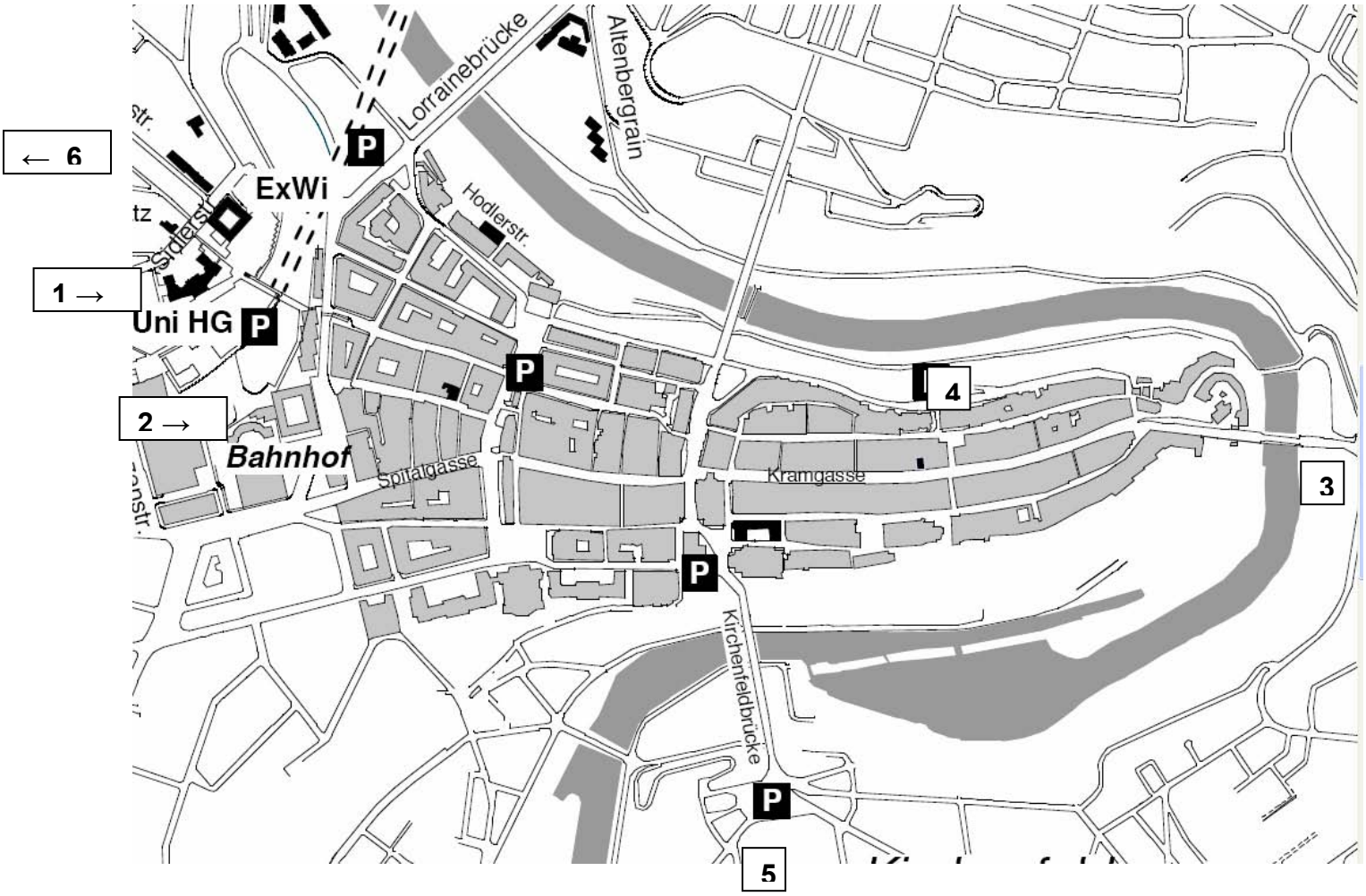
24th European Congress of Arachnology

25. - 29. August 2008 in Bern, Switzerland

http://www.esa2008.unibe.ch

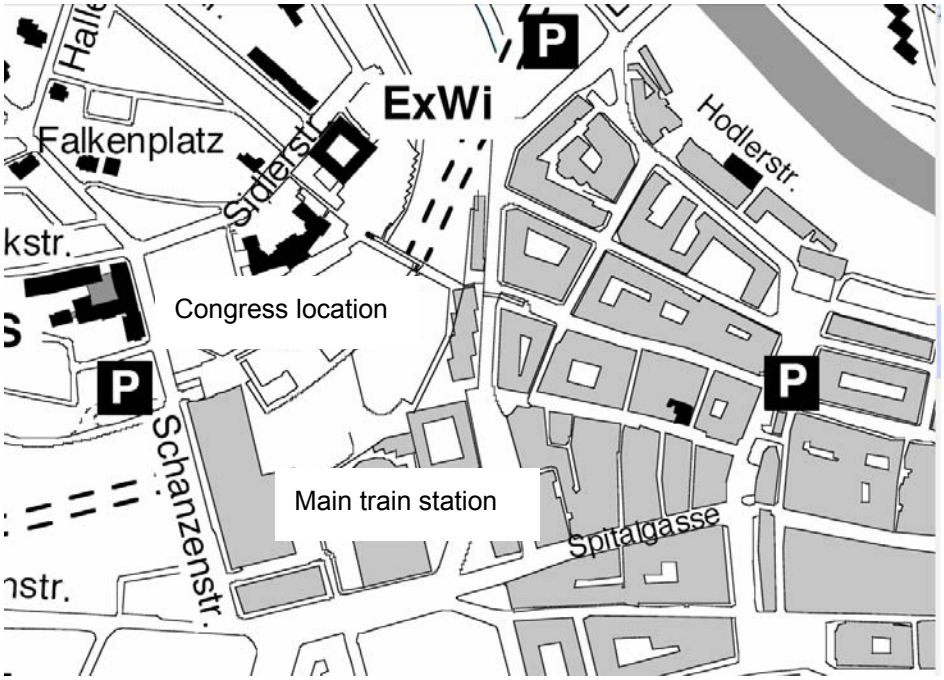
Locations of congress events



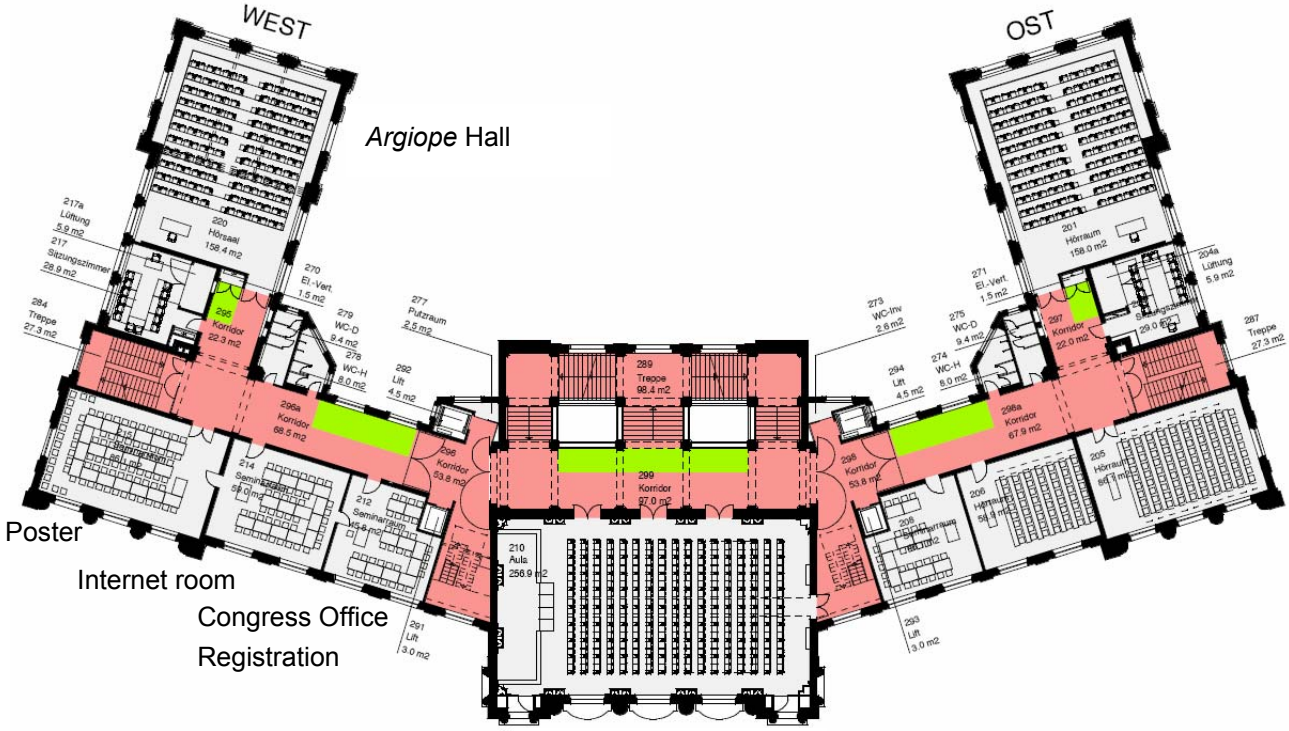
Centre of the City of Bern

1 Historical building of the University = Congress location
2 Main train station, bus stations in front
3 Altes Tramdepot, informal meeting on Sunday evening
4 Rathaus of the Canton of Bern, Rathausplatz, Welcome by the mayor of the City of Bern, Monday
5 Congress dinner in the Natural History Museum Bern, Tuesday
6 Russian Party, Zoological Institute, Wednesday

1 Historical building of the University = Congress location
You reach the congress location from the place in front of the main station "Bahnhofsplatz" by going through the main train station (follow "University") or by Schanzenstrasse – Sidlerstrasse.



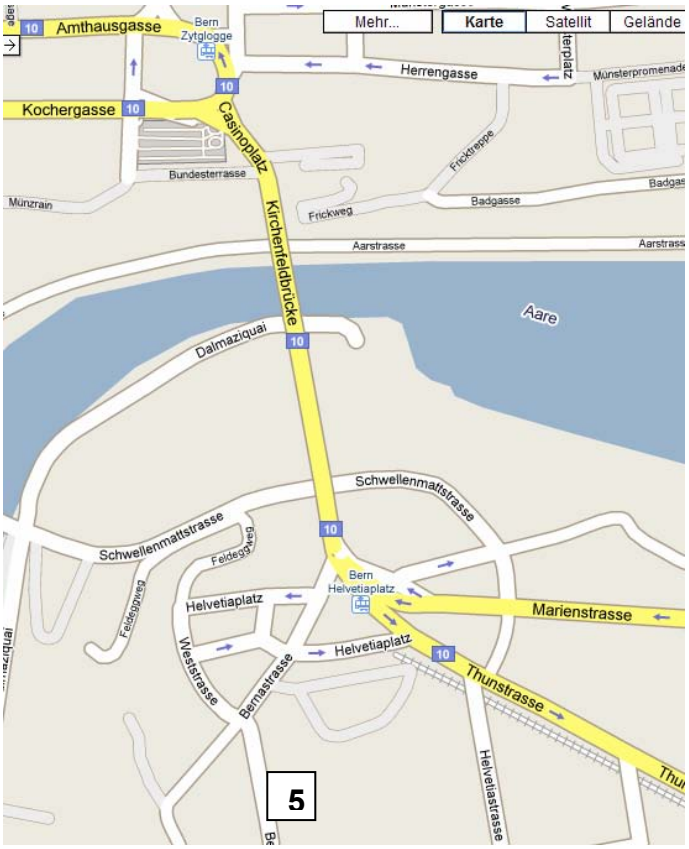
Historical building of the University = Congress location: second floor



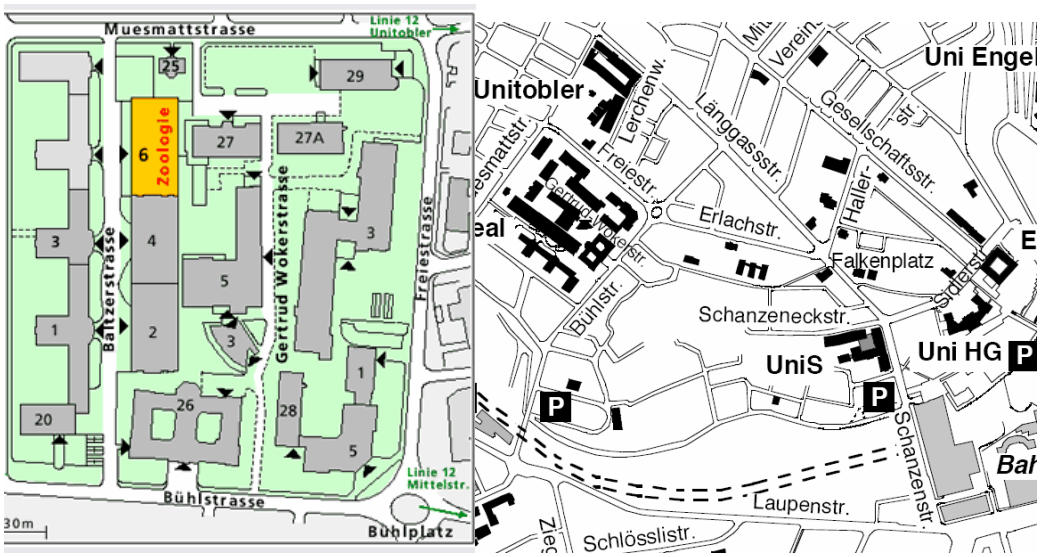
3 Altes Tramdepot, informal meeting on Sunday evening (18 - 21 h). We meet in the Kesselhaus: Enter the pub, pass by the bar, go straight through the restaurant and you will detect arachnologists in the winter garden- like atmosphere of the Kesselhaus.

4 Rathaus of the Canton of Bern, Rathausplatz 2, Welcome by the mayor of the City of Bern, Monday 17.30

5 Congress dinner in the Natural History Museum Bern, Bernastrasse 15, Tuesday, 19 h



6 Russian Party, Zoological Institute, Baltzerstrasse 6. Wednesday, 19 h (via Schanzenstrasse or Sidlerstrasse, Erlachstrasse to Bühlstrasse and Baltzerstrasse), 6 minutes walking from congress location.



Congress telephone: from outside Switzerland: 0041-31-631 3485
from Switzerland: 031-631 3485
Congress fax: same as phone number
Internet access in the congress building: our congress internet room offers access to the internet with 10 laptops.

Bus tickets
One short ride (single ticket, Kurzstrecke) costs 2 CHF, one normal ride (1-2 zones, 1-2 Zonen) costs 3.80 CHF. A list on the ticket machine tells you whether your destination can be reached as Kurzstrecke or by 1-2 Zonen.

There is a possibility to reduce this price a bit by buying a ticket for 12 trips (Mehrfahrtenkarte). This ticket costs 20 CHF (Kurzstrecke) and 38 CHF (1-2 Zonen). There is a considerable reduction if you paid to a special discount system which works on an annual basis and is thus not interesting for you. There are no tickets for a whole week (at least not at a reasonable price).

Single tickets are bought at the ticket machine at the bus station. Mehrfahrtenkarten can be obtained at the kiosks in the train main station. They can be used by several persons.

Excursion to the Alps
Meeting point: Wednesday August 27th, 9:00 behind the congress building (look for the busses). Please bring: warm & weatherproof clothing, hiking boots, sunscreen and a hat. The excursion area is alpine, which bears a number of natural risks such as exhaustion, falling in steep terrain, sudden weather changes, and rockslides. By participating in the excursion, you acknowledge that you are prepared to avoid these risks. If in doubt, please choose hiking option (1) or ask the organisers.

Packed lunch will be provided for each participant including 1.5 L of mineral water. Once in the excursion area, we will form guided groups that stay together until they get back to the busses. There are three options:

1) Gantrisch Seeli: 4 km, ± 200 m altitudinal difference. This hike leads to a small alpine lake. On the way, we will cross habitats like alpine meadows and spruce forest.

2) Gantrisch circuit: 10 km, ± 600 m altitudinal difference. For experienced hikers. This hike leads us around Mount Gantrisch and across two mountain passes. Most of the hike is above the timberline. Habitats will include alpine meadows and rocky areas in different expositions: xerothermic on the south-exposed side and rather cool and moist on the northern side of the mountain.

3) Gantrisch summit: 12 km, ± 750 m altitudinal difference. For experienced climbers. Like (2), but we will additionally climb the summit of Mount Gantrisch (2175 m above sea level). There are some steep sections where you will have to use your hands.

Programme

Saturday 23. August 2008	
	Pre-Conference workshop: Data analysis in spider ecology (only for accepted workshop participants)

Sunday 24. August 2008	
	Pre-Conference workshop: Data analysis in spider ecology (only for accepted workshop participants)
16-19 h	Registration (congress office) Building is on Sunday only accessible via West entrance
18.00	Informal meeting in the historic city (Altes Tramdepot)

Monday 25. August 2008 (*Cupiennius* Auditory)	
8.00	Registration
8.30	Opening ceremony
8.50	Keynote talk Christoph Muster: Phylogeographic studies in spiders - a review
	Carl Clerck symposium on systematics of spiders Chair John Edmondson
9.40	John Edmondson: Introduction
9.50	Torbjörn Kronestedt: Carl Clerck and what became of his spiders and their names
10.10	Holger Frick: Progress in erigonine phylogeny with special focus on the *Savignia*-group (Linyphiidae).
10.30	Coffee break / Poster visit
11.00	Peter Jäger: From Clerck to µ-CT: Frozen copulations in huntsman spiders (Araneae: Sparassidae).
11.20	Steffen Bayer: Uncovering diversity in Laotian caves: a combined morphological and molecular approach in the genus *Heteropoda*
11.40	Cristina Anne Rheims: Cladistic analysis of the subfamily Sparianthinae (Araneae, Sparassidae), with the description of three new genera
12.00	Miquel Arnedo: DNA barcodes for biodiversity assessment in poorly known regions: The woodlouse hunter spiders of Morocco
12.20	Lunch / Poster visit
13.20	Todd Blackledge: Orbicularian monophyly? A total evidence approach.
	Chair Todd Blackledge
13.40	Matjaz Kuntner: The golden orb weaver: update on *Nephila* taxonomy
14.00	Tamas Szűts: Morphology of the red triangular spiders (Araneidae, *Arkys*)
14.20	Milan Řezáč: Taxonomic review and phylogenetic analysis of central European *Eresus* species (Araneae: Eresidae)
14.40	Jeremy Miller: Phylogenetic Affinities of the enigmatic spider subfamily Penestominae
15.00	Coffee break / Poster visit
15.30	Norman Platnick: The oonopid spider planetary biodiversity inventory: transforming how systematists work
15.50	Peter Michalik: The male genital system of goblin spiders (Araneae, Oonopidae)
16.10	Carles Ribera: The Mediterranean *Loxosceles*: a single species or a species-rich assemblage?
16.30	Alberto Lopez-Pancorbo: The family Nesticidae (Araneae) in the Mediterranean basin: origin, biogeography and phylogenetic relationships
16.50	Gathering at meeting point
17.30	Welcome by the mayor of the City of Bern (Rathaus)
18.45	Guided city tour in Bern, a UNESCO Cultural World Heritage Site

Tuesday 26. August 2008 (*Cupiennius* Auditory)	
8.30	Keynote talk Chair Martin Schmidt Trine Bilde: Kin selection and sexual selection in cooperative spiders
	Symposium on dispersal of spiders
9.20	Yael Lubin: Limited male dispersal in a social spider with extreme inbreeding
9.40	Sabrina Kumschick: Distribution and spread of the wasp spider (*Argiope bruennichi*) in Europe
10.00	Odile Bruggisser: Climate change and the dynamics of ballooning spiders
10.20	Gilles Blandenier: Do trapped ballooners reflect epigeal spider communities?
10.40	Coffee break / Poster visit
	Special symposium on scorpions and smaller arachnid orders Chair Christian Kropf
11.10	Lionel Monod: Liochelid scorpions of the Indo-Pacific: systematics and biogeography
11.30	Lauren Esposito: Biogeography of the bark-scorpions, *Centruroides* Marx 1890
11.50	Shahrokh Navidpour: Ecomorphotypes of scorpions of Khoozestan (Southwestern Iran) (Scorpiones: Buthidae, Scorpionidae, Hemiscorpiidae).
12.10	Carsten Kamenz: Gross morphological investigations of scorpion lungs
12.30	Jiri Kral: Fundamental trends in the karyotype evolution of Pedipalpi: comparison with spiders, solifuges, and palpigrades
12.50	Lunch / Poster visit
13.50	Congress photo
14.00	Chair Joachim Haupt Axel Schönhofer: Systematic of the Opiliones family Trogulidae
14.20	Jason Dunlop: A new opilioacarid mite in amber, with comments on the fossil record and affinities of mites
14.40	Martina Hrušková-Martišová: Luring behaviour as a complementary strategy to forced copulation in *Galeodes caspius subfuscus* (Solifugae: Galeodidae)
15.00	Roland Stockmann: Scorpions in the art
15.30	Coffee break / Poster visit
	Ecology and evolution Chair Yael Lubin
16.00	Jean-Pierre Maelfait: Spider abundance and phenology as influenced by climate and climate change
16.20	Charlotte De Busschere: Study on the divergence patterns in an adaptively radiated wolf spider genus on the Galapagos
16.40	Nuria Macías-Hernández: Unraveling the patterns of genetic and morphological variation in the Canarian endemic spider *Dysdera verneaui*
17.00	Klaus Birkhofer: Scale-dependence of diet composition in spiders: effects of hunting strategy, habitat and global distribution
17.20	Frederik Hendrickx: Is sex-ratio distortion a strategy resulting in stable male coexistence in the dwarf spider *Oedothorax gibbosus*?
17.40	Arthur Decae: Patterns of distribution indicating characters of evolution and ecology in European Mygalomophae.
18.00	Walking to the Natural History Museum
19.00	Congress dinner in the Natural History Museum Bern

Wednesday 27. August 2008	
9.00	Excursion to the Alps
18.00	Back in Bern
19.00	Russian Party (Zoological Institute)

Thursday 28. August 2008 (*Cupiennius* Auditory)	
8.30	Keynote talk Chair Wolfgang Nentwig Pierre Escoubas: Spider venoms: from deadly cocktails to drug lead libraries
	Ecology and evolution
9.20	Reut Berger-Tal: When mate search is costly, but males are polygamous: an ecological perspective on a desert spider
9.40	Kajsa Mellbrand: Spiders - linking land and sea
10.00	Julien Pétillon: Influence of habitat structure on flood avoidance behaviour and flood resistance in salt-marsh lycosids.
	Behaviour Chair Trine Bilde
10.20	Stano Pekar: Out of the frying pan and into the fire? Not really!
10.40	Coffee break / Poster visit
11.10	Rolf Brechbühl: Colour matching is not equivalent to crypsis in crab spiders
11.30	Aaron Harmer: The long and short of it: properties of highly elongated orb-webs of Australian ladder-web spiders
11.50	Alberto Chiarle: New findings on the courtship behaviour of *Pardosa wagleri* and *P. saturatior* (Araneae, Lycosidae), a pair of sibling species.
12.10	André Walter: *Argiope bruennichi* shows a drinking-like behaviour in web hub decorations (Araneae, Araneidae)
12.30	Lunch / Poster visit
13.30	Keynote talk Chair Ferenc Samu Soeren Toft: The role of nutrition in spider physiology, behaviour and ecology
	Toxicology and physiology
14.20	Tommy Baumann: Antimicrobially acting compounds produced in the hemocytes of *Cupiennius salei*
14.40	Wolfgang Nentwig: How spiders use their venom
15.00	Ingi Agnarsson: Spider silk as a novel humidity-driven biomimetic muscle
15.20	Jan Engelstädter: High incidence of maternally inherited bacteria in spiders
	Agroecology Chair Stano Pekar
15.40	Ferenc Samu: Do natural grasslands enhance arable spider populations? First results of a planned landscape experiment
16.00	Itai Opatovsky: Do agricultural crops change the composition of spiders in nearby desert habitats?
16.20	Coffee break / Poster visit
16.50	John D. Herrmann: Habitat loss vs. isolation: effects on spider communities in apple orchards
17.10	Reidun Pommeresche: Diversity of epigeic spiders in grass-clover leys and under sown cereals.
17.30	Hafiz Muhammad Tahir: Predatory efficacy of three hunting spiders of rice ecosystems of Pakistan
17.50	John Joseph: Comparative toxicity of botanical and chemical insecticides on spiders in the rice ecosystem of Central Kerala, India
18.10	General Assembly of the European Society of Arachnology

	Parallel session in the *Argiope* Hall
	Biogeography and faunistics Chair Peter Horak
11.10	Efrat Gavish-Regev: Where do they come from? Biogeography of linyphiids from agroecosystems in the north-western Negev desert
11.30	Leticia Bidegaray-Batista: The diversification patterns of the spider genus *Harpactocrates* provide clues to the origins of Mediterranean biodiversity
11.50	Peter Schwendinger: About *Phyxioschema* (Araneae, Dipluridae)
12.10	Domir De Bakker: Canopy spiders from savanna trees in the Afrotropical region
	Chair Domir De Bakker
14.20	Koen Van Keer: The spiders of city subhabitats. Surprisingly high species diversity in a densely built city area.
14.40	Peter Gajdos: Changes in composition of epigeic spider communities in oak-hornbeam forest in Bab after 40 years
15.00	Yuri Marusik: Diversity of the spiders of Russia east of Ural
15.20	Mathew Mundackatharappel: Diversity and faunistic features of spiders of the Western Ghats of India
15.40	Ambalaparambil V. Sudhikumar: African and Southeast Asian elements in spider fauna of the Western Ghats of India
16.00	Enathayil Sunish: Studies on the diversity of wandering spiders in Wayanad wildlife sanctuary, southern Western Ghats, India, with special emphasis on mygalomorphs

Friday 29. August 2008 (*Cupiennius* Auditory)	
	Book vernissage Chair Wolfgang Nentwig
8.30	Ioan Duma: Theridiidae of Romania
8.40	Sebastian Pothalil: Spiders of India
8.50	Marco Isaia: Catalogue of spider species from Piemonte and Lombardia
	Spider films
9.00	Stano Pekar: Foraging behaviour of a pompilid wasp hunting *Lachesana* spiders
9.05	Mohammad Marhabaie: Spider prey capturing
	Conservation and management Chair Soeren Toft
9.10	Manuel Kobelt: Alien spider introductions to Europe supported by global trade
9.30	Myles Nolan: Developing a predictive system utilising spiders for assessment of habitat quality
9.50	Robert Tropek: Effects of traditional coppicing and game keeping in European lowland forests on epigeic spiders
10.10	Coffee break / Poster visit
10.40	V.P. Uniyal: Effects of vegetation, microclimate and space on spider assemblage in Terai Conservation Area, India
11.00	Eren Karakoc: Colonization of a newly created dune grassland by spiders
11.20	Kevin Lambeets: Multi-species inference of environmental conditions for the conservation of riparian spiders.
11.40	Christian Komposch: Wolf spider coenoses of alpine rivers: habitat preference, recolonisation of renaturated areas and conservation-strategies (Arachnida: Araneae: Lycosidae)
12.00	Photo awards (sponsored by Arachnologische Gesellschaft)
12.10	Young scientist award for outstanding posters (sponsored by the British Arachnological Society)
12.20	Young scientist award for outstanding talks (sponsored by ESA and the University of Bern)
12.30	Closing ceremony

Phylogeographic studies in spiders – a review

C. Muster

Phylogeography considers geographic distributions of genealogical lineages within and among closely related species. The number of phylogeographic studies dealing with spiders is still limited. By 31 May 2008, a total of 41 studies have been published that include sequence data (genealogical information) from at least five localities within a species (geographic variation). Since publication of the studies on Appalachian *Nesticus* in 1997, the annual number of papers fulfilling these criteria has steadily increased. There is a strong geographic and taxonomic bias of the available data. Most studies consider North America (18), followed by Australia/Oceania (10), Europe (8) and Asia (7), while Africa (1) and South America (1) remain neglected. Phylogeographic structures have been investigated in representatives from 22 spider families, with a clear focus on low-vagile habitat specialists, especially Mygalomorphae. The bulk of studies concentrates on molecular taxonomy (species delineation, status of cryptic taxa, verification of morphological species concepts) rather than biogeographic questions (area genesis, colonization routes, Pleistocene refugia etc.). Incongruence between genetically divergent lineages and nominal taxa is a frequent outcome, but this does not necessarily imply conflict between morphology and molecules. In retrospective and by application of rigorous analyses both character sets often correspond in revised taxon diagnoses.

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Carl Clerck and what became of his spiders and their names

T. Kronestedt

An account is given on the life and entomological achievements of Carl Clerck (1709-1765). Focus is given on his book "Svenska spindlar" from 1757 where binary names for spiders were introduced. In 1856 the spider species described by Clerck were revised by Tamerlan Thorell, who subsequently was able to study Clerck's forgotten spider collection. The surviving material largely confirmed Thorell's previous interpretations. In 1892 Clerck's names were invalidated due to the rules adopted at the 2nd international zoological congress in Moscow in which Linnaeus's Systema Naturae Ed. X of 1758 was established as the starting point for zoological nomenclature. Due to arguments put forth by Pierre Bonnet, the International Commission on Zoological Nomenclature in 1948 recommended that the names in Clerck's book of 1757 should be formally recognized. The case was confirmed by the Commission in 1959. In 1965 Clerck's insect collection, also including his spiders, was rediscovered. The spiders were later studied by Åke Holm, who gave an account of the remaining specimens in the collection in 1978. Their status as type material is considered. The collection is now deposited in the Swedish Museum of Natural History in Stockholm. Presently 53 spider species carry names given by Clerck.

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Progress in erigonine phylogeny with special focus on the *Savignia*-group (Linyphiidae)

H. Frick, W. Nentwig & C. Kropf

The phylogeny of the 571 genera and 4329 species of Linyphiidae is to a large extent unknown. Todays knowledge is based on the pioneer works on erigonione relationships on genus level by Merrett [1], Millidge [2] and the first cladistic approaches of Hormiga [3, 4] and Miller and Hormiga [5]. We added 19 species in 16 genera of the so called *Savignia*-genus group (defined by Millidge [2]) to the matrix of Miller and Hormiga [5] based on 176 characters. Data, available from other analyses (e.g. Dupérré & Paquin [6]) using the characters from Miller and Hormiga [5] were also included. Altogether, we reconstructed the topologies for a total of 96 erigonine species in 89 genera and 12 outgroup species.

The analysis resulted in more most parsimonious trees than before (11 versus 1) and was not helpful in resolving the relationships between the newly added taxa. However, the close relationship of the members of the Savignia-group was supported, but not the monophyly of the group (paraphyly with respect to different clades). So, new taxa should be added to this matrix only if new potentially informative characters are investigated as well.

[1] Merrett, P., 1963. The palpus of male spiders of the family Linyphiidae. Proc. zool. Soc. Lond. 140: 347-467.
[2] Millidge, A.F., 1977: The conformation of the male palpal organs of linyphiid spiders, and its application to the taxonomic and phylogenetic analysis of the family (Araneae: Linyphiidae). Bull. Br. arachnol. Soc. 4: 1-60.
[3] Hormiga, G., 1994. Cladistics and the comparative morphology of linyphiid spiders and their relatives (Araneae, Araneoidea, Linyphiidae). Zool. J. Linn. Soc. 111: 1-71.
[4] Hormiga, G., 2000. Higher level phylogenetics of erigonine spiders (Araneae, Linyphiidae, Erigoninae). Smithsonian Contributions to Zoology 609: 1-160.
[5] Miller, J. & Hormiga, G., 2004: Clade stability and the addition of data: A case study from erigonine spiders (Araneae: Linyphiidae, Erigoninae). Cladistics 20: 385-442.
[6] Dupérré, N. & Paquin, P., 2007. Revision of the North American genus *Scirites* (Araneae, Linyphiidae). Zootaxa: 1460: 47-58.

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From Clerck to µ-CT: frozen copulations in huntsman spiders (Araneae: Sparassidae)

P. Jäger, P. Michalik, T. Hörnschemeyer & J. Goebbels

Spider copulatory organs have been used for spider identification ever since Clerck published his work on Swedish spiders in 1757. Nothing drastically has changed to this method of illustration of morphological characters. However, if we would like to understand copulatory organs, i.e. their parts and the particular functions in order to get a better impression of the phylogenetic value of such structures, we have to analyse them in action. Frozen copulations of two species of Sparassidae in combination with methods of the micro-computer tomography (µ-CT) show details of functional aspects. We have investigated the anchoring of the retrolateral tibial apophysis and the insertion of the embolus. Statements about systematics and evolution are discussed.

Male palp (top) and female epigyne and internal duct system (bottom) of Holconia sp. (Sparassidae) analysed with the µCT-method.

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Uncovering diversity in Laotian caves: a combined morphological and molecular approach in the genus *Heteropoda*

S. Bayer

Only a few years ago a very large spider species was described from caves in Laos, *Heteropoda maxima* Jäger 2001. This surprising record showed that surveys of such habitats might be worth to be continued. No research about *H. maxima* was carried out since its original description but in subsequent years more material of cave-dwelling *Heteropoda* species was collected in different karstic regions of Central and Northern Laos, consisting generally of smaller forms than *H. maxima*. Now it is investigated whether these new forms belong to one species or represent different (sub)species. Moreover, the taxonomic suitability of characters of copulatory organs is evaluated. For this study morphological methods as well as the examination of genetic differences with molecular methods were applied. Therefore the nucleotide sequences of the cytochrome oxidase subunit one (CO-I) coding gene were compared and analysed. The morphological methods include preparation, measuring and drawing of the specimens. Finally a comparative cladistic study of morphological and molecular characters will be presented using phylogeny computer programs.

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Cladistic analysis of the subfamily Sparianthinae (Araneae, Sparassidae), with the description of three new genera

C.A. Rheims

Sparianthinae was first recognized as a subgroup of Sparassidae by Simon (sub Sparianthidi) to include *Sparianthis* Simon, *Pseudosparianthis* Simon and *Stasina* Simon[1]. This grouping was accepted and maintained throughout all subsequent classifications[2][3][4][5] and currently includes 13 genera, namely *Defectrix* Petrunkevitch, *Pleorotus* Simon, *Pseudosparianthis* Simon, *Rhacocnemis* Simon, *Sagellula* Strand, *Sparianthina* Banks, *Sparianthis* Simon, *Stasina* Simon, *Stasinoides* Berland, *Stipax* Simon, *Strandiellum* Kolosváry, *Thelcticopis* Karsch and *Thomasettia* Hirst[5]. A cladistic analysis using parsimony was applied to test the monophyly of Sparianthinae and discuss the relationships between it's genera and other Sparassidae genera. The data matrix comprised 38 taxa scored for 81 characters. The analysis yielded 5 most parsimonious trees with 298 steps. Results show that Sparianthinae as previously defined is not monophyletic. Thus, *Sampaiosia* Mello-Leitão is transferred to Sparianthinae and synonymized with *Pseudosparianthis* Simon and *Sparianthina* Banks is removed from the subfamily. In addition, based on the most parsimonious trees, three new genera are proposed: one to include *Sparianthis amazonica* Simon, *Sparianthis barroana* (Chamberlin) and three new species; one to include *Thelcticopis pestai* (Reimoser), *Pseudosparianthis cubana* Banks and one new species; and one to include *Olios bicolor* Banks and two new species.

[1]Simon, E. 1887. Espèces et genres nouveaux de la famille des Sparassidae. Bull. Soc. zool. France 12: 466-474
[2]Simon, E. 1897. Histoire naturelle des araignées. Paris, 2: 1-192.
[3]Järvi, T. H. 1912. Das Vaginalsystem der Sparassiden. I. Allgemeiner Teil. Ann. Acad. Sci. Fenn. (A) 4: 1-131
[4]Petrunkevitch, A. 1928. Systema Aranearum. Trans. Conn. Acad. Arts Sci. 29: 1-270.
[5]Roewer, C. F., 1954. Katalog der Araneae von 1758 bis 1940. Bruxelles, vol. 1, p. 1-1040.

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DNA barcodes for biodiversity assessment in poorly known regions: the woodlouse hunter spiders of Morocco

M.A. Arnedo & L. Bidegaray-Batista

The term taxonomic impediment refers to the inability of traditional taxonomy to catalogue all life on Earth, before extinction occurs. Genetic data provide a powerful tool to improve the efficiency of taxonomic practice. A DNA barcode is a short gene sequence taken from standardized portions of the genome, used to identify species. This technique improves species-level taxonomy by associating all life history stages or genders, providing characters for groups with few morphological features, unravelling undescribed and cryptic species and facilitating rapid identification by non-specialists. About 20 spiders of the genus *Dysdera* have been reported from Morocco. This number is similar to species counts from nearby regions like Italy or the Iberian Peninsula. However, information on Moroccan *Dysdera* is very scarce. Half of the species are known from a single sex and identification of female and juvenile specimens is difficult. We have tackled this problem by generating a DNA profile of the cox1 gene from 70 individuals from 45 localities widespread throughout Morocco. Males, and in some instances females, were identified as nominal or undescribed species and used as references to asses the existence of unveiled diversity. Our results clearly illustrate the synergic effects of DNA barcodes on current taxonomic practice.

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Orbicularian monophyly? A total evidence approach.

N. Scharff, J.A. Coddington, I. Agnarsson, T. Szűts, C. Hayashi, J. Wenzel & T.A. Blackledge

We present results based primarily on new molecular data that test the monophyly of Orbiculariae, using a taxon sample of 44 genera from 22 families (eight orbicularian). Outgoup families represent current taxonomic categories such as Mygalomorphae, Haplogynae, Australochiloidea, Eresoidea, RTA-clade, and Palpimanoidea. Molecular data included both mitochondrial and nuclear markers (COI and 16S; 28S, 18S, Histone H3 and Wingless). We also reviewed the literature to assemble morphological data for 34 of those genera. Morphological features included genitalia, somatic morphology and behavior. Through parsimony analyses and Bayesian inference of statically and dynamically aligned matrices, we explore and quantify the contribution of different character and taxa partitions and discuss implications for Orbicularian phylogeny, and the evolution of various morphological and behavioural traits.

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The golden orb weaver: update on *Nephila* taxonomy

M. Kuntner

With the largest orb webs and extreme sexual size dimorphism, the pantropical spider genus *Nephila* has been the subject of hundreds of biological studies. Unfortunately, their prominence has spawned much substandard taxonomic work, bringing chaos to the nomenclature and despair to revisionary taxonomists, ethologists, ecologists, and other biologists interested in these fascinating spiders. Consequently, the most conspicuous tropical orb weaver with more than 150 available species names has not been revised since Dahl (1912). Two works attempt to fix the problem, the Australasian revision published by Harvey et al. (2007) and the ongoing worldwide revision reported here. The latter attempts to provide a globally consistent concept for *Nephila* species delimitation by examining over 2500 samples from all major collections and documenting intraspecific variation of unprecedented proportions. The total count of valid species is being reduced to only 14 (two in the Neotropics, seven in the Afrotropics, five in Australasia), and all other names are proposed as synonyms or nomina dubia. The monophyly of the genus and intrageneric species relationships are continually being tested via phylogenetic analyses of morphological, behavioral and molecular data. The revision, when published, will complete the taxonomy of Nephilidae, and the phylogenetic hypothesis will help understand the evolution of morphological (sexual size dimorphism, developmental plasticity) and behavioral (mating strategies, web biology) traits as well as facilitate new research into nephilid ecology, physiology and biogeography.

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Morphology of the red triangular spiders (Araneidae: *Arkys*)

T. Szűts & N. Scharff

The spider genus *Arkys* is only known from the Austral-Pacific region. It was originally established by Walckenaer (1837) to hold some very conspicuous triangular spiders from New Guinea and Australia, but was synonymised with the "bird-dropping" mimics belonging to the genus *Archemorus* in 1984. The morphology and biology (as far as it is known) of the genus is remarkable and the genus has therefore been placed in several different families since it original description. It is currently placed in Araneidae, but was formerly placed in what is currently known as Tetragnathidae, Mimetidae and Thomisidae. We have examined the morphology of the genus in detail in connection with an ongoing project on araneid phylogeny, and we here present details on the genitalia and somatic morphology and discuss character homology in light of previous and present family assignments.

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Taxonomic review and phylogenetic analysis of central European *Eresus* species (Araneae: Eresidae)

M. Řezáč & J. Johannesen

Ladybird spiders (*Eresus* spp.) have attracted scientific interest since the 18th century, but taxonomical knowledge of the genus is unsatisfactory. Early classification based on colour and size variation divided European *Eresus* into numerous species. These were later lumped into one predominant morphospecies, *Eresus niger/E. cinnaberinus*, which could be found from Portugal to Central Asia. Here, we perform a major revision of *Eresus* from northern and central Europe using morphological, phenological, habitat, distribution and molecular data. Three species, *E. kollari, E. sandaliatus* and *E. moravicus* were distinguished. The name *E. niger* (originally *Aranea nigra*) cannot be used as the name *A. nigra* was used for a previous spider species. The name *E. cinnaberinus* is considered a *nomen dubium*. The three species differ in size, colour pattern, shape of prosoma and copulatory organs, phenology, and have slightly different habitat requirements. No morphologically intermediate forms were recorded. In contrast to distinct morphology and phenology, the genus is genetically complex. Genetically, the mitochondrial haplotypes of *E. sandaliatus* and *E. moravicus* are monophyletic, whereas those of *E. kollari* are paraphyletic. Eastern central European *E. kollari* is likely a hybrid lineage between *E. sandaliatus* and the monophyletic western central European *E. kollari*. Because eastern and western European *E. kollari* are morphologically and phenologically indistinguishable, we did not formally split them. However, detailed population-based research in the future may partition *E. kollari* into additional species.

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Phylogenetic affinities of the enigmatic spider subfamily Penestominae

J.A. Miller, A. Carmichael, C.E. Griswold, J. Johannesen, J. Kral, J. Spagna & C. Haddad

The Penestominae was first described from females only and placed in the Eresidae. Discovery of the male decades later brought surprises, especially in the anatomy of the male palp which features a retrolateral tibial apophysis (RTA). The presence of an RTA is synapomorphic for a large clade of spiders exclusive of Eresidae. A molecular data matrix based on four loci was constructed to test two alternative hypotheses: 1) penestomines are eresids and the RTA is convergent, or 2) penestomines belong within the RTA clade. Taxon sampling concentrated on the Eresidae and the RTA clade, especially outside of the Dionycha and Lycosoidea. The results imply revised circumscription of some RTA clade families, including Hahniidae, Amaurobiidae, Dictynidae, and Cybaeidae. Multiple fossil calibration points were used to date events in entelegyne spider evolution. This work was done in the context of a taxonomic revision of Penestominae.

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The Oonopid Spider Planetary Biodiversity Inventory: transforming how systematists work

N.I. Platnick

A group of over 45 systematists from more than 10 countries are collaborating to achieve a global taxonomic revision of the goblin spiders (Oonopidae) within the space of just a few years. This project is larger than any single systematist could ever accomplish, even over an entire career.

Our Internet-enabled collaboration provides a strong contrast with how systematic work has generally been accomplished during the 250 years since the publication of Clerck's Svenska Spindlar.

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The male genital system of goblin spiders (Araneae, Oonopidae)

P. Michalik & M. Burger

The male genital system of spiders consists of paired testes and deferent ducts, which lead into an unpaired ejaculatory duct. The distinct testes are tube-like and can vary in length and thickness in the different spider groups [1]. The deferent ducts are usually thin and can be coiled (often depending on their length). In this study, we present the general morphology of the male genital system of goblin spiders for the first time. The following species were studied: Oonopinae - *Oonops balanus*, *Stenoonops reductus*, *Orchestina moaba*; Gamasomorphinae - *Silhouettella loricatula*, *Scaphiella hespera*, *Opopaea recondita*, *Myrmopopaea* sp., *Lionneta* sp., *Neoxyphinus ogloblini*. The male genital system of the investigated species consists of an unpaired testis with paired thin deferent ducts originating laterally of the testis. The deferent ducts lead into an unpaired ejaculatory duct, which can differ in size. The organization with an unpaired testis is unique for spiders and thus a new synapomorphic trait for goblin spiders. Further studies will show whether the unpaired testis in Oonopidae evolved from partly fused testes as e.g. present in Dysderidae.

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The Mediterranean *Loxosceles*: a single species or a species-rich assemblage?

C. Ribera

The genus *Loxosceles* Heineken & Lowe, 1832 groups 100 species, 88 of which are American endemics. In contrast to this high diversity only 11 species have been reported from Africa. After Brignoli's contributions (1969, 1976) on the Mediterranean basin only a single species is currently accepted: *L. rufescens* (Dufour, 1820), whose type locality is Sagunto (Spain) and two species/subspecies are considered as Nomina dubia: *L. decemnotata* Franganillo, 1925 from Spain and *L. rufescens lucifuga* Simon, 1910 from Algeria.

The main interest to study the systematics of this genus in the Mediterranean basin comes from the knowledge of a recent severe clinical case as a consequence of a *Loxosceles* bite in the Canary Islands (Gran Canaria). As a first approach to unravel the diversification of the group in the western Mediterranean, 1000 bp of the COI gene from specimens from Morocco, Tunisia, Canary Islands and the Iberian Peninsula were sequenced in order to find out whether some species introduced from South America were present as a consequence of human activity.

Preliminary results show that the genus *Loxoceles* in the western Mediterranean is represented at least by ten different species and no direct relationship has been found between these species and the species from the American continent. Some of the species are easy to identify but others shows identical copulatory organs.

Up to now we have identified 3 species in the Canary Islands (3 of them endemic), 3 in the Iberian Peninsula, 3 in Tunisia and 3 in Morocco. As a result of the few previous morphological and molecular analyses on this group, we predict that many more species will be described in the near future.

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The family Nesticidae (Araneae) in the Mediterranean basin: origin, biogeography and phylogenetic relationships

A. Lopez-Pancorbo & C. Ribera

Nesticids are represented worldwide by slightly more than 200 species grouped in 9 genera. One quarter (53 species and 6 genera) inhabit the karstic areas surrounding the Mediterranean Basin.

Some authors have pointed out that their primigenious habitat could have been the leaf litter of tropical forests [1]. Except for some widespread species (*Nesticus cellulanus* and *Eidmannella pallida*) in the Mediterranean nesticids are cave dwellers with only a single exception (*Carpatonesticus lotriensis*).

To study the origin, colonization pathways and phylogenetic relationships of the Mediterranean species, 2000 bp from two mitocondrial genes (COI & 16S) and one nuclear gene (18S) have been partially sequenced.

Preliminary results of this phylogenetic analysis indicate that, at least, 3 independent colonization processes from eastern Mediterranean have occurred giving rise to a high number of endemic species in the main European southern peninsulas. The results show that specific radiations that have basically contributed to the high level of endemicity of this family, have been relatively recent phenomena, while ancient groups hardly present specific radiation processes. These data together with the absence of nesticids in North Africa suggest that several extinction independent phenomena may have occurred in the past.

According to the phylogeny inferred, a deep taxonomical review at the genus level should be undertaken.

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"Guessing game taxonomy" – or the lack of good genus definitions in European funnel-web spiders (Araneae: Agelenidae)

A. Bolzern & A. Hänggi

In Europe the family Agelenidae is represented by 12 valid genera (*Agelena, Agelescapa, Allagelena, Benoitia, Hadites, Histopona, Lycosoides, Maimuna, Malthonica, Pseudotegenaria, Tegenaira* and *Textrix*). At least some of these genera do not have a precise description. This leads to the problematic situation that several species could be placed in one or the other genus. Thus, for those genera redefinitions are needed.

As a first step, the actual state with a historical view to the original descriptions is presented. Additionally, an overview of the usually used characters is shown. Focused on the species-richest genera *Tegenaria* and *Malthonica,* some new, potentially useful characters are introduced.

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Two new spider species *Harpactea lazarovi* and *H. tenuiemboli* from Balkan Peninsula (Bulgaria, Serbia) (Araneae: Dysderidae)

C. Deltshev

Harpactea lazarovi is described and illustrated (male/female) from a locality in Central Stara Planina Mountain (Bulgaria). It corresponds well to the *lepida* species group. *H. tenuiemboli* is described and illustrated (male/female) from a cave in Rhodopy Mountain (Serbia). Morphologically it fits well to the *lepida* species group. The new species are discussed and compared with other species of the *lepida* group.

Disclaimer: The species *Harpactea lazarovi* and *Harpactea tenuiemboli* will be described as new species elsewhere in a scientific journal. The author explicitly states that the names *Harpactea lazarovi* and *Harpactea tenuiemboli* as they appear in this abstract are herewith disclaimed for nomenclatural purposes until the date of appearance of the original description.

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A new genus and species of pouched goblin spider (Oonopidae, Araneae) from West Africa

W. Fannes

Oonopidae or goblin spiders are very small (usually less than 2 mm), six-eyed, haplogyne spiders that are particularly abundant and diverse in the tropics and subtropics. In this talk, the morphology and ultrastructure of a new genus, widespread in West Africa but exceedingly rare in museum collections, is described and discussed. The genus' single constituent species can be distinghuished from other oonopids by its peculiar type of carapace microsculpture and posteriorly situated epigastric groove. Externally, females lack specialized epigastric structures. The male has an inward-curved embolus and a ventral 'pouch', a deep depression between the labium and sternum that accomodates the tips of both emboli. Similar features have been documented from several known genera of Oonopidae (e.g. *Grymeus* Harvey, 1987, *Silhouettella* Benoit, 1979) and also occur in many presently undescribed genera.

This study is part of the PBI project 'The megadiverse, microdistributed spider family Oonopidae'.

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Caracladus – revision including a new species (Linyphiidae)

H. Frick

The genus *Caracladus* Simon, 1884 with two Asian and two European species is revised and one new species from Europe is presented (Linyphiidae: Erigoninae). We summarize data on the diagnosis, distribution, habitat and phenology of all these species. Detailed illustrations are given for *C. avicula, C. leberti, C. montanus, C. tsurusakii* and the new species.

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Orbweb features as taxonomically diagnostic characters in *Zygiella* (Araneae, Araneidae)

M. Gregoric, M. Kuntner & R. Kostanjsek

The species classically grouped in the genus *Zygiella* are thought to all possess a characteristic web feature – a missing sector in the upper part of the orb. *Zygiella* has recently been split into several genera (among them *Leviellus, Parazygiella* and the monotypic *Stroemiellus*) and proposed to belong to Zygiellidae rather than the classical Araneidae. To find orbweb features, which can potentially diagnose these genera, we investigated adult female web architectures of *L. thorelli, P. montana, S. stroemi, Z. keyserlingi* and *Z. x-notata.* Here, we compare nine characters emphasizing absolute and relative web size, web and hub asymmetry, and radial and spiral counts. The missing sector is facultatively present in all species but its prevalence in adult female webs varies from 41% in *Z. keyserlingi* to 94% in *P. montana*. Overall, the webs of *Stroemiellus* could be diagnosed by its relatively smaller size with dense sticky spirals, and the non-circulating spirals above hub. *Parazygiella* had significantly less primary radii and sticky spirals compared to the others, and the webs of *Leviellus* differed from the others by the more pronounced vertical hub asymmetry. No web character could diagnose the genus *Zygiella* s. str. from the others. However, based on the web architecture, three of these genera seem to be diagnosable, which provides preliminary support for Wunderlich's taxonomy.

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Arachnology in Finland. 1. From Laxmann to Palmgren

S. Koponen

Very little has been published on the history of arachnology in Finland. The activity of Finnish-born arachnologists during two centuries from the time of Clerck and Linnaeus (when Laxmann described *Aranea singoriensis*) to Palmgren (and his "Die Spinnenfauna Finnlands und Ostfennoskandiens I–VIII") is briefly dealt with here. The following persons have been included: E. Laxmann (1737–96), P. Forskål (1732–63), A. von Nordmann (1803–66), F.W. Mäklin (1821–83), K.E. Odenwall (1873–1965), T.H. Järvi (1877–1960), R. Krogerus (1882–1966), and P. Palmgren (1907–93).

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PBI and the goblins: devilishly interesting

Y. Kranz-Baltensperger

There are currently more than 30 investigators worldwide from many countries working on a Planetary Biodiversity Inventory (PBI) of the spider family Oonopidae, commonly called "goblin spiders". Oonopidae are an extremely diverse group, with only ca. 20% described species. The investigated specimens come from museums collections and from field trips, where special attention is paid to forest floor and canopy inhabiting species. The morphological data of thousands of specimens from described and undescribed genera and species are databased and are available to every investigator. This internet-accessible database serves both phylogeny reconstructions and standardized species descriptions. Further goals of the project are interactive keys and an automated species identification system. An introduction to the database is given and a short overview of the family Oonopidae is presented.

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Vladimir Vagner and his contribution to arachnology

D.V. Logunov

A contribution to arachnology and some other areas of biology, particularly of the zoopsychology, of the famous Russian zoologist, Prof Vladimir Vagner is discussed. Unique photographs of Prof Vagner from several archives in Russia are provided.

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New records of an Iranian spider species and four genera previously unrecorded from Isfahan Province

M.G.R. Marhabaie, N. Nikbakht, Sh. Bahrampour & J. Moshtaghian

Not many studies are performed on Iranian spiders. A total of 244 spider species from 33 families are reported in a checklist of Iranian spider fauna from the year 2006. That checklist reports only eight species from Dysderidae, Filistatidae, Lycosidae, Salticidae, Theridiidae and Thomisidae families found in Isfahan Province. Due to the variable local climate (west central Iran), a broader biodiversity of spiders is expected. This study was designed to make a more complete and accurate assessment of spider diversity in the province. The specimens were collected during a two-year period in various seasons from different areas of the province. Since no key for spiders of the region is published yet, the specimens were identified and illustrated using the four published keys and confirmed by a specialist. The genera *Microlinyphia*, *Tetragnatha*, *Uloborus* and *Xysticus* which respectively belong to the families Linyphiidae, Tetragnathidae, Uloboridae and Thomisidae are being reported for the first time from Isfahan Province. All four genera were previously reported from Iran but not from Isfahan. Interestingly, this is the first time that the Holarctic species *Microlinyphia pusilla* is being reported from Iran.

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Revision of the South American genus *Polybetes* Simon (Araneae: Sparassidae)

C.A. Rheims, P. Jäger & A.D. Brescovit

The genus *Polybetes* Simon occurs exclusively in South America and includes to date 13 species[1]. It was revised by Gerschman & Schiapelli[2] who considered it to be a senior synonym of *Streptaedoae* Järvi 1912 and *Leptosparassus* Järvi 1912. Nevertheless, these authors examined mostly material from Argentina. In this paper a taxonomic revision of the genus is presented based on the examination of ample material from all the largest South and North American collections. Based on these results, three species, *Olios fasciatus* Keyserling 1880, *Olios vitiosus* Vellard 1924 and *Olios hyeroglyphicus* Mello-Leitão 1918 are transferred to the genus and four synonymies proposed: *Polybetes obnutus* Simon 1897 with *Polybetes pythagoricus* (Holmberg 1875), *Polybetes pallidus* Mello-Leitão 1941 with *Polybetes quadrifoveatus* Järvi 1912, *Polybetes punctulatus* Mello-Leitão 1944 with *Polybetes fasciatus* (Keyserling 1880) and *Olios vitiosus* Vellard 1924 with *Polybetes germaini* Simon 1897. Two new species are described from Piauí and Santa Catarina, Brazil, and the male of *Polybetes delfini* Simon 1904 is described for the first time. *Polybetes rubrosignatus* Mello-Leitão 1943 and *Polybetes proximus* Mello-Leitão 1943 are not congeneric with *P. martius* and are thus placed as incertae sedis until further knowledge on the Neotropical sparassid fauna is attained.

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Phylogenetic justification for the erection of a new monotypic genus of Afrotropical erigonines (Araneae: Linyphiidae)

R.R. Seyfulina & R. Jocqué

The Linyphiidae are represented in the Afrotropics by 88 genera and 414 species. The present paper reports on a new genus and species of canopy dwelling erigonine spiders from western Kenya. Males are characterized by the curved femur I, a feature that is unique among afrotropical linyphiids. Other somatic features for both females and males are quite ordinary, whereas the genitalia have a peculiar structure. The male palp has a cymbium with a button shaped retromedian process. The embolic division is characterized by a blade shaped radix, a ctenoid tailpiece, and a special L-shaped embolus with flattened tip, connected with the radix via a membrane. The epigynum has a featureless pentagonal dorsal plate. The copulatory and fertilization ducts are very thin and hardly visible against the background of the spermathecae. With this combination of characters, there is no obvious relationship of the new taxon with any of the known genera. In order to justify the erection of the new genus we incorporated the taxon in the most recent detailed phylogenetic analysis of Linyphiidae [1]. The most parsimonious trees suggest that the taxon, which is sister to a large clade of distal erigonines, is highly autapomorphic and deserves its own genus.

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Did the Cretaceous-Tertiary boundary events cause the extinction of numerous spider (Araneae) families, and gave the start to an "exploding diversification" of advanced spider families in the early Tertiary?

J. Wunderlich

(1) The proof of six extinct spider families of the Cretaceous Period argue against the resistence of spiders to Cretaceous-Tertiary extinction events in contrast to families of most insects.

(2) Gaps of the more "advanced" spiders (Araneae: Infraorder Araneomorpha) in the Cretaceous faunas indicate a geologically late - post Cretaceous - diversification of the more "advanced" spiders (of most members of the Araneoidea and the RTA-clade); this finding is discussed and compared with the diversification of ants which probably influenced strongly the spiders (co-)evolution.

(3) The "advanced" spiders displaced probably most of the more "archaic" Cretaceous spiders during the Early Tertiary (Paleogene), corresponding to the Placentalia which displaced most Marsupialia during this period.

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Kin selection and sexual selection in cooperative spiders

T. Bilde

The transition to permanent group living in spiders is associated with the elimination of juvenile and adult dispersal and complete inbreeding among group members. Phylogenetic analyses suggest multiple origins of sociality and that permanent group living evolves in subsocial families that have maternal care and temporary cooperative groups of young. Survival benefits to larger groups may drive this transition, and inclusive benefits are also likely to favour the cooperation and group living. Experimental data showing direct benefits of cooperation among kin in a subsocial spider supports the role of kin selection in the transition to sociality. The transition to an inbreeding mating system represents an evolutionary puzzle, sine continued inbreeding is expected to reduce fitness due to inbreeding depression and ultimately reduce the adaptive potential of populations. In the transitional subsocial species, it has been hypothesized that sexual selection for female choice of unrelated males, or female multiple mating has evolved to increase genetic variation of offspring and offset potential costs of inbreeding. This would create selection for genetically dissimilar groups. The lower relatedness of such groups, however, would reduce kin selected benefits of cooperation. I will discuss the role of these opposing selective forces in the transition to cooperative societies.

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Limited male dispersal in a social spider with extreme inbreeding

Y. Lubin, K. Birkhofer, R. Berger-Tal & T. Bilde

Cooperatively breeding animals commonly avoid incestuous mating through pre-mating dispersal. However, a few group living organisms, including the social spiders, have low pre-mating dispersal, intra-colony mating and inbreeding. This results in limited gene flow among colonies and sub-structured populations. The social spiders also exhibit female-biased sex-ratios, as survival benefits to large colonies favor high group productivity, which selects against 1:1 sex-ratios. While propagule dispersal of mated females may occasionally bring about limited gene flow, little is known about the role of male dispersal. We assessed the extent of male movement between colonies in natural populations both experimentally and by studying colony sex-ratios over the mating season. We show that males frequently move to neighboring colonies, whereas only 4% of incipient nests were visited by dispersing males. Neighboring colonies are genetically similar and movement within colony clusters does not contribute to gene flow. Post-mating sex-ratio bias increased with time and with increasing colony size, suggesting that males remain in the colony when mated females have dispersed. Thus male dispersal is unlikely to facilitate gene flow between different matri-lineages. This is consistent with models of non-Fisherian selection for the maintenance of female biased sex-ratios, which predict the elimination of male dispersal.

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Distribution and spread of the wasp spider (*Argiope bruennichi*) in Europe

S. Kumschick, S. Fronzek, M.H. Schmidt & W. Nentwig

The wasp spider (*Argiope bruennichi*) originally comes from the Mediterranean part of Europe and occasionally was found in warmer regions of central Europe. In the second half of the 20th century, the spider started to spread and to expand its range northwards. There are a few studies which describe the spread in several countries, but a continent-wide survey of this spread is lacking. Furthermore, not much has been done to analyse the reason for this spread. We collected data of the distribution of the wasp spider over time for most European countries and correlate this with climate (temperature, precipitation, …) at that time. We will report on how the spread of the wasp spider is correlated with climate and its change. In addition, we analyse the question up to which degree this spread is also triggered by anthropogenic changes of landscape use since *A. bruennichi* is restricted to some types of habitats and benefits from habitat disturbance.

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Climate change and the dynamics of ballooning spiders

O.T. Bruggisser, G.Blandenier & L.-F. Bersier

Dispersal abilities of plants and animals are essential for the persistence of populations. Especially in agricultural landscapes, where convenient habitats are patchily distributed and disturbance levels high, effective dispersal abilities are essential. Spiders have a highly efficient mode of dispersion, which involves passive aerial movement by 'ballooning' on silk threads. Food limitation and habitat crowding were demonstrated to induce ballooning, but little is known about the decisive stimuli triggering this behaviour. The ballooning propensitiy is definitely dependent on local meteorological conditions. Because of this dependency, the influence of the current climate change on the ballooning behaviour of spiders is of ample interest. We used a unique data set of 11 years to study the evolution of a ballooning spider community and its dependency on meteorological conditions.

More than 15000 ballooning spiders were caught in weekly intervals by a 12 m high suction trap between 1994 and 2004 in the agricultural landscape of Changins, Switzerland. Meteorological conditions were measured at the site. While trends in meteorological variables were weak during the study period, their yearly coefficient of variation increased markedly. Over 11 years, most ballooning spider species showed a declining trend in abundances. On a weekly basis, the ballooning community responded to temperature, global radiation and humidity. Moreover, we were able to show that ballooning species occupying different ecological niches differed in their response to meteorological conditions. On a yearly basis, the variability of total spider abundance was closely linked to the variability of temperature. The extreme climatic event of 2003 had a strong impact on ballooning abundances, which appeared to have effects lasting the following year. Because variability of spider abundances correlates with variability of temperature, we expect spider communities to become more vulnerable to extinction as extreme climatic events are predicted to increase.

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Do trapped ballooners reflect epigeal spider communities?

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We compare a dataset of 11 years of captures with a 12 m high suction trap in western Switzerland (Changins) with ground-level data in about 30 sites in the immediate surroundings of the trap. First, patterns of ballooning phenology are clearly different according to ecological groups of spiders. Adults of open habitats spiders show more periods of aerial dispersal than those living in trees and bushes. This is a well-adapted strategy to survive in disturbed areas like agricultural land. Second, the majority of spiders showing a decreasing trend in ballooning are common spiders of agricultural landscapes. Some species however increased markedly during the study period, both in the suction and ground-level traps. Their expansion can be followed at the landscape level.

Theoretical distances of aerial dispersal are shown by an approach based on the distance of a ballooning spider to its nearest potential or known habitat.

We compare the communities of newly created habitats (fallow meadow, hedgerow) with species distribution among spiders ballooning simultaneously.

Preliminary results suggest that suction traps could be used as a standard method to monitor trends of spider fauna, which is highly needed in the context of the current biodiversity crisis.

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Liochelid scorpions of the Indo-Pacific: systematics and biogeography

L. Monod & L. Prendini

Phylogenetic relationships in the scorpion family Liochelidae Fet & Bechly, 2001 are poorly understood. The taxonomic validity of several currently recognised genera remains uncertain. A phylogenetic analysis of relationships among the Indo-Pacific liochelid genera, based on ca. 3 kb of DNA sequence from four loci in the nuclear (18S rDNA and 28S rDNA) and mitochondrial (12S rDNA and 16S rDNA) genomes, was conducted to test hypotheses concerning factors that may have shaped their current pattern of distribution. Based on the phylogeny and known distributions, the high diversity and endemism of Liochelidae in the Australasian region may be explained by its complex geological history and major climatic changes. The Melanesian liochelids apparently diversified by consecutive speciation and integration events along island arcs that now form part of larger, composite landmasses. In contrast, the diversity of Australian liochelids appears to have resulted (1) from the fragmentation of a once widespread rainforest habitat due to the onset of aridification and decline of rainforests during the Middle Miocene; and (2) from the subsequent, successive expansion and contraction of the remnant forest refugia. Congruence between the phylogeny, the distribution of Liochelidae and the temporal sequence of geotectonic and climatic events in the Indo-Pacific region will be discussed.

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Biogeography of the bark-scorpions, *Centruroides* Marx 1890

L.A. Esposito & L. Prendini

The New World buthid genus *Centruroides* Marx, 1890, contains many of the world's most dangerously venomous species. Envenomation by these scorpions is a significant cause of morbidity and, in some cases, mortality in Mexico and the southwestern U.S.A., Central America, the Caribbean and northern South America. Despite its medical importance, the taxonomy of the genus is in shambles. Many of the species are poorly defined, and their relationships the subject of much speculation. A molecular data matrix for 48 species and 15 outgroups comprised of DNA sequences from six loci in the nuclear (28S rDNA, 18S rDNA, Histone H3) and mitochondrial genomes (cytochrome oxidase I, 16S rDNA, 12S rDNA) was analyzed phylogenetically. Various biogeographic hypotheses were tested against the resulting phylogeny, with interesting implications.

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Ecomorphotypes of scorpions of Khoozestan (Southwestern Iran) (Scorpiones: Buthidae, Scorpionidae, Hemiscorpiidae).

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Khoozestan Province (63,236 km2), with its hot and humid climate, is located in the South-West of Iran. Scorpions and scorpionism (human envenomation cases) are common in Khoozestan due to its geographical location and climate. In this study, 19 species of scorpions were collected from the different parts of province by UV light at night during two years (see Navidpour et al., 2008). Three general ecomorphotypes of scorpions are recognized for this part of Iran.

(1) Psammophilous and semi-psammophilous species such as *Apistobuthus susanae*, *Buthacus macrocentrus*, and *Vachoniolus iranus* Navidpour et al., 2008 (all Buthidae), are found in the desert portion of Khoozestan (e.g. Omidiyeh, Bostan, and Hamidiyeh areas), with sandy and soft substrata.

(2) Pelophilous species such as *Scorpio maurus townsendi* (Scorpionidae) and *Odontobuthus bidentathus* (Buthidae) live in burrows in clay soils and hard substrata (south, west, north, and central Khoozestan).

(3) Lithophilous species such as *Hemiscorpius lepturus* (Hemiscorpiidae) and *Compsobuthus matthiesseni* (Buthidae) are adapted to life in narrow cracks and rock crevices in the mountains of Izeh, Masjedsoleyman, and Baghmalek areas (eastern Khoozestan).

Adaptive morphology of these three ecomorphotypes is illustrated and discussed.

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Gross morphological investigations of scorpion lungs

C. Kamenz, J.A. Dunlop, G. Scholtz, A. Staude & J. Goebbels

Comparative morphological studies on scorpion book lungs intend to figure out the morpho-space of variation, with particular reference to the spacial orientation of their lamellae. This is needed due to conflicting accounts of scorpion lamellar position in the literature, whereby description of the lung anatomy was generally rather vague. Our investigations with histological methods and micro-tomographical techniques reveal the most precise 3-dimensional reconstruction of these organs to date. We studied 10 species thus far and present here the first results, which show tendencies of the evolution of scorpion book lungs.

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Fundamental trends in the karyotype evolution of Pedipalpi: comparison with spiders, solifuges, and palpigrades

J. Král, F. Šťáhlavský, J. Musilová, A. Sember, L. Dulíková, S. Pekár, P. Weygoldt, J. Haupt, A. Gromov, S. Huber & L. Prendini

Fundamental trends in the karyotype evolution of Pedipalpi are assessed by comparison with the karyotypes of spiders, solifuges, and palpigrades [1]. Karyotypes of amblypygids, schizomids, and solifuges were previously unknown. Male chromosome numbers were as follows: Amblypygi: *Charinus neocaledonicus* 74, *Charon grayi* 70, *Phrynus* sp. 64, *Damon medius* 66, *Phrynichus deflersi arabicus* 30; Thelyphonida: *Labochirus proboscideus* 78, *Hypoctonus siamensis* 54, *Typopeltis tarnanii* 52, *Typopeltis* sp. 44; Schizomida: *Agastoschizomus lucifer* 22, *Orientzomus* sp. 16; Solifugae: *Solpuga zuluana* 22, *Paragaleodes heliophilus* 12, *Rhagodes* sp. 18, *Biton planirostris* 22, *Gluvia dorsalis* 10. A high chromosome number is hypothesized to be synapomorphic for basal clades of amblypygids, thelyphonids, and spiders. Karyotype evolution of amblypygids and thelyphonids is characterized by reduction in the chromosome number, accompanied by increased numbers of biarmed chromosomes, caused by pericentric inversions and centric fusions. Low chromosome numbers of schizomids may reflect derived position of this group within Uropygi (Thelyphonida + Schizomida). Alternatively, a low chromosome number may be synplesiomorphic for Schizomida, Palpigradi, and Solifugae which would bring schizomids into base of Tetrapulmonata. The absence of differentiated sex chromosomes in solifuges, palpigrades, and many pedipalpi, as well as acariform mites, suggests a late differentiation of sex chromosomes during evolution of Arachnida.

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Systematic of the Opiliones family Trogulidae

A. L. Schoenhofer & J. Martens

Among European Opiliones the family Trogulidae is one of the exceedingly difficult to deal with in respect to systematics, taxonomy and evolutionary biology. External morphology is extraordinarily homogeneous. Clear-cut characters to delimit species remained difficult to establish as it was likewise for the limit of intraspecific variation. Most species described during the last three decades did not shed new light on the situation because previously described similar species were not re-characterized carefully enough. Considering the high degree of morphological homogeneity cryptic species had to be expected. A consequent revision of Trogulidae was therefore demanded by many scientists.

Within this approach on systematics and taxonomy we established a molecular phylogeny (28S, cytochrome b gene) and combined phylogenetic informations with geographic, morphologic and morphometric data. This allowed us to re-evaluate species limits and characters for determination. It became clear, that genital morphology is important for the recognition of genera and species groups but not sufficient for the determination of species. We found the number of cryptic species highly underestimated. Furthermore the genus *Dicranolasma* is recovered and the generic structure of the family Trogulidae is revised.

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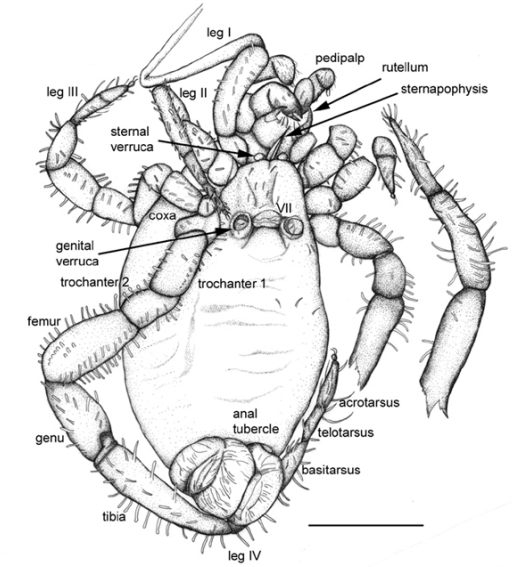
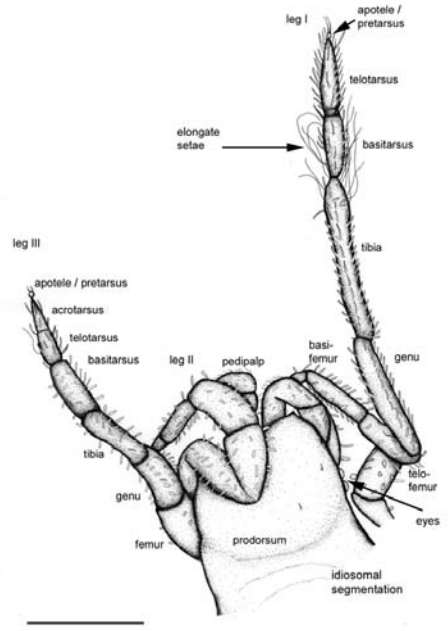
A new opilioacarid mite in amber, with comments on the fossil record and affinities of mites

J.A. Dunlop, C. Sempf & J. Wunderlich

The second fossil opilioacariform mite (Acari: Anactinotrichida: Opilioacarida) is described as a new species of ?*Opilioacarus* recovered from Baltic amber (Palaeogene: Eocene). Compared to the previously described amber opilioacarid, the new fossil reveals more of the genital region, as well as an unusual pattern of long setae towards the distal end of the first leg. Unlike the previous species, the new fossil bears only two pairs of eyes and the fourth pair of legs are shorter in relation to the body, which clearly indicate a new fossil taxon. Recent work on the phylogenetic position of the mites – and their constituent subgroups – is briefly reviewed, together with a summary of the fossil record of mites in general.



Ventral view of the new amber opilioacarid



Dorsal view of the new amber opilioacarid

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Luring behaviour as a complementary strategy to forced copulation in *Galeodes caspius subfuscus* (Solifugae: Galeodidae)

M. Hrušková-Martišová & S. Pekár

There are two opposing male strategies how to overcome female's resistance to mating: luring behaviour (courtship) and coercive behaviour (forced copulation). Majority of males do not perform luring if they force females to mate.

We studied the mating in camel-spider *Galeodes caspius subfuscus* in order to find traits of the luring and/or coercive behaviour. This also included morphological description of the intersexual differences in the body parts used during the mating.

We observed that males used superior speed to grip the female, restrained her by locking her extremities and paralyzed her by biting. In all cases post-mating cuticular damages were found on the female's body. All these characteristics indicate the presence of forced copulation.

In spite of clearly coersive character of the copulation two forms of luring behaviour were observed as well: courtship prior the copulation (stroking and tapping with pedipalps) and during the copulation (copulatory courtship). Occurrence of pre-copulatory courtship in forcibly copulating males has not been reported before.

While pre-copulatory courtship facilitates males being accepted as mates, copulatory courtship appears to influence cryptic female choice. We suggest that in *G. caspius subfuscus* both forms of luring behaviour have evolved as complementary strategies to forced copulation in order to increase the paternity success.

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Scorpions in the art

R. Stockmann

The representations of scorpions concern not only works of art such drawings, paintings,sculptures,curios, but also usual things. The more ancient art object is made of flint. Ancient egyptian and babylonian arts are rich in representations. Astrology, as well as christian, jewisch or islamic art play a great part in figurations of all ages. Databases on the Internet of the different museums in the world and consultation of very various Web sites , as well as the search of objects in different countries allow a wide view of scorpions in art. Figurations often include obvious mistakes of zoological morphology, which we give a list.

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The double function of sperm in scorpions: The mating plug of *Euscorpius italicus* (Euscorpiidae) is formed by sperm

S. Althaus, A. Jacob, W. Graber, D. Hofer, W. Nentwig & Ch. Kropf

The mating plug of *Euscorpius italicus* is investigated with respect to its fine structure and changes over time. The mating plug fills the female's gonopore after one mating only. Sperm forms the major component of the mating plug, a phenomenon previously unknown in arachnids. Three parts of the mating plug can be distinguished. The part facing the outside of the female (outer part) contains sperm packages comprising roughly 500-900 inactive spermatozoa. In this state sperm is transferred. In the median part the sperm packages get uncoiled to single spermatozoa. In the inner part, free sperm is embedded in a large amount of secretions of different densities. Fresh mating plugs are in a soft-gelatinous state, later they start to harden from outside towards inside. This process is completed after 3-5 days, possibly under female participation. Sperm from artificially triggered spermatophores could be activated by immersion in Insect Ringer's solution indicating that the fluid condition in the female genital tract causes sperm activation..

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Pseudoscorpions of the genera *Neobisium* and *Roncus* from Carpathians - prospects of karyotype and molecular studies.

F. Šťáhlavský, T. Vařil & J. Christophoryová

During the last ten years the cytogenetic studies provided better identification of similar species within pseudoscorpions. This arachnid order is characteristic by very similar external morphology in many taxons but simultaneously exhibits high variability in karyotypes. It is typical especially for the genera *Neobisium* and *Roncus* (both from the family Neobisiidae). Despite of the fact that the number of the karyotyped species enable as think about the trends of the karyotype evolution in these groups, hypothesis about the karyotype evolution were not compared with the morphological or molecular phylogeny so far. That is why we start more detailed analysis of these two genera from Carpathians. This 1500 km long mountain range enables to study the differentiation and prospective speciation very well. During the first stage of our study we try to summarize knowledge about the distribution of *Neobisium* and *Roncus* species from the studied area. Our first results of cytogenetic and molecular analyses indicate that many cryptic species can be distributed in this area, especially within the genus *Neobisium*. That is why the number of the endemic pseudoscorpions species probably will be higher in Carpatians.

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An unidentified harvestman *Leiobunum* sp. alarmingly invading Europe (Arachnida: Opiliones)

H. Wijnhoven, A. L. Schoenhofer & J. Martens

Since about the year 2000 a hitherto unidentified species of the genus *Leiobunum* C. L. Koch, 1839, has rapidly invaded central and western Europe. Records are known from The Netherlands (probably the country of first occurrence in Europe), Germany, Austria and Switzerland. This introduced species, until now, mainly inhabits walls of buildings and rocky environments. Adults characteristically aggregate during daytime into groups of up to 1,000 individuals. Undoubtedly this introduced species has the ability to become a threat to our indigenous opilionid fauna.

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Effect of the antibacterial peptide parabutoporin on neutrophil granulocytes

J.Willems & Q.Remijsen

Parabutoporin (PP) is one of the many bioactive peptides found in scorpion venom of the *Parabuthus* genus. In our research group it was initially characterized as a strong antimicrobial peptide which – at micromolar concentrations- is mainly active against Gram-negative bacteria.

At much lower concentrations however PP also affects activities and viability of neutrophils: it strongly inhibits the production of reactive oxygen intermediates via the NADPH oxidase system and it has a striking anti-apoptotic effect on the same cells.

The molecular mechanisms responsible for these actions were recently clarified.

As to the inhibition of superoxide production we could show that PP, which is cationic and contains serine residues, is a very potent competitive inhibitor for the phosphorylation by PKC of p47phox, one of the components of the active NADPH oxidase complex (1).

As to the pathway by which PP can induce the delay of spontaneous apoptosis of neutrophils, we could show that the inhibition of NADPH oxidase is not responsible for this effect but it is caused by the activation of PI3K and Akt.

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Evolutionary patterns of web investment in orb-weaving spiders

T.A. Blackledge, N. Scharff & I. Agnarsson

Orb-weaving spiders are classic models for foraging theory due in part to the ease of describing the shapes of their webs. While orb web architecture does provide information about spiders' investment in foraging, it only part of the story. Energetic investment is better measured by the total amount of silk spun in a web and spiders can potentially produce larger looking webs with less silk in them by modulating the diameters of silk threads. Moreover, the function of orb webs in prey captured is determined as much by the biomechanics of silk threads as by the overall shapes of webs. Here, we provide a preliminary investigation of patterns of intra-and inter-specific variation in silk investment and biomechanical performance of threads by several taxa of orb-weaving spiders including araneid, nephilids, tetragnathids and uloborids.

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Spider abundance and phenology as influenced by climate and climate change

J.-P. Maelfait, E. Karacoc, L. Baert & F. Hendrickx

From 1990 onwards till present spiders and carabid beetles of a dune and saltmarsh nature reserve along the Belgian coast were continuously sampled by means of pitfall traps emptied at fortnightly intervals.

For the most abundantly retrieved species the captures were summed per yearly cohort. Year to year variation appears to be predominantly influenced by winter temperature conditions. A trend towards an earlier reproductive activity can be seen in spring breeding species.

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Study on the divergence patterns in an adaptively radiated wolfspider genus on the Galapagos

C. De Busschere, F. Hendrickx, L. Baert & J. Maelfait

Adaptive radiation is the process in which an ancestral species induces a range of species adapted to different niches and characterized by unique features to explore these niches[1]. Although this is a well studied topic, there is still a lot of uncertainty about the underlying processes creating this divergence. Whether divergence in ecological traits is merely influenced by ecological processes (ecological opportunity)[1] or rather by the potential of species to produce alternative phenotypes[2,3] is crucial for understanding the mechanisms of speciation.

This research is focused on different populations of the genus *Hogna* occurring on the Galapagos. These populations are difficult to distinguish morphologically and constitute several species, until now 3 species are described *H. albemarlensis, H. galapagoensis* and *H. snodgrassi.* Preliminary analyzes of the cytochrome oxidase subunit I reveals that these populations are primarily diverged in function of the geographical position of the islands and secondly in function of the habitat. These populations are recently diverged and give the potential to get insight in the first steps of speciation. Furthermore a biometric study revealed morphological differences between *H. albemarlensis* and *H. galapagoensis* occurring on Santa Cruz due to the different vegetation[4].

The main goal for further research is to contrast the degree of divergence in both ecological and molecular traits in order to explain the observed patterns of this differentiation. Furthermore we would like to know to what extent this divergence in traits can lead to reproductive isolation. Practically, this research involves morphometric methods, biometric measurements and genetic analyzes.

H. galapagoensis occurring in the pampa zone on Isla Santa Cruz

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Unraveling the patterns of genetic and morphological variation in the Canarian endemic spider *Dysdera verneaui*

N. Macías-Hernández, P. Oromí & M. Arnedo

Studies at the species/population interface provide key insights into the causes of speciation. The Canarian species of the genus *Dysdera* are one of the most remarkable examples of evolutionary radiation among spiders. Tenerife is the largest island and harbours the richest *Dysdera* fauna in the archipelago. Among Tenerife endemics, *Dysdera verneaui* shows the widest distribution and broadest ecological tolerance, providing an excellent model to investigate the geographic patterns of genetic and morphological variation and their association to environmental and historical factors. Phylogenetic and population analyses of multi-gene sequence data from 80 individuals sampled throughout the island, indicate high to moderate levels of gene flow among neighbouring populations from different habitats, but also unravel the existence of isolated populations corresponding to ancient protoislands. On the other hand, morphological analyses of these individuals hint at the environmental involvement in the generation of phenotypic diversity. Overall, this study shed light on some of the factors that have prompt diversification in the woodlouse hunter spiders of the Canary Islands.

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Scale-dependence of diet composition in spiders: effects of hunting strategy, habitat and global distribution

K. Birkhofer & V. Wolters

Analysing effects of spatial scale on food-web properties is experimentally challenging and field studies are rare [1]. Apart from the total extent of a study area, the grain or individual sample area size may determine proportions of different resources in a consumer's diet [2]. In this review of 178 published records of species-specific diets we analysed the impact of hunting strategy (small grain size), habitat type (medium) and geographic distribution (large) on diet composition and food-web properties in spiders.

Diet composition differed between levels of all three factors with 5-6 prey orders significantly contributing to the observed patterns. The proportion of Diptera prey contributed most to differences between spiders with different hunting strategy, habitat or worldwide distribution. At the habitat level, Hemiptera prey contributed to a similar extent, distinguishing the proportional prey composition of spiders in agroecosystems from species in other habitats. Predation rates on other spiders only differed between hunting strategies, with cursorial spiders showing the highest proportion of intraguild prey independent of habitat or distribution. This review indicates the importance of scale for diet composition and suggests strong effects of different sample area sizes on food-web properties.

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Is sex-ratio distortion a strategy resulting in stable male coexistence in the dwarf spider *Oedothorax gibbosus*?

F. Hendrickx, B. Vanthournout, V. Mazalov, D. Vanacker & J.-P. Maelfait

The dwarf spider *Oedothorax gibbosus* is characterized by a male dimorphism in which the cephalothorax of the *gibbosus* morph possesses a grooved hunch while *tuberosus* lacks these features. Previous results, obtained by Vanacker et al. 2004, demonstrated that both morphs have different mating strategies. Non-virgin females prefer the *gibbosus* morph as mate, while the *tuberosus* morph has a longer adult lifespan. As eggs are primarily inseminated by sperm of the last mated male prior to cocoon production, the mating strategy of *gibbosus* can have a strong fitness advantage if females are inseminated by multiple males. Breeding results moreover suggest that females mated with the *tuberosus* morph produce a female biased sex-ratio, which is expected to lower the fitness of this morph according to Fishers' theory of sex-ratio selection. We present a game theoretical model that serves as a possible hypothesis explaining how sex-ratio distortion of the *tuberosus* morph serves as strategy to increase its fitness relative to *gibbosus*, which might ultimately lead to the stable coexistence of both morphs.

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Spider venoms: from deadly cocktails to drug lead libraries

P. Escoubas

Spider venoms contain a dazzling array of peptide toxins and represent an enormous resource for the discovery of novel molecular probes and drugs. Venom analysis by mass spectrometry has shown the presence of up to 1000 peptides. Various structural families and multiple isoforms form combinatorial libraries of bioactive peptides. To explore this diversity, we have developed a new methodology based on LC-MALDI-TOF mass spectrometry. Mining of venom peptidomes can single structurally and pharmacologically related toxins. De novo peptide sequencing via tandem mass spectrometry is used in combination with cDNA libraries to generate full peptide sequences, as illustrated for Australian funnel-web spiders.

Spider venom exploration is applied to the search for novel toxins to be be evaluated in drug discovery programs. Current interest in toxins modulating ion channels involved in nociception, is linked to the need to discover novel routes of analgesia. Spider toxins selective for ASIC (Acid-sensing Ion Channels) and Nav (voltage-dependent sodium) ion channels were shown to possess analgesic properties in animal models and are promising leads for the development of novel drugs. The combined use of cutting-edge proteomics and genomics technologies allows for the exploration of the vast potential of spider venoms.

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When mate search is costly, but males are polygamous: an ecological perspective on a desert spider

R. Berger-Tal & Y. Lubin

Theory predicts that males who provide little or no parental investment should strive to increase their reproductive success by reaching as many females as possible. This view is challenged, however, by the occurrence of species with high costs of mate search, in which the males encounter only few females. Male monogamy is often related to species with high investment in a single mating. In some mating systems, however, high search costs are associated with low male investment in a single mating; these have been mostly overlooked in the literature. I followed marked males in a natural population of the spider *Stegodyphus lineatus*. The males encountered up to five females. Yet, there was a large cost when searching for females, as only 50% reached a single female's nest. During most of the mating season there was a highly female biased operational sex-ratio and females mated on average with a single male in their lifetime. We suggest that high cost of search can reduce intrasexual selection and the chance of finding additional mates. Thus, if the benefits of paternity protection are lacking, the need to invest in a single mating is reduced. We predict that the density of available females will influence the stability of this mating system.

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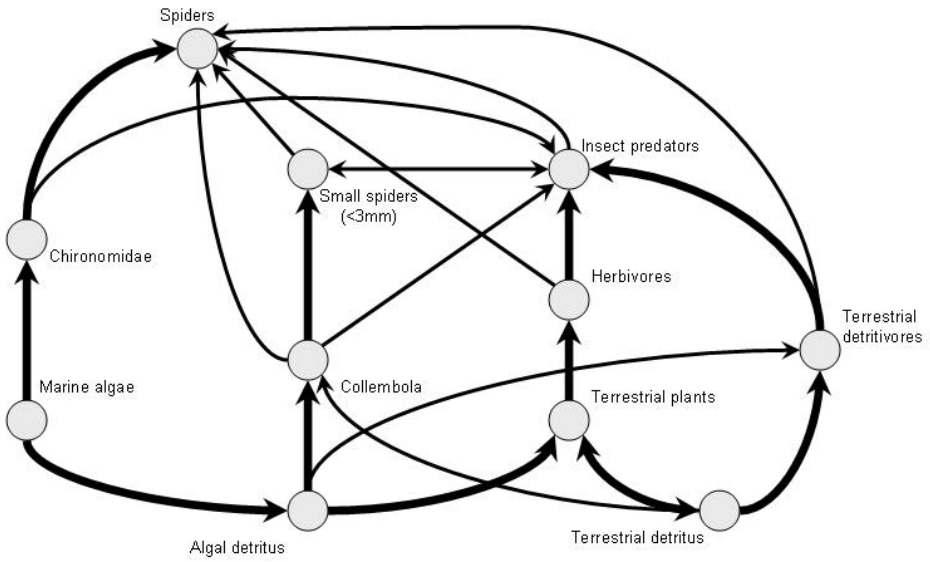
Spiders - linking land and sea

K. Mellbrand, P. Lavry, G. Hyndes & P. Hambäck

Flows of nutrients and energy across ecosystem boundaries, subsidies, may have profound consequences for food web structure and function in receptor ecosystems. We have used stable isotope analysis and two-source mixing models to analyze the marine contribution to terrestrial arthropod predator diets and construct a bottom-up food web for Baltic Sea shore ecosystems, where marine inflows mainly consists of wrack and emerging insects with aquatic larval stages. We have also used stable isotope analysis to track the inland reach of marine subsidies to examine the roles of arthropods in the inland transport of marine subsidies.

Our results show that spiders are the predators mainly utilizing marine material on Baltic Sea shores, and that spiders and dipterans together function as important vectors for the inland transport of marine nutrients and energy. In both Baltic Sea shore meadows and Australian sandy beaches, marine nutrients and energy reach further inland than the actual inflow of matter (wrack) or animals (emerging insects) by entering the terrestrial food chain. This indicates that highly mobile arthropod vectors can substantially increase the reach of marine subsidies, causing them to affect not only beaches but inland ecosystems as well.



Suggested coastal food web of Baltic Sea shores.

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Influence of habitat structure on flood avoidance behaviour and flood resistance in salt-marsh lycosids

J. Pétillon, K. Lambeets, W. Montaigne & J.-P. Maelfait

Vegetation and underground structures are known to influence flood avoidance (e.g. Cooke, 1962; Adis, 1997) and flood resistance (e.g. Foster & Treherne, 1976; Kneib, 1984) in invertebrates. In monthly-flooded European salt marshes, recent invasions by the nitrophilous grass *Elymus athericus* strongly modified natural habitat structure, notably by the presence of a deep litter. We therefore investigated the effects of such a habitat change on flood avoidance and resistance in a major terrestrial component of salt-marsh fauna, spiders. We hypothesize that invaded habitats may change the ability to resist flooding for ground-living invertebrates by the presence of new refuges during tides. Two dominant cursorial species in salt-marshes were studied, both belonging to the family of Lycosidae, *Arctosa fulvolineata* and *Pardosa purbeckensis*. These species first differ by their rarity within their habitat which may be explained by their dispersal abilities, high for P. *purbeckensis*. Their aut-ecology is also different, *A. fulvolineata* being much more abundant in invaded habitats than in natural ones. We thus hypothesised differences in tidal effects depending on habitat structure, in the sense of a better flood withstanding for *A. fulvolineata* in habitat with litter. This hypothesis has been tested using both experimental and field designs.

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Body size determines the outcome of competition for webs among exotic and native sheetweb spiders (Araneae: Linyphiidae)

B. Eichenberger, E. Siegenthaler & M.H. Schmidt

The exotic sheetweb spider *Mermessus trilobatus* (Araneae: Linyphiidae) has become abundant in large parts of Central Europe within the last three decades. We conducted laboratory experiments to test if its invasion might negatively influence native spiders. The exotic *Memessus. trilobatus* and five native sheetweb spiders (*Erigone dentipalpis*, *Erigone atra*, *Gnathonarium dentatum*, *Dicymbium nigrum* and *Micrargus herbigradus*) were compared with respect to their success to take over webs of *E. dentipalpis*. The rate of web takeover or defence was determined by body size, whereby individuals with a wider thorax invaded webs more successfully. After taking body size into account, the frequency of defence or web takeover did not differ between species. Our results do not indicate that the invasion of *Mermessus trilobatus* is facilitaed by strong competitiveness. However, immature or smaller sized native species may be at risk. Apparently, introductions of large-bodied spiders pose the greatest threat to native spider communities.

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Arboreal spider community: a preliminary study of abundance and diversity of spiders on the European beech

S.Y. Hsieh & K.E. Linsenmair

Spiders were sampled by insecticide knockdown fogging from the canopies of the European beeches (*Fagus sylvatica*) in the Wuerzburg University Forest, Germany. Totally 24.216 specimens from 324 beeches arranged into three different growth stages (A: over 140 years, B: 50 – 60 years and C: 20 – 25 years) were collected between June 2005 and October 2007 on a monthly basis. Beating trays and pitfall traps were also used in order to complete the data of the whole community structure. There are three main seasonal patterns with the highest abundance in August and least in February. The amounts of spider and insects sampled with beating trays are strongly positive correlated in winter. The results contribute to our understanding of how important forests of different age classes are and which age classes conserve a maximum of diversity of the tree crown spider fauna for sustainable forestry.

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Conservation of spiders in pitfall traps

P. Jud & M.H. Schmidt

Pitfall trapping is a common method for catching surface active arthropods such as spiders (Araneae). Usually, a fluid is employed to increase trapping efficiency and to preserve the catch. Possible differences between widely used trap fluids are sparely documented. Here, we compared ethylene glycol, propylene glycol and formalin with respect to capture efficiency and preservation of the spider catch. The two glycols were employed at two different concentrations. The resulting five types of fluid were prepared with and without quinine sulphate. Each of these ten combinations was employed in six pitfall traps in a fallow. Capture efficiency was similar across all combinations of fluid and bitter agent. In contrast, preservation differed between the treatments. Undiluted glycols showed higher percentage of expanded pedipalps, coated epigynes and damaged abdomens. Quinine sulphate improved conservation in glycols, but impaired conservation of abdomens in formalin. Ethylene glycol caught more slugs than formalin traps. Overall, we recommend dilution of both ethylene and propylene glycols with water in order to facilitate spider determination. Undiluted glycols should only be used when the risk of traps drying out is high. Formalin can be preferred over ethylene glycol when it is likely that slugs would otherwise spoil the catch.

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Intraguild predation of *Anyphaena accentuata* and *Philodromus* spp. during overwintering

S. Korenko & S. Pekár

We surveyed overwintering spider populations on the bark of a commercial apple tree orchard. We found 35 spider species overwintering on the apple tree bark, with dominant three species: *Anyphaena accentuata, Theridion* spp. and *Philodromus* spp. There was a negative correlation between abundance of *A. accentuata* and *Philodormus* spp. (r = -0.37, Pearson product moment). This could either result from interspecific competition or intraguild predation. Individuals of *A. accentuata* mostly overwintered as subadults, whereas *Philodromus* spp. overwintered as juveniles. Thus, overwintering individuals of *A. accentuata* were on average larger and had a potential to predate on smaller *Philodromus* spp. However, the intraguild predation depended on the relative ratio between the two spider species. Smaller species had higher chance to find a shelter and thus escape predation. In laboratory conditions we investigated predatory activity of the two spider species at low temperatures. Spiders were kept at -4, -2, 0, 1, 2, 5 and 7 °C and fed with *Theridion* spp. *A. accentuata* was able to catch and consume prey at -2 °C and higher temperatures, whereas the lowest temperature threshold of prey capture for *Philodromus* spp. was 0 °C. Due to predatory activity at low temperatures, *A. accentuata* has high potential in the control of orchard pests overwintering on bark during winter and early spring, when other predators are inactive.

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Life-history of a parthenogenetic oonopid spider, *Triaeris stenaspis* Simon 1891 (Araneae, Oonopidae)

S. Korenko & S. Pekár

Life-history of oonopid spiders was unknown. We present analysis of the life-history of *Triaeris stenaspis* that has been introduced into greenhouses over Europe. Spiders were reared under laboratory conditions, under constant physical and diet conditions, and followed from hatching to their end of life. We found that the spiders pass through 3 juvenile instars, with each instar lasting approximately a month. The longevity was on average about 6 months. The mortality was higher for eggs, and rather constant for all juvenile instars. Five morphological characters (length of prosoma, width of anterior eye region, length of tibia, number of ventral spines on patella and tibia) were recorded for each instar providing basis for a reliable identification of developmental stages. All reared spiders developed were only to females. Although kept isolated they laid fertile eggs, providing sound evidence for parthenogenesis. Eggs were always enclosed in disc-shaped egg sacs, each containing 2 eggs. The total fecundity was on average 27 eggs, decreasing with age. Fertility was rather low (56 %). Beside egg sacs, females regularly produced empty sacs with an increasing frequency toward their end of life. Explanation of this is not clear.

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Value of the aphid *Hyalopterus pruni* as food for the spider *Clubiona phragmitis*

B. Larsen & S. Toft

It has been suggested that the aphid *Hyalopterus pruni* from *Phragmites* plants might be an important prey for the sac spider *Clubiona phragmitis* during summer and early autum. However, studies on other aphids and spiders have all indicated a low quality of aphids as spider food. We tested the food value of the aphid against hatchlings of *C. phragmitis* using the collembola *Sinella curviseta* as a high-quality comparison prey. Both growth and development were very low in spiders fed aphids compared with spiders fed the collembola. However, a mixed diet of aphids and collembola led to a higher growth rate than a pure collembola diet. These results show that the aphid in itself is a low-quality prey but it may contribute some nutrients that are in short supply in other prey. *H. pruni* is probably not a staple prey of *C. phagmitis* but it may be a valuable supplement.

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Similar ecological mechanisms in plants and spiders? Strong between-group correlation in community diversity and specialisation

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A well known phenomenon in community ecology is the amazing variation of niche width across species: some occur in many habitats (generalists), others in few (specialists). Within a given habitat, a gradient of community specialisation may be observed, with communities supporting more or less specialist/generalist species. However, it remains generally unknown which mechanisms are responsible for this variation in community specialisation, and whether the same mechanisms influence different taxonomic groups.

To address this, we examined whether community characteristics (species diversity and mean community specialisation) were correlated between plant and spider communities. We investigated these relationships at different spatial scales, using presence/absence and abundance data, in 24 sites of highway verges located in an agricultural landscape. Significant correlations were found for richness, diversity and community specialisation indices between taxa. In particular, sites with more specialised plant communities also sheltered more specialised spider communities.

These strong correlations suggest that plant and spider communities are driven, at least in part, by similar mechanisms. Consequently, our results have implications for our understanding of community-level processes. Moreover, as specialist species decline in the context of global changes and their conservation is now of great concern, our results also have implications for species conservation.

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Sex ratio distortion in the male dimorphic dwarf spider *Oedothorax gibbosus*

D. Vanacker, F. Hendrickx, J.-P. Maelfait & B. Vanthournout

According to the sex-allocation theory of Fisher, a 50:50 sex ratio is considered to be an evolutionary stable strategy. In a population with uneven numbers of males and females, the underrepresented sex will have a fitness advantage at the time of mating, hence increasing in the population which ultimately leads to the evolution of a stable 50:50 sex ratio.

Despite this theory, many examples of distorted sex ratios can be found in nature. This is also the case in the dwarf spider *Oedothorax gibbosus* where it is observed that some females produce more females than males in each clutch causing a female biased population sex ratio. Moreover, this species is characterized by the presence of a male dimorphism.

Specific breeding designs were performed to understand the underlying mechanism of this sex ratio distortion. These data suggest that both parents control the offspring sex ratio. At present, additional methods such as sperm flow cytometry and chromosomal analyses are used to further clarify this mechanism. These data will be used to examine the possible interaction between the male dimorphism and the sex ratio distortion, which might result in the evolutionary stable occurrence of both the distortion and the dimorphism in the population.

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Out of the frying pan and into the fire? Not really!

S. Pekar & M. Jarab

A novel adaptive trade-off for Batesian mimics was recently discovered for ant-mimicking salticid spiders of the genus *Myrmarachne*. By mimicking ants, *Myrmarachne* achieves protection from ant-avoiding predators but falls prey to myrmecophagous predators. We investigated the existence of this trade-off in European ant-mimicking gnaphosid and corinnid spiders. Namely, *Micaria sociabilis* (Gnaphosidae) that imitates *Liometopum microcephalum*, *Phrurolithus festivus* (Corinnidae) that imitates *Lasius niger* and *Liophrurillus flavitarsis* (Corinnidae) a mimic of *Aphaenogaster senilis*. Myrmecophagous *Zodarion* spiders were tested with all three ant-mimics and their models. *Zodarion* captured all ant individuals of all three species but only 45 % of *M. sociabilis*, 10 % of *L. flavitarsis* and none *P. festivus*. The ant-mimics were captured 3-times later than their ant models suggesting that they imitate ants closely but not perfectly. Ant-mimics avoided capture by sudden fast running after *Zodarion* approached. Obtained results show that ant-mimics possess adaptations that protect them also from falling prey to myrmecophages. Besides fast running, all ant-mimics are clearly diurnal while myrmecophagous *Zodarion* is nocturnal. This limits their mutual encounter rate at places of syntopical occurrence.

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Colour matching is not equivalent to crypsis in crab spiders

R. Brechbühl, J. Casas & S. Bacher

The ambush predator *Misumena vatia* varies its body colour between white and bright yellow thereby matching the colour of the flower it sits upon. This phenomenon is thought to avoid their detection by potential prey (pollinators), a phenomenon called crypsis. Such cryptic spiders are thus expected to have more encounters with pollinators resulting in a higher foraging success. We tested if the visitation frequency of pollinators to flowers harbouring a crab spider is higher when colours of spider and flower match. Yellow or white spiders were placed on yellow, white and violet flowers in a complete factorial design, resulting in six different colour combinations of crab spiders and flowers differing in their degree of colour matching. In contrast to our expectations, we found that pollinators generally avoided flowers harbouring spiders, independent of the degree of colour matching. Thus, crypsis cannot explain the observed colour matching behaviour of crab spiders.

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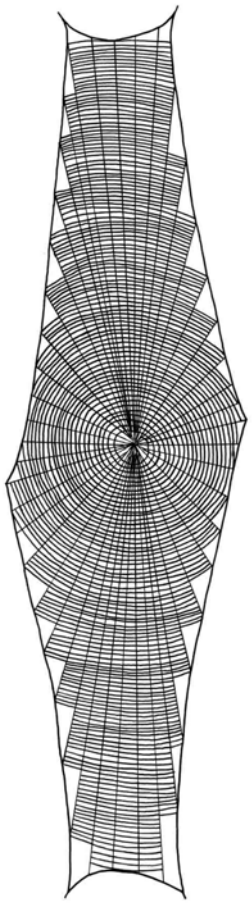
The long and short of it: properties of highly elongated orb-webs of Australian ladder-web spiders

A.M.T. Harmer & M.E. Herberstein

Australian ladder-web spiders (Araneidae: *Telaprocera maudae*) build highly elongated orb-webs that in natural conditions may be up to seven times taller than wide. In a typical circular orb-web, the radial threads tend to be of approximately the same length. However, in a ladder-web, the radials are of varying lengths, with threads in the vertical ladder sections of the web being drastically longer than horizontal threads. All radial threads within a web need to serve the same basic functions, that is, they must support the capture spiral and assist in absorbing prey impacts, and they must be able to accurately convey information produced by struggling prey to the spider at the hub. Due to the radical variation in radial length present in ladder-webs, these functions must be performed over greatly different relative distances. Using an Instron 5542 universal material testing machine with a 0.5N load cell, we tested the material properties (tensile stress, Young's modulus) of ladder-web radial silk, both at breaking point, and under fixed deflection in intact webs. In addition to this we also tested the effect of elongated radials on the propagation of vibrations through ladder-webs. Early evidence suggests a relationship between material properties of radial silk and web elongation, with radials in more elongated ladder-webs being stronger and stiffer than those in ladder-webs which more closely resemble a 'typical' circular orb. Discussed are the potential costs and benefits for ladder-web spiders of variation in radial silk properties.



Web of Australian ladder-web spider.

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New findings on the courtship behaviour of *Pardosa wagleri* and *P. saturatior* (Araneae: Lycosidae), a pair of sibling species.

A. Chiarle, M. Isaia & S. Castellano

Pardosa wagleri and *P. saturatior* are twin species previously studied by Tongiorgi [1], who established the validity of the two species on the basis of differences in ecology, phenology, color and size, and by Barthel & von Helversen [2] who provided preliminary evidence for their separation by reproductive isolation mechanism and morphometric parameters. In this paper the courtship displays of the two species is described for the first time and compared by the examination of the sequence successions and optical flow, both based on video analysis. Intra-individual, intra- and inter-specific differences were tested with classical statistical analysis, including Anova, Nested-Anova and Paired t-test. The two displays are characterized by two phases, the first (A) involving several parts of the spider body and the second (B) the males palps only. Main differences between *P. wagleri* and *P. saturatior* displays are found in phase A, which is characterized by two sub-phases (A1 and A2) involving synchronic movements of palps, legs and abdomen. According to Nested Anova, Phase B resulted identical for the two species. In conclusion our study deepens the work of Tongiorgi [1] and Barthel & von Helversen [2], providing new insight on the biology of the two species.

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[2] Tongiorgi, P. (1966). Italian wolf spider of genus *Pardosa* (Araneae: Lycosidae). Bull. Mus. Comp. Zool. Harv., 134: 275-334

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