecies, *C. infamatus infamatus*, *C. i. ornatus*, *C. limpidus limpidus*, and *C. l. tecomanus*, are not resolved; existing taxonomy is based on a few morphological characters. Comparison of mtDNA sequences of ribosomal genes provides a new and powerful tool to examine such situations. Scorpions were collected from 14 different localities in Michoacan, Queretaro and Guerrero, Mexico; collection sites varied in altitude (from 300 to 1940 m a.s.l.) and ecology. DNA sequences of the mitochondrial 16S rRNA gene reveal a complex taxonomic situation. At least three separate lineages are confirmed, with the 6-18 % sequence divergence. Comparison with other buthid species (*Mesobuthus* from Western and Central Asia; our data) show that similar level of divergence is exhibited by congeneric morphospecies. It is suggested that *C. i. ornatus* may deserve a species status.

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**Mark Townley**

### **Egg sac attachment to spinnerets in wolf spiders**

**Mark Townley, Edward Tillinghast  
University of New Hampshire; University of New Hampshire**

**Abstract:** In araneids, secondary major and minor ampullate silk glands function only during proecdysis, when the primary major and minor ampullate silk glands are being remodeled and are nonfunctional. In adult araneids, the secondary ampullate glands and their spigots exist only in a nonfunctional vestigial state (the vestigial spigots are referred to as nubbins). Observations on the spinnerets of several lycosid species indicate that the ampullate glands of male and juvenile female lycosids undergo the same ontogenetic changes as araneid ampullate glands. Adult female lycosids, however, retain functional secondary major and minor ampullate glands and the bases of their spigots are noticeably larger than those of the corresponding primary major and minor ampullate glands. At least one use to which these secondary ampullate glands are put is producing fibers that secure the egg sac to the spinnerets. Silk from the primary ampullate glands is used concurrently for the same purpose, but the greater diameter of the secondary ampullate gland fibers suggests that they bear the greater part of the burden. That the secondary ampullate glands of adult female lycosids may be used for other purposes as well is suggested by observations, in the literature and from our laboratory, indicating that functional secondary ampullate glands are also retained by adult females, but not adult males, in a number of other families (e.g. *Agelenidae*, *Clubionidae*, *Thomisidae*) in which egg sacs are not carried on the spinnerets.

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**George Uetz**

**Multi-modal communication, species recognition and mate choice in *Schizocosa* wolf spiders: results of cue isolation, cue-conflict and audio/video playback studies.**

**George Uetz, J. Andrew Roberts, Melissa Orr**  
**University of Cincinnati; University of Cincinnati; University of Cincinnati**

**Abstract:** Wolf spiders (Lycosidae) exhibit multi-modal communication (visual and vibration), as well as complex multiple-component visual signals in courtship. We studied the role(s) of male courtship modes in species recognition and mate choice in closely-related species of *Schizocosa*. Results of cue isolation experiments suggest that female responses to male courtship modes have diverged among species of the *S. ocreata* clade. In some species, a single component is both necessary and sufficient to elicit female receptivity, while in others, multiple components are equivalent. Females of sibling ethospecies *S. ocreata* and *S. rovneri*, discriminate heterospecifics when both vibration and visual cues are present, but make recognition errors when only a single mode is present. Cue-conflict experiments (conspecific/heterospecific components together) combining video/audio playback show that females of these species vary in response to mixed information, and differ in reliance on visual and vibration cues. Multi-component visual displays in male *S. ocreata* (decorative leg tufts and displays) may covary with condition in live males, and visual signaling may serve an indicator trait function in female mate choice. Video playback experiments manipulating tuft size and display rate show female receptivity varies with both traits independently, as well as together. However, cue-conflict video playback experiments (negative covariance) suggest that variation in male display rate may override variation in tuft size as a criterion of female choice. If so, then leg tufts may also serve as an amplifier of condition-indicating displays. The role of various signaling modes will be discussed in the context of evolution of multi-modal communication.

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**George Uetz**

**Mating behavior and mate preference in *Schizocosa ocreata*: the female perspective.**

**Stephanie Norton, J. Andrew Roberts, Phil Taylor, George Uetz**  
**University of Cincinnati; University of Cincinnati; University of Cincinnati; University of Cincinnati**

**Abstract:** Courtship behavior has been studied extensively in the wolf spider *Schizocosa ocreata*. While much research has tested predictions of sexual selection theory regarding male traits used in female mate choice, some important assumptions about female behavior remain untested. Because variation in female mating behavior is critical in sexual selection, we studied several aspects of mate choice from the females' perspective: (1) Do females mate more than once? (2) Does female receptivity vary with age (post-adult)? (3) Is female preference for male characters (leg tufts and visual courtship displays) repeatable? Females were paired with multiple males, and re-mating by females was rare (6%). To examine variation in receptivity with age post-adulthood, we studied responses of females to live males and video playback. In live pairings, cumulative mating probability increased over a 14-day period post-molt, with 90% mated within 7 days. Receptivity varied significantly with age post-adulthood: females were

more aggressive and less receptive to video images of courting males in the first week, became significantly more receptive after 3 weeks, and less thereafter. To determine repeatability of mate preference, females were shown videos of courting males (identical in behavior and size, but different tuft sizes) simultaneously in a choice chamber, either one time or once/day over 4 days. Female preference for larger tufts was significant across categories when measured once, and was repeatable when choosing between an average male and one with reduced tufts, but not when choosing between an average male and one with enlarged tufts.

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**Carlos Valderrama**

**Landscape Arachnology: Preliminary results on the effect of fragmentation of bottomland hardwood forest in the spider communities in Southeastern Louisiana**

**Carlos Valderrama, Thomas W. Sherry  
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**Abstract:** Forest fragmentation causes diverse changes in natural habitats, which should impact spiders via isolation of populations, starvation and local extinction. The spiders were captured by hand collecting, beating traps and Berlesse funnel and following the methodology proposed by Coddington et al. for the evaluation of diversity. Preliminary results of changes in spider communities in Bottomland hardwood forests in Southeastern Louisiana suggests a reduction on the diversity of spider in smaller fragments. Large orb-weaving spiders are among the guilds that shows a more significant reduction in diversity. The study areas are 12 fragments with a range from 4 Ha. forest remnants in urban and suburban areas to large areas of forest that include the Atchafalaya basin and the Pearl River basin. Changes in fragment isolation, forest structure and prey abundance are been evaluated as possible mechanisms responsible of the drop on spiders'  $\frac{1}{2}$  diversity.

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**Melissa Varecchia**

**A test for aggregative behavior in the arboreal Asian tarantula *Poecilotheria regalis* (Araneae, Theraphosidae, Selenocosmiinae).**

**Melissa Varecchia, Barbara Vasquez, Sam Marshall  
Hiram College; Hiram College; Hiram College**

**Abstract:** We examined aggregative behavior in the arboreal tarantula *Poecilotheria regalis* (Araneae, Theraphosidae, Selenocosmiinae). This experiment was designed to test for mutual attraction (or repulsion) in group-reared spiders placed in groups in experimental containers with an equal number of spiders as retreats. The test spiders were captive bred and raised in groups. The current studies were conducted when the spiders were approximately 1 year old.

Each spider was individually paint marked and placed into a 15 cm by 15 cm by 18 cm tall plastic container in groups of four. In each of the four corners of the container there was a vertically-oriented retreat made of a clear plastic tube 2 cm wide and 10 cm long open on both ends. We tested a total of 20 groups. Each morning for five mornings all spiders were located and their location (retreat number) was noted. For the first morning  $\chi^2$  census most spiders were grouped (66 out of 80). When we tested the condition of all spiderlings (solitary, or in a group of two, three, or four) against an expectation of random retreat choice we found no significant difference (chi sq. = 5.25, 3 df). While there was no evidence for mutual attraction based on an expectation of random settlement in a retreat, there was no repulsion either. We did find that this tendency to settle in retreats randomly in regard to group size changed across the five days, with spiderlings more often solitary or in smaller groups by the fifth morning.

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**Rick Vetter**

**Lymphomatoid papulosis: a rare lymphoproliferative skin disorder that is often diagnosed as brown recluse or generic spider bite**

**Richard Vetter, C.A. Thomason**

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**Abstract:** Lymphomatoid papulosis (LyP) is a lymphoproliferative disorder (classified as a pre- or low-grade cutaneous T-cell lymphoma) exhibiting intermittent recurring lesions, either as single or multiple dermal eruptions lasting 2 to 8 weeks, with spontaneous regression often leaving unsightly scars. New lesions can appear weeks, months or years later at different and previous locations on the body. It is rare and non-fatal but LyP sufferers have a 5 to 20% chance of progressing to potentially fatal lymphoid and non-lymphoid malignancies. LyP is difficult to properly diagnose due to rarity (1 new case per million people) and its expression is paradoxical (clinical examination suggests benign condition whereas histologic biopsies often indicate malignant lymphoma). We conducted a survey of 102 LyP sufferers through an LyP Support group. Because most general physicians have never heard of LyP, these lesions were often misdiagnosed as common conditions of diverse etiology (eczema, psoriasis, leukemia, adult acne, etc.). Thirty-one respondents were given 40 diagnoses involving arthropods (e.g., mites, fleas, scabies, insects). Fourteen diagnoses (of the 40) invoked spiders; four specifically blamed the brown recluse for the wound. Three brown recluse bite diagnoses originated from areas of the country that are outside the range of the brown recluse spider; one of these patients had his "brown recluse bite" surgically removed. It is hoped that this study will 1) educate physicians about LyP and the difficulty of diagnosing the condition and 2) reduce physician reliance on blaming the brown recluse spider for wounds it cannot logically cause.

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**Sean Walker**

**Do Sex Differences in Mortality Really Result in Dwarf Males?**

**Sean Walker**  
**Department of Zoology, Miami University**

**Abstract:** The evolution of sexual dimorphism in spiders has attracted evolutionary biologists since Darwin. Recently, a great deal of controversy has been generated by a simple model that predicts small male size and a high degree of sexual dimorphism in spiders with extremely male biased adult mortality. Male biased adult mortality results in a female biased operational sex ratio and decreased intensity of sexual selection on male size resulting in an optimal male size that is much smaller than the optimal female size. However, the differential mortality model does not include any cost of early maturation. I created a simple life-history model based on similar assumptions to examine how costs of early maturation (pre-mating mortality) may constrain the degree of sexual dimorphism and optimal male size. When no cost of early maturation is incorporated into my model, it predicts large increases in the degree sexual size dimorphism (ratio of female to male size) as the ratio of male mortality to female mortality increases. However, when I incorporate a cost of early maturity into my model, the optimal male size becomes constrained resulting in a small increase in the degree of sexual size dimorphism as sex differences in mortality increase. This occurs because early maturation by males is balanced the probability of pre-mating mortality. This suggests that sex differences in adult mortality influence optimal male age and size through their effects on the operational sex ratio and sexual selection. However, these effects are balanced by the potential costs of early maturation.

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