AMERICAN ARACHNOLOGY

The Newsletter of the American Arachnological Society

Number 44 **November 1991**

1992 ANNUAL MEETING

Craig Hieber will host the society's 1992 meeting St. Anselm College, Manchester, N.H. The meeting will run from 23 to 27 June.

ELECTION RESULTS

The following were selected in this spring's elections:

President-elect: James E. Carico
Secretary: Brent D. Opell
Director: Charles E. Griswold

NOTICES AND REQUESTS

Poisonous Spiders Needed

James C. Cokendolpher, 2007 29th Street, Lubbock, Texas 79411 (telephone: 806 744-0318) is preparing a color slide series on the medically important spiders of the world. Thus far, most USA species have been photographed, but many foreign species are still needed. If you have access to living material and are willing to ship it to Mr. Cokendolpher, please contact him for details.

Information and Specimens Sought

James C. Cokendolpher (see above request for address) is preparing a manuscript on the pathogens, parasites, and parasitoides of Opiliones. He is interested in obtaining any diseased or parasitized opilion from anywhere (write first on dried fungal samples, as permits will be required for importation from foreign countries). Gifts of opilions (alive or preserved) with attached parasitic mites would also be appreciated. Citations to publications which do not primarily deal with opilions but that do mention records of disease or parasites in opilions would also be appreciated.

Chamberlin Reprints

Recently I received the entire stock of Ralph V. Chamberlin's publications on Centipedes and Millipedes. Anyone desiring a set of these papers may write me and I will send what is available. W. F. Rapp, 430 Ivy Avenue, Crete, NE 68333.

IN THIS ISSUE

AMERICAN ARACHNOLOGY is the official newsletter of the American Arachnological Society and is distributed twice a year to members of the society. Items for the newsletter should be sent to the editor, Brent D. Opell, Department of Biology, Virginia Tech, Blacksburg, Virginia 24061, U.S.A. (Bitnet address: Uloborid@VTVM1. Deadline for receipt of material for the fall issue is 10 September and for the spring issue 10 March. All correspondence concerning changes of address and information on membership in the American Arachnological Society should be addressed to the Society's membership secretary, Norman I. Platnick, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, U.S.A. Members of the Society also receive the JOURNAL OF ARACHNOLOGY, which is published three times each year.

J O A Cover Photo Wanted

Anyone wishing to submit a photo for possible use on the cover of Journal of Arachnology may do so by sending it to: Jim Berry, Department of Biological Sciences, Butler University, Indianapolis, IN 46208

Nomenclatural Notes

Applications appearing in Volume 48 (27 June 1991) of Bulletin of Zoological Nomenclature:

Case 2791: *Chelifer museorum* Leach, 1817 (currently *Cheiridium museorum*; Arachnida, Pseudoscorpionida): proposed conservation of the specific name.

Case 2759: *Goniosoma conspersum* Perty, December 1833 (currently *Mitobates conspersus*; Arachnida, Opiliones): proposed conservation of the species name.

Opinions published in Volume 48:

Opinion 1637. *Aphonopelma* Pocock, 1901 (Arachnida, Araneae): given precedence over *Rhechostica* Simon, 1892.

RESEARCH NOTE

SOME POMPILID WASPS AMPUTATE THE LEGS OF THEIR SPIDER PREY

On 22 July 1991, I observed a female pompilid wasp *Auplopus nigrellus* (Banks) chasing a female *Aysha incursa* (Chamberlin) up (about 1 meter) and down an elm tree in my backyard. The spider ran frantically, never stopping to fight. Once the wasp was able to corner it on the ground at the base of the tree, it stung and paralyzed the spider. This is not so remarkable, as all pompilids provide spiders as food for their unhatched eggs in this fashion. What appeared remarkable at the time was that the wasp amputated all the spider's legs before carrying the prey away. After consulting Foelix's "Biology of Spiders", I thought I had discovered something new. Correspondence with Dr. Howard E. Evans of Colorado State University revealed that my observations only confirmed those of previous authors, except that I had found a new prey species. Even the new prey record was not very exciting, as Aysha gracilis as well as several other species had already been reported. Dr. Evans also kindly identified my specimen and provided me with citations to some of the literature on this group of interesting wasps. At least two genera in our region amputate some or all of the spider's appendages prior to moving it to the next site. Foelix's book also does not mention that some adult pompilids feed on spider hemolymph. This information, as well as a wealth of other data, are provided in two general papers on pompilid biology: Evans, H. E. 1953. Comparative ethology and the systematics of spider wasps. Systematic Zool., 2:155-172 and Evans, H. E. and C. M. Yoshimoto, 1962. The ecology and nesting behavior of the Pompilidae (Hymenoptera) of the northeastern United States. Misc. Publ. Entomol. Soc. Amer., 3:67-119.

James C. Cokendolpher, 2007, 29th Street, Lubbock, Texas 79411

ARACHNOLOGY AT THE VIRGINIA MUSEUM OF NATURAL HISTORY

Established in 1988 as an agency under the Secretary of Conservation and Natural Resources, the Virginia Museum of Natural History may claim to be the youngest institution of its kind in the United States. Located in Martinsville, in the southwestern Piedmont region of the state, the museum is "off the beaten track" in terms of population centers, but admirably placed with respect to research opportunities. Five hours drive will take one to either the seacoast at Virginia Beach, the Cumberland Mountains on the Kentucky border, or Jon Coddington's laboratory at the USNM.

At present, seven curators represent the areas of mammalogy, herpetology, archaeology, hardrock geology, vertebrate paleontology, invertebrate paleontology, and living invertebrates. Although no geographic constraints are imposed on curatorial research, substantial emphasis is understandably placed on the "natural history" of Virginia and adjacent regions. In this context, the Department of Recent Invertebrates has undertaken an inventory of the state's fauna in selected arthropod and mollusk groups. Data on geographic and seasonal occurrence are accumulated from recent literature, museum collections, and on-going field work, and it is

hoped that baseline accounts will be published, as various taxa achieve a satisfactory level of coverage, in a series "Invertebrata Virginiana."

Departmental holdings in arachnids got off to an admirable early start with the donation of his personal spider collection by Bill Shear, who is a member of the museum's Board of Trustees. This extensive material consisted of over 900 vials of about 300 species of identified spiders, chiefly from Ohio, Pennsylvania, West Virginia, Florida, and New Mexico. In many families, the material has been used in revisions and authoritatively labeled by such specialists as Gertsch, Levi, Platnick, Ivie, Brady, Opell, and the donor himself, greatly facilitating the identification of incoming samples.

Under the constraints of funds, space, and, above all, curatorial time, collection development in all taxa is centered almost exclusively on the Virginia fauna. This means that VMNH will never have a large scorpion collection, but building adequate series of other mega-arachnids (sorry, no mites except in Berleseate residues!) still provides an adequate challenge, with nearly 800 species to be expected instate amongst spiders, opilionids, and pseudoscorpions. A long-range goal is to establish the precise Virginia distribution for all species. Present efforts entail sampling of selected sites across the state, using a combination of pitfalls, Berlese extraction, and traditional hand-picking, a program conducted in concert with the Virginia Division of Natural Heritage, the museum's sister-agency. During the past two years literally thousands of mega-arachnids have been taken, chiefly in the extreme southwestern part of the state (Virginia Beach and vicinity) and a number of new state records and range extensions are already established (Virginia has been a blank area on too many spot maps for too long). During 1991 the sampling network will be expanded into the Piedmont and Appalachian regions of Virginia. As would be expected, the "take" has tended to be very heavy in groups like Gnaphosidae, "Erigonidae", Lycosidae, Agelenidae, Phalangiidae and other ground-dwelling species, and correspondingly light in araneids and salticids, although an attempt will be made to correct this imbalance. To the extent that taxa have been recently revised, determinations are made in-house, which means that for some taxa (e.g., erigonids and lycosids) the process often stops at the family level. Obviously, there is a lot of material available for study and, since series are often very extensive, we have a liberal "retention policy" for any specialists interested in working on various taxa. Inquiries may be directed to the undersigned.

Richard L. Hoffman, Virginia Museum of Natural History, Martinsville, Virginia 24112

1991 ANNUAL MEETING

Meeting Report

by Brent Opell

The 1991 meeting of the American Arachnological Society was held from 17-22 June at the University of Mississippi ("Ole Miss"). The meeting's hosts, Gary and Pat Miller, treated 90 participants to three days of paper presentations, punctuated by glimpses of William Faulkner's small town of Oxford. The meeting began on Monday evening with a reception at the Downtown Grill on Oxford Square and resumed the following morning with the first paper presentations. In addition to 34 oral papers, seven posters were presented. Tuesday evening was set aside for video presentations and the following evening we were treated to a tour of Rowan Oak, Faulkner's country home, followed by a picnic on the grounds. The meeting ended, as it had begun, on Oxford Square with a reception at a bookstore called Square Books. Thanks to Pat and Gary for the careful planning that made this such a successful meeting.

Field Trip Report

By Charles Dondale

The verdant Tishomingo State Park in the northwestern corner of Mississippi was chosen by Gary and Pat Miller for the field trip this year. The park afforded good collecting, as it represents a hilly transitional area between the Appalachians to the north and the plains of central Mississippi to the south. Mature hardwoods predominate, with a thick litter layer and a penetrable understory. About 38 wild-eyed net swingers were on the Ole Miss bus, with

Vince and Barb Roth and James Cokendolpher following in a little red jackrabbit, and Marie Goodnight bringing up the rear in her camper.

First stop was at the park office and museum where we viewed the exhibits of local mammals, birds, fish, and snakes. Then we proceeded to the first collecting site near a pioneer cabin, where, under an enormous rock overhang Achaearaneae and Eustala webs were draped. Also, a species of Leiobunum with white knees bounced over the moist rock. Lorna Levi was able to fill a large vial with araneids, some still feebly waving their legs, from Trypoxylon cells. Running over the oak litter was a Schizocosa which Gail Stratton and Pat Miller thought belonged to the latest addition to the singing ocreata complex.

At noon we found shade beside Haynes Lake and devoured the box lunches provided by the Ole Miss Food Service, then headed across the historic Natchez Trace, which bisects the park. Collecting resumed in a wooded ravine with a quiet stream. Herb Levi found Micrathena sagittata, and Alan Cady an Azilla. G.B. Edwards took a nice Thiodina and some juvenile Phidippus to be reared back in the lab. David Bixler, a Californian Pardosa man, from whom we had not heard for some years, caught a Vejovus carolinianus under an oak log. Vince and James spotted a Ummidia from the cockpit of the jackrabbit, but while Vince was getting himself out of his seatbelt, James hopped out and made the capture.

En route back to the campus we stopped at a marine Cretaceous fossil site that had been exposed when a new bridge over Twenty Mile Creek was built near Frankstown, Prentiss County. Even the driver was out collecting sharks' teeth. Then it was back through the bean fields, past blooming mimosas, past people at work on the red soil, and past whole landscapes smothered by Japanese Kudzu vine, back to Oxford.

And so another memorable conference ends with an interesting field trip. We owe much to Gary and Pat who planned and carried out the whole day's outing without loosing so much as one arachnologist. Thanks to them, Mississippi is becoming less the blank spot on our range maps than in the past.

Student Paper Awards

First Place: David Kroeger, Department of Biological Sciences, University of Cincinnati. Paper (with G. Uetz): Aggressive interactions between males in Metepeira incrassata, a colonial orb weaving spider.

Second Place: Micky Eubanks, Department of Biology, The University of Mississippi. Paper (with G. Miller): Effects of intraspecific density and predation pressure on a habitat shift in the wolf spider Gladicosa pulchra.

ABSTRACTS

** Survivorship of Wolf Spiders (Lycosidae) Reared on Different Diets [Poster]

Jenniver Bischoff, George W. Uetz. Department of Biological Sciences, University of Cincinnati, ML 006, Cincinnati, OH 45211-0006.

Anecdotal observations from previous studies have indicated that lycosid spiders often die before maturing when raised on only one prey type. Two wolf spider species (*Schizocosa avida* collected from Kentucky, and an unknown *Lycosa* sp. collected from Florida) were used to test the hypothesis that diet affects survivorship. Siblings from one egg sac of each species were divided into two groups of 50 spiderlings each, and reared under identical conditions with different diets. The polytypic diet consisted of crickets (*Acheta domesticus*), fly grubs (*Sarcophaga bullata*), cockroaches (*Periplaneta americana*), mealworms (*Tenebrio molitor*), bettles (*Dermestes* spp.), and an occasional supplemental orthopteran collected from the field. The monotypic diet consisted only of crickets (*Acheta domesticus*). There was a significantly lower survivorship of spiders raised on monotypic prey in both species, although the pattern of mortality over time varied between species. These results support the hypothesis of Greenstone (1979) that lycosids require a mixed diet.

** Preliminary analysis of relationships between maturation date and spider weight, egg sac weight, website, and website residence duration for a field population of *Achaearanea*

tepidariorum [Poster]

Alan B. Cady. Department of Zoology, Miami University - Middletown, Middletown, OH 45052

Achaearaneae tepidariorum (Theridiidae) were studied on sandstone cliffs in East Tennessee. Individuals that matured early in the season had significantly greater body lengths and weights and egg sac weights than did those that matured later. The size of a web's main tangle was the best predictor of these three variables. Individuals that matured earlier moved less than those that matured later. When individuals were sequentially introduced onto an isolated cliff, the original residents defended and maintained their websites against the introduced spiders and withstood cold temperatures better than did the introduced individuals. It appears that early maturing individuals owe their larger size and increased reproductive output to the their larger web's enhanced ability to capture prey. Spiders able to establish websites first would have more space available to them, allowing them to construct larger webs. Because individuals that hatch early would have more time to grow before overwintering, they would also mature and reproduce earlier during the next spring. Thus, those spiders securing websites early have a greater probability of reproductive success for themselves and their offspring. There may be a genetic component to cold tolerance (which may be a function of size) or early reproduction that confers this advantage or it may simply be that "early spiders" occupy the best and largest web sites, thus perpetuating this cycle.

** R. V. Chamberlin's Spider Names

H. D. Cameron. Dept. of Classical Studies, University of Michigan, Ann Arbor, Michigan 48109

Chamberlin was fond of creating names on the rhyming principle. From *Lyc-osa*, by misdividing the morphemes, he created the name *Schizo-cosa*, so that the rhyming morph indicated that it was a Lycosid genus. Likewise, to rhyme with *Dicty-na*, again misdividing, he created such names as *Tos-yna*. Many of the more mysterious elements in his names are taken from the language of the Gosiute Indians, his neighbors in Utah, from which he created hybrid names composed of Greek, Latin, and Gosiute. Examples of such names are: *Phrurotimpus*, *Tosyna*, *Oaphantes*, *Calisoga*, and *Tidarren*. Some are completely Gosiute, such as *Kibramoa and Pimoa*.

** A Model of Foraging Strategies in *Argyrodes trigonum*. [Poster]

Karen R. Cangialosi. Dept. of Zoology, Miami University, Oxford, OH 45056

The spider species, *Argyrodes trigonum* forages in the webs of other spiders by stealing food captured by the host (kleptoparasitism), but also by preying on the host, stealing the host's web, or building its own web and foraging independently. Which foraging strategy an individual exhibits probably depends on a wide variety of conditions including availability of hosts, host webs, web sites, and prey. In order to investigate how changes in ecological conditions maintain this behavioral polymorphism, a mathematical model was developed to generate predictions of how A. trigonum foraging mode choice is influenced by these factors. Data from field observations and experiments will be interpreted in light of these predictions.

** Water and Hemolymph Content of Insects and Spiders

James E. Carrel. Division of Biological Sciences, University of Missouri-Columbia, Columbia, MO 65211

Water content of many insects and spiders, which is readily determined by subtracting dry mass from wet mass, typically represents more than 50% of an animal's live body weight. Body water content seems to be correlated more with an animal's diet than with its body size or its environment. Hemolymph volume is technically difficult to ascertain , so relatively little information about the amount of hemolymph in insects and spiders is available. In general, hemolymph represents from 25 to 40% of the live mass of these animals. In insects hemolymph contributes more than other tissues to water loss during dessication; the same phenomenon may occur in spiders. These laboratory findings suggest that, under natural conditions, hemolymph content may be more variable than water content in insects and spiders.

** Impact of Spiders on Pest Insects Damage to Soybeans. [Poster]

Paul E. Carter (1) and Ann L. Rypstra (2). (1) Department of Zoology, Miami University, Oxford, OH 45056 (2) Department of Zoology, Miami University, Hamilton, OH 45011

The goal of this project was to increase spider density in soybean fields in order to reduce insect pest damage. We encouraged spider colonization in four soybean monoculture fields by providing artificial habitats (old crates) early in the season. We monitored the spiders that colonized the shelters and the biomass of insects consumed each week from 10 July - 13 October 1990. We also monitored leaf damage both near (<1m) and far (>10m) from the shelters monthly. The number of spiders in the shelters increased over the season to a maximum in late September. Leaf damage near the shelters was negatively correlated with spider number, and consumed insect biomass was positively correlated with spider number. In August, leaf damage near the shelters was significantly less than leaf damage far from the shelters in all four fields. These results suggest that increasing spider densities can be beneficial to agricultural crops.

** Effect of Female Age on Receptivity and Mate Choice in Wolf Spiders (Schizocosa ocreata). [Poster]

Veronica M. Casebolt, Melissa Decker, Elizabeth Ponce, George W. Uetz Department of Biological Sciences, University of Cincinnati, Cincinnati, OH 45221-0006

Male wolf spiders of the species *Schizocosa ocreata* are recognized by conspicuous tufts of bristles on their first pair of legs. Earlier studies have suggested this secondary sexual characteristics may influence female mate choice. Since males reach sexual maturity well before females, early maturing females might have more potential mates, and therefore be more selective. This hypothesis was tested by presenting females of different ages with either intact or experimentally altered males (with tufts removed). Females mature for <48 hours responded positively to males less often than those mature for >3 weeks. Although females mature <48 hours showed less overall receptivity, no difference was seen in responses to shaved vs. intact males. Females mature >3 weeks exhibited a significant preference for intact male, displaying receptivity to the shaved individuals less frequently. These results suggest that female age may influence receptivity, and consequently bias mate choice studies.

** Amino Acid Composition of Dragline Silk in Phidippus

Carrie A. Cate. Department of Biology, Midwestern State University, Wichita Falls, Texas 76309

The percent amino acid composition of the silk protein in two species of salticids, *Phidippus audax* and *Phidippus apacheanus*, is determined. Comparisons are made between silk removed directly from major and minor ampullate glands and newly produced dragline silk.

** Movement-biased Mate Choice and Image Similarities as a Function of Divergent Courtship Postures in the Dimorphic Jumping Spider, *Maevia inclemens*.

David L. Clark. Department of Biological Sciences, University of Cincinnati, Cincinnati, OH 452221-006

Males of the dimorphic jumping spider, *Maevia inclemens*, are both morphologically and behaviorally distinct (i.e., initiate courtship differently). Previous studies suggest that females choose mates on the basis of which male they see move first. This hypothesis was tested using videotaped sequences of male courtship behavior, where movement was experimentally controlled. Male morphs were synchronized behaviorally (by computer digitization) and presented to female simultaneously in the Y-maze test chamber. Results confirm that females do not show a preference for either male morph. It is hypothesized that the divergent behaviors of Phase I courtship (i.e. initiation) exploit the female movement detection response from different distances (the tufted morph begins at 86 mm and the grey morph from 34 mm). A graphic model, based on the visual range of females, demonstrates that Phase I courting males are similar in apparent visual target area. Furthermore, the shape of the two male types in Phase I courtship posture may share image similarities from the perspective of observing females.

** Estimating Spider Biodiversity in the Tropics

Jonathan A. Coddington (1), Charles E. Griswold (1), Diana Silva Divia (2), Efrain

Penaranda (3), Scott F. Larcher (1). (1) Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, DC 20560 (2) Museo de Historia Natural de la Universidad de San Marcos, AV. ARENALES 1256, APTO. 14 0434, LIMA 14, PERU (3) Instituto de Ecologia, Casilla 10077, La Paz, Bolivia

Allocating conservation resources wisely requires, among other things, information on the geographic distribution of biodiversity. Using minimal modifications of standard museum collecting techniques, we sampled three sites in Bolivia along an elevational gradient in order to estimate total species richness (St) at each sites. Four analytical methods to estimate St are presented and discussed. We also compared the effect of different collectors, collecting techniques, and time of day on numbers of species and individuals collected per sample.

** Two New Species of *Nesticus* Spiders from the Southern Appalachians (Araneae, Nesticidae)

Frederick A. Coyle and Augustus C. McGarity. Department of Biology, Western Carolina University, Cullowhee, NC 28723

Diagnoses, descriptions, illustrations, and natural history data are presented for two new species of *Nesticus* spiders: N. n. sp. 1 from epigean habitats in southwestern North Carolina, and N. n. sp. 2 from a cave in eastern Tennessee. *Nesticus* n. sp. 1 appears to be the sister species of *Nesticus brimlevi* Gertsch, a cave-dwelling species. *Nesticus* n. sp. 1 exhibits marked geographic variation, is found only in humid and dark microhabitats, and may exhibit the prolonged reproductive activity characteristic of cave-dwelling nesticid species.

** Observations on the Behavior of the Kleptoparasitic Spider, *Mysmenopsis furtiva* (Araneae, Mysmenidae)

Frederick A. Coyle, Theresa C. O'Shields, and Daniel G. Perlmutter. Department of Biology, Western Carolina University, Cullowhee, NC 28723

Mysmenopsis furtiva, a tiny spider which lives in the funnelwebs of the Jamaican diplurid spider, *Ischnothele xera*, behaves both as a kleptoparasite and as a commensal; it pilfers portions of its host's prey and also captures and consumes minute insects which are trapped in the host web and unnoticed or ignored by the host. *Mysmenopsis furtiva* is able to ingest hemolymph from its host's prey at a much faster rate than it can ingest material from the insects it captures. Two of its stealth strategies are to move not at all or slowly when the host is motionless and to synchronize its rapid movements with host movements. The host's anti-kleptoparasite behaviors suggest that the kleptoparasite has a significant negative impact on the host.

** Retreat Architecture and Construction Behavior of an East African Idiopine Trapdoor Spider (Araneae, Idiopidae)

Frederick A. Coyle and Robert E. Dellinger. Department of Biology, Western Carolina University, Cullowhee, NC 28723

The arboreal retreats of an East African idiopine spider are provided with a trapdoor with tabs on its edge. The trapdoor is constructed by virtually the same door-molding behavior program observed so far in the citenizids (*Ummidia* and *Hebestatis*) and antrodiaetids (*Aliatypus*), a construction program very different from the door-cutting behavior of another idiopid trapdoor spider, *Arbanitis gillesi*. Present evidence indicates that, in the idiopidae, the door-molding program is primitive and door-cutting is derived. It is suggested that the door edge tabs may increase the spider's prey-sensing radius and allow the door to be closed more securely. Observations of door closing, prey capture, and soil ejection behaviors are presented.

** DNA Sequences Reveal Three Major Clades of Hawaiian Spiders in the Genus *Tetragnatha*. [Poster]

Henrietta B. Croom (1), Rosemary G. Gillespie (2). (1) Department of Biology, The University of the South, Sewanee, Tennessee 37375 (2) Department of Zoology, University of Hawaii-Manoa, Honolulu, Hawaii 96822

Mitochondrial DNA coding for most of the third domain of the RNA of the ribosomal small subunit has been sequenced form 40 individual spiders of 11 different endemic Hawaiian morphospecies and one circumtropical (presumably-introduced) species *T. mandibulata*. The secondary structure of the rRNA encoded by these sequences has been determined using the folded sequences from primates and insects as a

guide. The spider rRNA shows strong similarity in secondary structure to these other taxa. Preliminary calculation of sequence differences across all sites shows that each endemic spider is approximately 21% different from *T. mandibulata.* Endemics differ from each other by 3-13%. This suggests that the endemic spiders studied so far may be derived from a single introduction to the Hawaiian Islands, corroborating a similar conclusion based on morphology. The sequences from 20 spiders over a 204-base-pair homologous region were compared and variations were found at 44 different sites. These variable sites were analyzed using *T. mandibulata* as an outgroup. A heuristic analysis of the data matrix yields 36 shortest length trees. The strict consensus tree indicates that all these endemic spiders fall into one of three clades. These clades are well defined in our analysis, and occur in all 36 shortest length trees in the same relative position.

** Epigynal plugs and variation in the Genus *Eperigone*

Robert L. Edwards, Box 505, Woods Hole, MA 02543

Several traditional measurements, including TmI, and the color patterns of several species of *Eperigone* were examined to determine their usefulness in separating species, both as adults and immatures. The value for TmI and the color pattern on the abdomen were found to be the most useful characters. The male palpal tibia lengths and widths showed considerable variation in absolute and relative terms. Females of three of the species examined had epigynal plugs. These plugs are described.

** Effects of intraspecific density and predation pressure on a habitat shift in the wolf spider *Gladicosa pulchra.*

Micky Eubanks, Gary L. Miller. Department of Biology, The University of Mississippi, University, Mississippi 38677

Preliminary studies of the wolf spider, *Gladicosa pulchra* (Lycosidae), indicated that this species undergoes a habitat change as it nears sexual maturity: moving from the forest floor to trees in the fall. Age related habitat changes (ontogenetic niche shifts) such as this may occur in response to competition between conspecifics or size-specific predation. Two field experiments were conducted to investigate (1) the effects of increasing intraspecific density and (2) the effects of increasing predator density on the habitat change of *G. pulchra.* The numbers of conspecifics or predators were manipulated inside of 60 cm diameter tin enclosures placed around trees. Climbing behavior of *G. pulchra* was observed. Increasing intraspecific density had little effect on the habitat change, but increasing predator density significantly increased the incidence of climbing in females. This is one of the first studies to demonstrate sex differences in response to predation pressure. These studies support earlier work that suggests that intraspecific competition has little or no effect on the fecundity or survival of spiders.

** Follow the DNA Road: Costs, Benefits, and Forecast for Arachnology

Victor Fet. Department of Biological Sciences, Loyola University, New Orleans, Louisiana 70118

The 1980s brought to the molecular labs the powerful tools of restriction enzymes, recombinant DNA cloning and DNA sequencing, followed by the breakthrough technique of polymerase chain reaction (PCR). We can now estimate molecular variation within and among populations and trace their historical routes ("phylogeography" of John Avise). Mitochondrial DNA (mtDNA) holds a strong "ideological" position: its maternal inheritance permits to assess genealogical lineages. One of the most striking discoveries of 1988-89 was that PCR can amplify specific DNA fragments from dried and preserved specimens! PCR is now employed in several labs to amplify DNA from scorpions and spiders. Costs: high as compared to non-molecular systematics, especially for set-up lab (PCR machines range from $3,000). Benefits: to have your hands on the molecular heterogeneity especially in order to check biogeographic hypotheses (vicariance vs. dispersal, island colonization etc); difficult cases in taxonomy (sibling species); phylogenies; intraspecific variation; and patterns of gene flow. Forecast: Though costly, in a few years these techniques will become routine. The choice of the best organisms and hypotheses is crucial. I imagine a network of joint projects: as systematic arachnology becomes molecular it can no longer be an individual science.

** Adaptive Radiation Among Hawaiian Spiders,

Genus *Tetragnatha*

Rosemary G. Gillespie. Department of Zoology, University of Hawaii at Manoa, Honolulu, HI 96822

The Hawaiian archipelago possesses some of the most extraordinary faunal assemblages in the world. As a consequence of repeated explosive diversification of species from single ancestors, Hawaii is recognized as a "show case for evolution". The terrestrial arthropods, however, which comprise 73% of the endemic terrestrial biota, remain (with the notable exception of the drosophilids) largely unexplored. My research has focused on the adaptive radiation of the spider genus *Tetragnatha* in Hawaii, a lineage of remarkable morphological and ecological diversity. These spiders offer a unique opportunity for understanding ecological and genetic aspects of evolutionary diversification and specialization: (1) They exhibit various stages in the process of speciation and divergence, and are amenable to ecological, behavioral and molecular genetic analyses; (2) they are ideal for comparison with the Hawaiian *Drosophila*, where courtship behavior is very important for initiating the speciation process: In *Tetragnatha* courtship is virtually non-existent.

** New species of *Acacesia*

Susan Glueck. Division of Ecology and Systematics, Corson Hall, Cornell University, Ithaca, NY 14853

New species have been found in the orb-weaver spider genus *Acacesia*, which ranges from southern North American to Argentina. There are three new species in addition to those two previously described in publications by Herbert Levi and others. Two are from the Sao Paulo, Brazil area, and one from Bolivia/Peru. Characters of the genitalia were used in constructing a taxonomic revision.

** Systematics of Neotropical Nemesiidae (Araneae, Mygalomorphae)

Pablo A. Goloboff. Dept. of Entomology, Comstock Hall, Cornell University, Ithaca, NY 14853

Forty seven species of Nemesiidae have been described for the neotropics. Forty two new species (mostly from Chile, Argentina and Brasil) have been studied. Although several genera remain to be studied, the most diverse are *Lycinus* (3 described species, 4 new), *Acanthogonatus* (8 described species, 11 new), *Chaco* (1 described, 6 new), and *Stenoterommata* (1 described, 9 new). *Acanthogonatus, Chaco and Stenoterommata* are monophyletic groups; no synapomorphies are known for *Lycinus*. Two new Chilean genera (2 species each) are of uncertain relationships; two other new Chilean genera are successive sister groups of *Lycinus* + *Diplothelopsis*. *Neostothis* should be removed from the synonymy of *Chaco*. Only one character, bipectinate tarsal claws, weakly supports the monophyly of Nemesiidae; it might really be plesiomorphic for Theraphosoidina, the sister group of Nemesiidae (therefore supporting Theraphosoidina + Nemesiidae). *Neodiplothele* should be transferred to Barychelidae, with which it shares the tarsi with clavate bonthria and two trichobothrial rows.

** Altitudinal Distribution of Aerially Dispersing Spiders

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Aerially dispersing arthropod natural enemies were collected in north-central Missouri using nets mounted on an automobile in the Surface Boundary Layer (SBL) and on a slow-flying aircraft at two altitudes within the Planetary Boundary Layer (PBL). At least some natural enemy taxa from each of five Orders were found in the SBL and at 158 m above ground level (mAGL), but only spiders and hymenopterous parasitoids were found at 914 mAGL. Ten spider families were represented in the SBL, seven at 158 mAGL, and one, the Linyphiidae, at 914 mAGL. By ascending to higher altitudes, the linyphiids encounter faster winds and are thereby enabled to disperse longer distances than members of other families.

** Conditions Selection and Survivorship Experiments with Spiderlings of *Diguetia albolineata*

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Two laboratory experiments were made with first

nymph instar spiderlings (dispersion stage) of *Diguetia albolineata* collected from both dry and wet sites from the seasonal forest of Chamela, Jal., Mexico. The first experiment recorded the choice behavior of spiderlings in contrasting humidity, light and position (up vs down) conditions; the second experiment tested for survivorship in different relative humidity conditions (25% and 75%). In the choice experiment, the spiderlings were indifferent to humidity, no matter the site of origin, but chose for light and position. In the survivorship experiment, the site of origin was important in the first days of the experiment (greater survivorship of spiderlings from wet sites), afterwards the experimental conditions influenced the spiderlings from both sites (greater survivorship in 75% relative humidity). These results do not agree with the distribution of D. albolineata observed in the field, where there are more spiders in dry than in wet sites. Therefore I assume there must be some factors different from humidity selection and survivorship of first stage spiderlings acting in nature.

** Host-Parasitoid Interactions: The Spider and the Fly Revisited

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Central to any argument for the evolution of parasitoid-specific defense behaviors is the ability of the host to distinguish parasitoids from other benign or beneficial organisms in the environment. This ability should be particularly important for colonial spiders which are limited in escape options, guard a sedentary egg-sac, and may have to distinguish between parasitoids and prey from similar taxa. To test whether colonial orb-weaving spiders can discriminate between potential prey and parasitoids, we "attacked" female *Metepeira incrassata* guarding egg-sacs with two tethered flies similar in size: 1) the common housefly *M. domestica* (Muscidae), and 2) the spiders principle egg-sac parasitoid *Arachnidomyia lindae* (Sarcophagidae). The spiders showed significant differences in type of behavior used against the two flies during the attacks and in durations of behaviors after attack. These differences are discussed with regard to the apparently close evolutionary relationship between this spider and parasitoid fly.

** Preliminary investigation of the behavior and ecology of *Hypochilus thorelli* (Araneae: Hypochilidae).

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Spiders in the family Hypochilidae are an intriguing group in that they possess morphological features of both the primitive mygalomorphs and the more modern web-builders. Despite their unique taxonomic position, little research has been done regarding their ecology and behavior. I examined the spatial distribution of *H. thorelli* living on sandstone outcrops along the Cumberland Scenic Trail (Anderson County, Tennessee). Using the nearest neighbor distance measure I found that on some of the outcrops *H. thorelli* has an aggregated dispersion. Additionally, 42% of the population shared common support threads (N=50). Despite this level of apparent tolerance and aggregation, studies with marked individuals revealed that 21% of the population had their webs stolen by other *Hypochilus*, which in some cases involved cannibalism.

** Aggressive Interactions Between Males in *Metepeira incrassata*, a Colonial Orb Weaving Spider

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In *Metepeira incrassata*, aggressive interactions result in a size-biased hierarchy of spatial position: the largest spiders (reproductive females) occupy protected positions in the colony center, where fitness is enhanced. In this study, interactions between males were observed to see if: 1) males increase fitness by competing for females in the center of the colony; and 2) if they adjusted their level of aggression relative to the value of the resource (core vs. periphery females). Frequency of aggressive encounters between males was significantly greater in the core than on the periphery. Individuals of both sexes are significantly larger in the core than on the periphery. Since larger individuals win contests significantly more often, males may increase their fitness by fighting for positions in the core of the colony, where females are larger. While the duration of aggressive encounters was longer on the periphery, there was no difference

in the level of aggression of encounters (based on the level of energy expenditure and/or risk) in core and periphery, suggesting that male *M. incrassata* do not adjust their level of aggression with position.

** Current Curation Methods of the Collection of Arachnida and Myriapoda at the United States National Museum

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During the last 7 years, the collection of arachnids and myriapods of the United States National Museum has undergone major curatorial renovation. Changes include standardization of glassware, improved labelling, and the formulation of curatorial standards for use in the alcoholic collections of USNM's Department of Entomology. A series of slides will highlight some of these improvements. Answers will be provided for some commonly asked questions regarding sources and availability of curatorial supplies. The advantages and disadvantages of various types of alcohol-resistant labels will be discussed.

** Stridulatory structures of some species of tropical orb-weaver *Micrathena*

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Scanning electron microscope studies of specimens of *Micrathena* collected in Panama, Costa Rica, and Mississippi show a range of stridulatory ridge spacing on the book lung covers within the species group and between sexes of the same species. The number of thickened stridulatory setae on the posterior trochanter's medial surface near the coxa for all species was found to be three of varying prominence and placement. Some immatures of other species whose adults had stridulatory ridges were found to have ridges on their book lung covers, while immatures of such species did not. Spacing of ridges on smaller individuals, such as small *Micrathena* species and males of *Micrathena*, suggest that ultrasonic sounds may be produced during abdomen wagging.

** Reproductive output among the Araneae: adaptation or constraint?

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It is a paradigm in arachnology that body size of female spiders is tightly correlated with clutch size. This trend has also been noted across species, and was again documented in the present study. The question then is: why should small spider species lay fewer eggs? The data at hand indicate that they lay relatively large eggs compared to larger species. Taking egg mass into consideration, all species studied made a similar investment in reproduction. Foraging mode in and of itself appears to have no influence on investment in individual clutches. Body size is everything.

** Patterns of occurrence and body size in a field spider community with special reference to the wolf spider *Lycosa annexa*

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As part of a year-long study of the acoustic behavior of two species of crickets, we collected spiders in pitfall traps in a field. Collections were made at 0800 and 1700 daily from three traps between 14 March and 23 November 1990. Over nine-hundred individuals of 31 species were collected. Species richness increased between March and June and decreased between July and November. The pattern of occurrence of the most common species, *L. annexa,* was examined in detail. Mature males and females were captured throughout the sampling period and almost exclusively during the night until late June when daytime captures became more common. Immatures were captured more frequently during the daytime. Penultimate males and females were collected in roughly equal numbers during the day and night. Peaks of large mature males were observed in March-April and July-August. Mature males that occurred late in the season were significantly smaller than those collected earlier. The size distribution of mature females followed a similar pattern.

** Influence of Sex and Egg Case Presence on Predatory Behavior of the Wolf Spider *Pardosa*

valens Barnes (Araneae: Lycosidae)

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The wolf spider, *Pardosa valens,* displayed distinct "sit-and-wait" predatory behaviors during interactions with the smaller, congeneric prey, Pardosa distincta in experimental chambers. Adult female P. valens, from which the egg cases had been removed, more frequently captured and attempted to capture prey, and had the highest value for a measure of speed or efficiency of capture. Females without egg cases exhibited higher frequencies for those behaviors that were components of the orientation, approach, and capture sequence observed during interactions. The greater frequencies of predatory behaviors displayed by these reproductively mature spiders are predictable for a terrestrial arthropod in a high elevation, seasonally extreme environment, where energy allocated to a large number of small eggs may be the best strategy.

** Social Behavior and Movement Patterns in a Primitively Social Spider, *Metepeira atascadero*

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We observed social interactions and movement of 144 individually-marked *Metepeira atascadero* (Araneidae) in Guanajuato, Mexico for two months during the pre-reproductive and reproductive periods. Movement patterns and social relations changed seasonally, and adult males and adult females exhibited different behavioral strategies. In the pre-reproductive period, sociality among subadult *M. atascadero* consisted of individuals sharing their space webs, thereby forming small colonies. Colony size and composition changed frequently as spiders relocated their webs. Although most spiders were colonial at least once, most of the population on any given day was solitary. During the reproductive period, adult females exhibited web-site fidelity, while adult males stopped building orbs and ranged broadly within and between plants. Most social interactions involved an adult male which attempted to establish a pair-bond with a reproductive female, or two adult males which fought over access to an adult female.

** Modern Distribution of Some Genera of the Family Gnaphosidae in the Holarctic

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No abstract available.

** Video Digitizing and Computer in Spider Systematics

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High quality hand drawings or scanning electron micrographs are central to a taxonomic publication. However, prior to this stage, the systematist may wish to draw many rough sketches in order to help him or her cluster the individual specimens into species. As an alternative to drawing sketches, one can take micrographs using a video camera (such as Panasonic WV-1500X) hooked up to a microscope. The camera sends analog signals to a Macintosh computer equipped with a MacVision digitizer. The computer allows relatively inexpensive pictures to be rapidly reproduced on sheets of paper using a dot-matrix, ink-jet, or laser printer. Digitized pictures along with pertinent information about the specimen can be stored, manipulated, and analyzed in FileMaker Plus. By creating data files and using the Macintosh clipboard system, this information can be exported to other programs such as MapMaker (for plotting localities on maps), StatWorks (for morphometric analysis), Cricket Graph (for presenting data), MacClade (for studying phylogenetics), and Microsoft Word (for listing localities).

** Spinneret Morphology and the Phylogeny of Haplogyne Spiders

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Spinneret morphology is surveyed in 47 genera of haplogyne araneomorphs. In most examined "lower" araneomorphs--hypochiloids, austrochiloids, and classical Haplogynae (including the cribellata family Filistatidae)--there is no evidence of cylindrical gland spigots. Only in the Leptonetidae and Telemidae do females have a spigot type, not also present in males, that may serve cylindrical glands. Cylindrical glands seem otherwise to be synapomorphic for about 70 "higher" araneomorph families corresponding roughly to the classical Entelegynae (but including those palpimanoid and orbicularian taxa with haplogyne females). A data matrix including 67 characters for 35 haplogyne and eight related genera, belonging to 36 families, suggests that the classical Haplogynae form a monophyletic group but that the superfamily Scytodoidea is paraphyletic. Paracribellar spigots, previously reported only on the PMS, apparently occur also on the PLS of austrochilids and filistatids. The family Loxoscelidae will be placed as a junior synonyn of Sicariidae.

** Natural VS Sexual Selection in a Desert Spider

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Theory predicts that there will be significant variation in behavior between the sexes because: the primary component of male fitness is the ability to find mates while the primary component of female fitness is the ability to compete for food. The hypothesis is tested for the desert spider, *Agelenopsis aperta.* Previous work has demonstrated that fitness in female A. aperta is linked to 3 behavioral traits: discrimination of web-site quality, maintenance of appropriate-sized territories and fighting behavior. I considered the extent to which exhibition of these traits occurs in males prior to maturity and test for a relationship between exhibition of these traits and body mass at maturity. The fitness benefits of larger body mass to male spiders is found to be of 3 types: better male-male competition for females; greater probability of being accepted by females; and capability of traveling longer distances in the search for females.

** Effects of Eye Occlusion on the Behavior of Female Lycosid Spiders Exposed to a Courting Male's Image

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Female *Rabidosa rabida* (Walckenaer) responded to anterior or lateral views of a courting male provided by video playback (Clark & Uetz 1990). The timing of responses distinguished sexual from predatory tendencies. Receptive displays were not evident, either being constrained by the setup or needing vibratory or chemical signals from a male. Untreated spiders performed rapid turns ($\bar{X}$ = 121°/s) and then rapid approaches ($\bar{X}$ = 5.9 cm/s). Experimental females in four groups had one pair of eyes occluded; four other groups had all but one eye pair occluded. Spiders lacking use of the posterior eyes showed slow turns ($\bar{X}$ = 14°/s) and walking ($\bar{X}$ = 0.7 cm/s), as did two control groups: playback of an empty arena and fully blinded spiders. Various, limited data suggested that the PMEs serve for rapid approaches (and turns < 50°); the PLEs for turns < 155° (but not approaches); and the ALEs for slow, close-range approaches (and turns < 20°). The AMEs by themselves played no role in the responses examined here.

** The Web-Spider Community of Soybean Agroecoystems [Poster]

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The web-spiders inhabiting four soybean monoculture plots were monitored from July through harvest in October 1990. We selected four one-meter row sections randomly and censused them visually each week. We recorded the location, type, size, and height of each spider. We also measured the height, width, and leaf density of the soybeans. The four plots did not differ in the plant characteristics we measured. However, the spider communities were significantly different, underscoring the non-equilibrium nature of these ephemeral habitats. Small sheet-weavers dominated the community. Most spiders were found on the group early, but in August they moved to the plants. As the plants aged and wilted, the spiders returned to the soil. Early, the vegetation width correlated with spider number. In mid-season, the vertical leaf distribution was important. Late, the leaf number correlated with spider number. Over all plots, leaf

damage due to insects was negatively correlated with spider density.

** The Evolutionary Transition from Hydraulic to Muscular Leg Extension: Electromyographic Evidence from Freely Walking Arachnids

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Recent studies suggest that primitive arachnids lacked extensor muscles at their femur-patella joints but used a method of hydraulic extension, a mechanisms retained in spiders, mites and whipscorpions. An extensor muscle replaced hydraulics in the ancestors of opilionids, scorpions and pseudoscorpions. The muscle is unusual in being bifunctional; it promotes movement at the femur-patella and patella-tibia joints simultaneously. Although the hydraulic-to-muscular transition seems to represent a major reorganization of the propulsive mechanism, it occurred with relatively minor changes in muscular anatomy. The purpose of this investigation was to determine whether the firing patterns of leg muscles changed during the hydraulic-to-muscular transition. Standard electromyographic techniques were used to record firing patterns from six homologous muscles in a primitively hydraulic arachnid, the giant whipscorpion, and an arachnid with extensor muscles, the black emperor scorpion. The analysis revealed similar muscle firing patterns in the two species. I suggest that the mechanical properties of the bifunctional extensor resemble those of the hydraulic mechanism and that this similarity accounts for the apparent conservativism in the motor program of leg muscles.

** Ballooning in Spiders: Results of Wind Tunnel Experiments

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Ballooning refers to the aerial displacement of spiders made possible by friction between rising air and strands of silk. Only recently have attempts been made to understand the aerodynamic constraints under which ballooning spiders must operate. The current study was stimulated by the cogent theoretical work of Humphrey (1987), and provides the first empirical data on the physical forces acting on spiders about to become airborne and on those that are already airborne. The data indicate (1) that both the silk and the spider's body provide the drag necessary for ballooning; (2) that fluid dynamic models overestimate the difficulty of becoming and remaining airborne, (3) that the spider has both postural and silk length control over drag development, (4) and that only very small spiders can rely on ballooning for dispersal over long distances.

** Predation Risk In Colonial Webs: A Complex Cost-Benefit Balance

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In *Metepeira incrassata,* a colonial orb-weaver from tropical Mexico, higher rates of predation from wasps are an important cost of group living. Field observations allowing separation of attacks at the colony and individual level have provided evidence of both an "encounter effect" and a "dilution effect". Encounter of colonies by predators increases with group size, although at a decreasing rate (a colony of 1000 is not ten times more likely to be located as 100, owing to visual apparency of the colony). While predation rates are higher in larger colonies, individual risk decreases as a result of numerical dilution. This may be offset to some extent, however, as predators concentrate their foraging and sequentially attack more spiders in larger groups. Even so, wasp capture efficiency decreases with colony size, apparently as a consequence of an "early warning effect" - wherein spiders become aware of their approach through web vibrations. As a result of these combined effects, predation risk from wasps decreases with group size.

** The stabilimentum and Web Shaking in *Argiope aurantia*

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Argiope aurantia is a common orb-weaving spider in Alabama. A mature female was studied over the summer until it died in the late fall. It built a web close to an outdoor light where it had

a bountiful supply of insects. Typically it would sit in the center of the web on its stabilimentum. Stabilimenta are extremely variable in structure between and within species, suggesting that they serve several different functions. When a nearby door was closed roughly, the web would shake. However, the duration of the shaking of the web extended beyond the effect caused by the door, and it was greater in amplitude. The spider accomplished this by pumping the web with its body movements. One of the suggested functions of the stabilimentum is to increase the apparent size of the spider so that potential predators are deterred. While sitting on the stabilmentum vigorous movement of the whole web must enhance this deterrent effect even further.

** Biology of the Puerto Rican Blue Tarantula (Araneae, Theraphosidae)

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Blue tarantulas (*Avicularia* sp.) were collected from the boulder forest of Culebra Island, Puerto Rico. Older spiders lived primarily in bromeliads where they would submerge themselves when the plant was disturbed. The young tarantulas were blue, them became primarily brown and later had long orange-tipped hairs. Young spiders would capture flies and then use silk as they circled to create a safe platform where they could hold on easily. Another unique use of silk occurred when the spiders were placed in clean cages without their retreats. The spiders would often build a single line of silk which they used as a harness attaching themselves to the vertical wall of their cage by slipping under third legs on one side to between the abdomen and cephalothorax on the other. Some spent weeks without rebuilding their retreats, thickening their 'harness' including other silken lines which crosscrossed their carapace.

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