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Welcome to the 27th European Congress of Arachnology held from 2nd – 7th September 2012 in Ljubljana, Slovenia.

The 2012 European Society of Arachnology (<http://www.european-arachnology.org/>) yearly congress is organized by Matjaž Kuntner and the EZ lab (<http://ezlab.zrc-sazu.si>) and held at the Scientific Research Centre of the Slovenian Academy of Sciences and Arts, Novi trg 2, 1000 Ljubljana, Slovenia. The main congress venue is the newly renovated Atrium at Novi Trg 2, and the additional auditorium is the Prešernova dvorana (Prešernova Hall) at Novi Trg 4.

This book contains the abstracts of the 4 plenary, 85 oral and 68 poster presentations arranged alphabetically by first author, a list of 177 participants from 42 countries, and an abstract author index. The program and other day to day information will be delivered to the participants during registration.

We are delighted to announce the plenary talks by the following authors:

Jason Bond, Auburn University, USA (Integrative approaches to delimiting species and taxonomy: lesson learned from highly structured arthropod taxa);

Fiona Cross, University of Canterbury, New Zealand (Olfaction-based behaviour in a mosquito-eating jumping spider);

Eileen Hebets, University of Nebraska, USA (Interacting traits and secret senses – arachnids as models for studies of behavioral evolution);

Fritz Vollrath, University of Oxford, UK (The secrets of silk).

Enjoy your time in Ljubljana and around in Slovenia.

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Cover photograph: *Caerostris darwini*, Andasibe-Mantadia NP, Madagascar
by: Matjaž Gregorič

ABSTRACTS

DNA barcoding symposium:

Biogeography of Caribbean arachnids facilitated by DNA barcoding

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DNA barcoding is a technique that helps with species identification by using relatively small and readily and cheaply amplified DNA sequences. The end goal of the barcoding movement is to provide reference barcodes for, and thus facilitate DNA identification of, all eukaryotes. But long before major reference barcode collections exist, and in areas where large portions of the biota are still unknown, DNA barcodes can be phenomenally useful in providing a quick estimate of species richness and identity. We discuss the use of barcodes in our large Caribbean biogeography project, focusing on over 50 islands and some 70 arachnid lineages, many of which are highly diverse, yet poorly known in the region. While the project involves nearly 20 expert taxonomists, manual identification of large and diverse samples is very time consuming. DNA barcodes serve to complement existing taxonomic expertise, and aid all downstream effort by offering rapid assessment of not only species identity, but also diversity and sampling completeness. By quickly gauging the need for additional sampling, and by guiding DNA sequencing of additional loci, as well as speeding up taxonomic work, DNA barcoding greatly facilitates a complex and multifaceted biodiversity project.

Foraging and diet selection of spiders in Negev wheat fields

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The use of natural enemies depends on understanding predator-prey interactions. Several studies confirmed that spiders are good candidates for natural pest control. We tested diet selection in spiders feeding on two agricultural herbivores in a lab experiment. We observed the foraging behavior of four spider species common in wheat fields in the Negev: three web-builders, *Bathyphantes extricatus* (Linyphiidae), *Alioranus pastoralis* (Linyphiidae) and *Enoplognatha gemina* (Theridiidae) and a hunting spider (Clubionidae; as yet unidentified). The spiders were tested with two different types of herbivores found in wheat: pest species (aphids, *Sitobion avenae* and *Schizaphis graminum*, considered poor quality prey), and a non-pest species, (collembola, *Sinella curviseta*, considered favorable prey). We reasoned that the clubionid would select and handle aphids because as a hunting spider, it would encounter aphids more frequently than the web spiders. We investigated the effects on spider foraging behavior of prey quality as a monotypic diet and availability of alternative prey in a mixed diet. When given a monotypic diet, *B. extricatus* captured more collembola than aphids, while for *A. pastoralis* the capture success did not differ. Both spiders spent significantly more time feeding on collembola than on aphids. *Alioranus pastoralis* lost relative body mass feeding on aphids and gained body mass feeding on collembola, while prey type had no significant effect on *B. extricatus* body mass change. When comparing two species with different hunting strategies, the clubionid attacked aphids less frequently than the theridiid *E. gemina*. For capture success, *E. gemina* captured aphids and collembola in higher frequencies than clubionid. Both spiders spent more time feeding on collembola than on aphids. Female *E. gemina* gained more relative body mass feeding on collembola compared to aphids, while the clubionid gained more feeding on aphids. Aphids and collembola were offered as a mixed diet to the clubionid and to *E. gemina*. There was no difference in capture success of the clubionid and *E. gemina* with both types of prey. There was also no difference between the two spider species in total feeding time and body mass change with both prey types. However, when *E. gemina* fed on both prey types in the mixed diet, it gained more relative body mass than did the clubionid. To conclude, we found 1) that aphids as a monotypic diet reduced either capture success, feeding time or relative body mass gain in all three web spider species in comparison with collembola; 2) the clubionid did not take more aphids, but gained more relative body mass on aphids than on collembola; and 3) when given with collembola in a mixed diet body mass gain was enhanced in the theridiid *E. gemina*. Thus, some spiders may be effective in aphid biocontrol, but differ in the way they derive benefit from aphids.

Student oral presentation - Ecology & Behavior:

Assessment of spider biodiversity in two palm grove models (traditional and modern) (Northeastern Sahara, Algeria)

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The current scientific understanding on spider community living in Algerian Sahara habitats is significantly very poor and remains not updated. Thus, our knowledge of spider diversity in this area remains highly ill-known with regarding patterns of environmental factors under the context of hot-arid climate, particularly in manmade agroecosystems. This study was carried out in four orchards of date palms (*Phoenix dactylifera*) in two palm groves located at Ouargla 31° 57' / 5° 20' (Northeastern Algeria) from November 2010 to July 2011. Spiders were sampled regularly in each site using three methods: pitfall trapping, sweeping and direct hunting, with an interval of 10 days between two surveys. The entire sample consists of a set of 1905 individuals, which were classified taxonomically into 61 spider species that belong to 38 genera and 18 families. Under the family Gnaphosidae, 14 species were recorded in five genera, followed by Lyniphiidae and Thomisidae with seven species for each family. Synecological study (species richness, occurrence frequency, Shannon index and evenness) revealed that high diversity values were recorded in mesic palm orchards. This study aims to establish the first exhaustive taxonomic inventory of spider fauna of the surveyed area.

DNA barcoding symposium:

Making the other 95% count: Integration of DNA barcoding with semi-quantitative bio-inventorying to infer large-scale diversity patterns and monitor biodiversity in spiders

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Understanding the spatial patterns of biodiversity and their underlying processes is a fundamental task for conservation biology. This is specially relevant for top predators, which rather than being a simple “aesthetic” component to conserve, are demonstrated to be: 1) the most sensitive trophic level to environmental changes, and 2) highly relevant for ecosystem functioning, with their extinction associated to extremely significant functional changes such as disease dynamics, wild fires and biogeochemical cycles. Spiders are among the most diverse and ubiquitous organisms on Earth, are easy to sample and play an important role in shaping arthropod communities as the dominant predators in most terrestrial ecosystems. Because of their sensitivity to environmental changes and anthropogenic impacts, spiders have been identified as promising bioindicators. However, despite their abundance and pivotal role in ecosystem functioning, spiders remain poorly known and consequently are often neglected in biodiversity conservation policies. This lack of knowledge compromises the correct assessment of the representativeness and complementarity of protected areas, which are essential in establishing conservation priorities. Here we propose to circumvent these limitations by combining standardized sampling protocols developed for Mediterranean spiders with modern DNA based taxonomic techniques to gain a better understanding of the diversity of European spiders and their biogeographic and evolutionary patterns. DNA barcoding uses standardized 500- to 800-bp sequences to accelerate and automatize species identification. DNA barcodes help to reveal biogeographic history and refine species distributions by providing information on phylogenetic relationships and population structure and, in addition, allow identification of immature stages.

In this talk, I will discuss advantages and pitfalls of the use of DNA barcoding for rapid biodiversity assessment and its potential for ecosystem monitoring using spiders as bioindicators. I will base my comments on lessons drawn from an ongoing DNA bio-inventorying initiative that focused on the spiders of Panama. I will argue that the reconciliation of DNA barcodes with semi-quantitative sampling provides unique opportunities to gain insights into spider community assembly and to identify the main drivers of spider diversification. Additionally, the recent irruption of massive, parallel sequencing techniques will facilitate the development of monitoring programs that incorporate mega-diverse groups, including spiders. These new theoretical and technical developments pave the way for the development of an European-wide system of representative sampling plots linked to major natural history institutions and high-throughput sequencing facilities. Such network will allow for monitoring ecosystems health and the impact of climatic changes, and other human induced perturbations, using the most ecologically relevant, yet largely neglected group of terrestrial organisms: Arthropods.

Cytogenetic survey of the family Homalonychidae (Araneae) and its putative relatives

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The family Homalonychidae is composed of the single genus *Homalonychus* endemic to southwestern North America. Homalonychids belong to a species-rich clade of araneomorph spiders – Entelegynae. However, their phylogenetic placement within entelegynes is uncertain. To elucidate this problem, we compared karyotypes of *Homalonychus* and its putative relatives using our data as well as data of other authors. Diploid numbers, chromosome morphology, and sex chromosome systems of entelegynes are conservative. Therefore, a comparison of these characters can be used to examine the relationships among the major clades. Karyotypes of most entelegynes are composed exclusively of acrocentric chromosomes and contain the sex chromosome system X_1X_20 . Male diploid numbers range from 10 to 49, whereas related families usually have the same or similar $2n$.

We have studied representatives of seven families. Their male karyotypes were as follows: *Eusparassus walckenaeri* (Sparassidae) 42 (X_1X_20), *Homalonychus theologus* 39 ($X_1X_2X_30$), *Liophrurillus flavitarsis* (Corinnidae) 22 (X_1X_20), *Selenops* sp. from Mexico (Selenopidae) 28 (X_1X_20), *Zora spinimana* (Zoridae) 24 (X_1X_20), *Zorocrates guerrerensis* (Zorocratidae) 22 (X_1X_20), *Zoropsis lutea* 26 (X_1X_20). Four families (Homalonychidae, Zoridae, Zorocratidae, and Zoropsidae) have been studied karyologically for the first time. Karyotypes of all species were formed exclusively by acrocentric chromosomes. All species displayed the X_1X_20 system except for *Homalonychus*. The X chromosomes of Mexican *Selenops* exhibited a great difference in size. This disproportion as well as the presence of the $X_1X_2X_30$ system in all selenopids karyotyped so far suggests collectively that the X_1X_20 system of this species originated from the $X_1X_2X_30$ system by tandem fusion between two X chromosomes. The homalonychid karyotype is close to the supposed ancestral chromosome complement of entelegynes (42, X_1X_20). This karyotype is still quite frequent in entelegynes including the families Sparassidae and Zodariidae that have been suggested to be related to homalonychids by some authors. Available cytogenetic data contradict relationship of homalonychids to the superfamily Lycosoidea and to phrurolitine corinnids. According to our hypothesis, the ancestral male karyotype of the clade formed by the superfamily Lycosoidea and Dionycha (excluding Sparassidae) was composed of 28 chromosomes including the X_1X_20 system. The number of chromosomes has been reduced independently multiple times during evolution of Lycosoidea and Dionycha sensu stricto. The family Sparassidae may form a sister clade of this group.

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Taxonomic revision and phylogenetic relationships of the Psechridae (Araneae) and the taxonomic significance of pre-epigynes

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The spider family Psechridae is distributed in Southeast Asia and comprises of two genera, *Psechrus* Thorell 1878 and *Fecenia* Simon 1887. Apart from several morphological differences between these two genera the shapes of their webs (used for prey capture) differs: *Psechrus* specimens build horizontal, slightly dome-shaped sheet webs and hang upside down at the underside of their webs whereas *Fecenia* specimens produce vertical pseudo orb webs with an enrolled leaf as retreat in the hub. Before 2010 27 valid species were described in Psechridae, 22 of which belonged to *Psechrus*.

Bayer (2011: *Fecenia*; 2012: *Psechrus*) recently revised both genera. In the course of those revisions several taxonomic misinterpretations had been revised. *Fecenia* presently comprises of five valid species (no new descriptions in the last 20 years). In contrast, in *Psechrus* 23 new species were described in the last three years (Bayer and Jäger 2010; Bayer 2012). This showed that species diversity in *Psechrus* is much higher than assumed according to former literature. Including revalidations and synonymies in Bayer (2012) 46 valid *Psechrus* species are presently known. According to their copulatory organs they had been divided into 8 different species-groups (except for three species, which could not be assigned to any of those species-groups).

The pre-epigynes of subadult females turned out to bear species-specific information in both genera (while copulatory organs of adults still have the highest priority concerning species discrimination). In most of the former taxonomic literature in arachnology the pre-epigynes were either neglected or played only a minor role. In *Psechrus* and *Fecenia* the structures of pre-epigynes were species-specific and allowed species identification. In *Psechrus* 43% of the species described are known by the pre-epigynes of their subadult females, in *Fecenia* even 80% (4 of 5 species). Consequently, for the latter genus the pre-epigynal characters could be integrated into a species key for the first time in arachnological research. In the present oral presentation I will report on the characteristics of the pre-epigynes in Psechridae (ontogenetical aspects, differences to the adult-epigyne etc.).

Moreover, I will present the basic results of a molecular study about the phylogenetic relationships of the Psechridae within the system of Araneomorphae and those of the species within the two genera of Psechridae (Bayer and Schönhofer 2012). For that purpose the two genes COI and 28S rRNA were analysed for 28 species of Psechridae (*Psechrus*: 24; *Fecenia*: 4) and 45 species of other families. It will be discussed if the placement of the Psechridae within the Lycosoidea, as proposed by Griswold (1993), Griswold et al. (1999, 2005), Silva (2003) or Raven and Stumkat (2005), could be corroborated by molecular data. The same concerns the *Psechrus*-species-groups established in Bayer (2012). In the molecular study *Psechrus*-species from all groups, except the *annulatus*-group, could be included. Additionally, it was tested if representatives of Psechridae could be identified by the analysis of the barcoding region of the COI gene.

Poster presentation - Ecology & Biogeography:

***Tibellus oblongus* as potential control agent against virus vector leafhoppers**

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Cereal pest and virus vector leafhopper *Psammotettix alienus* (Cicadellidae) after harvest must survive on alternative Poaceae host plants. In the mosaic landscape of the Mezőföld in Hungary, *Tibellus oblongus* (Philodromidae), a known agrobiont species, occurs in high numbers in meadows and field margins next to cereal fields. *Tibellus* numbers peak during late summer, in synchrony with the harvesting period of wheat, when leafhoppers seek refuge in those habitats. In the laboratory we compared the consumption of *Psammotettix* to *Drosophila*, which are very close in size, and latter is known to be a highly preferred spider prey. In choice tests we found that *Psammotettix* prey was chosen with the same frequency as *Drosophila*, and was marginally more quickly attacked than the fruit fly prey. In medium term feeding experiments the rate of weight gain of spiders on *Psammotettix*, *Drosophila* and mixed prey diet (equal biomass treatments) were not different from each other, but were significantly greater than that in the starvation control. *Tibellus* spiders are at the right place, at the right time, and have proven preferences. Are they guilty?

Oral presentation - Systematics & Evolution:

The phylogenetic scale of venom variation in haplogyne spiders

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Haplogynes are a higher-level clade of araneomorph spiders that includes many taxa of interest with respect to their venom composition. Some notable haplogynes include pholcids (“daddy long legs” or cellar spiders), plectreurids, and families in the scytodoid superfamily such as spitting spiders (Scytodidae) and the sicariid family that includes brown recluse (*Loxosceles*) and six-eyed sand spiders (*Sicarius*). With a goal of analyzing the phylogenetic scale of venom variation in spiders in general, we are comparing venom gland transcriptomes and proteomes from representatives of this group selected based on their phylogenetic position. Our data include some comparisons among relatively closely related taxa (common ancestor within the last 30 million years) and among other more distant relatives (common ancestor roughly 200 million years old). Our center of focus is comparisons among lineages of sicariids, that been evolving for over 100 million years in the context of being generalist, ground-dwelling predators of arthropods. We compare sets of sicariid toxins with toxins from scytodidae, pholcidae and a non-haplogyne archaeid spiders. We have discovered venom peptide toxin families that appear to be distinct for sicariidae, and others that are expressed across haplogynes. While some toxins are phylogenetically widespread, there are striking differences among lineages in relative abundance of these toxins. We will discuss patterns of positive selection within some of the most common and widespread toxin lineages. Together these data help illuminate the evolutionary dynamics of venom functional complexes in spiders.

Poster presentation - Ecology & Biogeography:

Ecology and diversity of Spiders in Patalkot (MP), India

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Patalkot is a unique horse-shoe shaped valley surrounded by giant hills and with seven tribal villages located inside the valley in the Chindwara District of Madhya Pradesh, India, which is part of famous Panchmarhi Biosphere Reserve (PBR).

This paper deals with spider fauna from this habitat. In a yearlong study a total of 128 species belonging to 22 Families and 32 Genera have been recorded. The spider diversity is in the order of Salticidae > Araneidae > Thomisidae > Oxyopidae.

This investigation is first attempt to document the spider fauna from this undervalued natural ecosystem. Spider diversity will be used as potential bioindicators for designing a future Biological Monitoring Program (BMP) for Patalkot habitat. The ecosystem is under great anthropogenic pressure as the faunal wealth of this ecosystem was not attempted previously. The data derived from above investigation regarding distribution and diversity spiders will assist in appropriate rehabilitation and conservation of these species in this region.

Plenary speaker:

Integrative approaches to delimiting species and taxonomy: lesson learned from highly structured arthropod taxa

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Advances in molecular techniques over the past decades have significantly shaped the field of systematics and taxonomy. Approaches to species delimitation that employ methods like DNA barcoding and generalized mixed Yule coalescent models are seemingly attractive because they present a more simplified solution to a putative “crisis” in taxonomy; that is, there are simply too few taxonomists to document biodiversity on our planet within a reasonable time period using traditional, often morphology-based taxonomic approaches. Nevertheless, the vast majority of spider species are, and continue to be, described on the basis of morphological features (often single character systems). Given the importance of species discovery to all fields within the biological sciences and to addressing the global biodiversity crisis, it is disturbing that the notion that taxon-based scholars can be replaced by mere technicians is being promulgated. Our molecular-based studies of arthropod taxa (e.g., mygalomorph spiders) have demonstrated that these taxa are often highly structured from a population genetic or phylogeographic perspective despite being relatively morphologically homogenous. Consequently, molecular approaches to species delimitation often grossly overestimate diversity whereas morphology-based species delineation underestimates it. It is clear that neither of these approaches taken alone is optimal and thus the field of taxonomy must employ a broader perspective that entails species hypotheses based on multiple lines of evidence. Through a process of reciprocal illumination, studies of mygalomorph species demonstrate that integrating morphological, ecological, and molecular-based approaches is the only way to ensure that our taxonomy reflects evolutionary diversity.

Non-consumptive effects are relatively rare among spiders and insects

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Predators affect prey population through direct consumption. In addition, predators can affect prey population through non-consumptive effects (e.g. elicit antipredator behaviour). But yet antipredator behaviour has only been documented for a limited number of terrestrial arthropods. To test for differences in antipredator behaviour among herbivore and carnivore prey, we conducted series of behavioural experiments. We confronted insect and spider species from a wide taxonomic range with chemotactile cues (kairomones) of three spider species that induced antipredator behaviour in earlier experiments. We applied two experimental setups: in the “no choice experiment” prey individuals were either put on filter papers with or without spider cues. In the “choice experiment” prey individuals were able to choose between filter paper halves with and without spider cues. Based on the behavioural parameters derived from video analysis we calculated the activity of individuals in presence/absence of spider cues. Only two prey species showed consistent behavioural changes throughout both experiments: the wood cricket *Nemobius sylvestris* became more active in the presence of spider cues. This reaction can be interpreted as escape behaviour. Astonishingly, ants of the species *Lasius niger* sped up in the presence of cues of the wolf spider *Aulonia albimana*, suggesting a species-specific relationship. This study represents the first investigation about occurrence of non-consumptive effects across broader ranges of prey taxa. Our results suggest that non-consumptive effects are relatively rare among the investigated species. Due to the bias towards cricket prey in former literature we conclude that strong antipredator behaviour may be an exception rather than the rule among terrestrial arthropods.

Oral presentation - Behavior:

Absence of phenotypic plasticity in the capture efficiency of alternative prey in myrmecophagous *Zodarion* spiders

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Phenotypic plasticity is the development of different phenotypes from a single genotype, depending on the environment. Plastic responses in trophic traits of spiders could involve changes in the capture efficiency, namely predatory behaviour, prey preference, and venom composition. *Zodarion* spiders are specialized ant-eaters. There is evidence that these spiders possess cognitive and physiological adaptations that restrict their diet only to Formicinae ant species, of the genera *Lasius* and *Formica*. Yet these spiders are able to subdue a number of different ant species. We studied if *Zodarion rubidum* can develop modifications in venom composition when exposed to long-term monotypic ant diet that would improve its capture efficiency.

We used early juveniles of *Zodarion rubidum* from the field and divided them into four prey monotypic ant groups: *Formica rufibarbis*, *Lasius platythorax*, *Myrmica scabrinodis* and *Tetramorium caespitum*. Spiders were fed with only one particular ant species in four days interval over a period of two months. In the beginning and at the end of the experiment their capture efficiency, i.e. attack latencies, paralysis latency and number of attacks, for the particular ant species was investigated. At last, the capture efficiency for ant species other than the monotypic diet was investigated. In the end, venom glands were extracted from all individuals and the venom composition was determined using MALDI-TOF mass spectrometric analysis.

In the beginning of experiment spiders had higher capture efficiency for the capture of *L. platythorax* and *F. rufibarbis* (both Formicinae) ants than for the capture of *M. scabrinodis* and *T. caespitum* (both Myrmicinae). After two months of monotypic diet, spiders on *L. platythorax* and *M. scabrinodis* improved their capture efficiency: paralysis latency was significantly shorter at the end of experiment than at the beginning. This was, however, very likely due to increase of body size (and venom glands) because spiders that fed on other ant species showed similar capture efficiency. The variance of paralysis latency decreased in all groups in the capture of *L. platythorax*. Our results show that development on a certain prey does not lead to an improvement of capture efficiency via change of venom composition. The capture efficiency is thus fixed in the strictly myrmecophagous *Z. rubidum* to its preferred prey.

Student poster presentation - Systematics & Evolution:

Comparing long wavelength color discrimination abilities of spiders

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Most jumping spiders have four types of photoreceptors in their principal eyes, therefore their color vision is better than that of the other spider taxa. Previous studies predicted that jumping spiders had a much broader spectral sensitivity range. Because jumping spiders have red light photoreceptors, they may have better long wavelength color perception ability. In this study, I will use heat-avoidance experiments, to investigate whether jumping spiders exhibiting bright body colors, have good color discrimination ability in long wavelength. Moreover, I will also investigate whether jumping spiders with dim body colors also have this capability. I will use four jumping spider species such as the brightly-colored *Telamonia festiva* and *Ptocasius strupifer*, and dim-colored *Portia* sp. and *Myrmarachne magnus*. The color discrimination abilities of spiders without red light photoreceptors such as *Oxyopes* sp. (Oxyopidae) and *Pardosa takahashii* (Lycosidae) will also be used as comparisons. I predict that both bright and dim jumping spiders should have long wavelength color discrimination ability, while the other spider taxa should have no such ability.

Student oral presentation - Systematics & Evolution:

Evolutionary patterns and processes resulting in extreme sexual size dimorphism in Argiopinae

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Female biased sexual size dimorphism (SSD) is a rare phenomenon in nature, which has evolved multiple times in spiders. Extreme cases of SSD, where the female average size is more than twice of the male, is known in some but not all representatives of Nephilidae, Araneidae, Tetragnathidae, Theridiidae and Thomisidae. Previous studies have shown that extreme SSD in spiders mostly arises through females increasing in size – female gigantism. However, males can also decrease in size – male dwarfism, and both processes may run simultaneously. The araneid subfamily Argiopinae includes three genera (*Argiope*, *Gea* and *Neogea*) with over 100 species inhabiting diverse habitats worldwide, and exhibiting different mating behaviors. Therefore, Argiopinae is a good model system to test competing hypotheses explaining the evolution of extreme SSD. In this project, we aim to provide a solid phylogeny of the clade, which will provide the basis for testing evolutionary and biogeographical hypotheses. In particular, it will enable our investigations into the patterns of SSD evolution in argiopines. Here, we report on a preliminary species level analysis based on mitochondrial and nuclear markers. Based on these results, we intend to reconstruct the evolution of body size and thereby explain the patterns of SSD evolution. We also aim to investigate to what extent SSD in Argiopinae may be explained by fecundity selection driving female gigantism. To do that, we will investigate the correlation between fecundity and spider body size in phylogenetically selected species.

Student poster presentation - Systematics & Evolution:

On the morphological separation of two sibling species: *Pardosa proxima* and *P. vlijmi* (Araneae: Lycosidae).

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The *Pardosa proxima*-group (Araneae: Lycosidae) includes eight Palearctic species: *P. proxima* (C. L. Koch, 1848); *P. hortensis* (Thorell, 1872); *P. morosa* (L. Koch, 1870); *P. strigillata* (= *P. tatarica*) Simon, 1876; *P. cribrata* Simon, 1876; *P. roscai* (Roewer, 1951); *P. pseudostrigillata* Tongiorgi, 1966 and *P. vlijmi* Den Hollander & Dijkstra, 1974. Recent studies on molecular data also support the monophyly of this group. The *Pardosa proxima*-group is characterized by a small, trapezoidal tegular apophysis and, in some species, a sclerotized lamellar process on palea. On the contrary females are characterized by the narrow anterior part of the septum, that is never connected with the anterior margin of the epigyne, and a broadened posterior part usually with a triangular or anchor-like shape. Carl L. Koch originally described *Pardosa (Lycosa) proxima* on material from unspecified localities in Greece (“Vaterland: Griechenland”) in 1847. In 1972, Den Hollander et al. observed that specimens, previously identified as *P. proxima*, showed an “aberrant” courtship behaviour compared to the typical form. Few years later, the same populations were examined by Den Hollander & Dijkstra who described *P. vlijmi* as a new “ethospecies” on purely ethological basis. Moreover, they stated that the two species were “morphologically indistinguishable”. Due to the lack in details of the original drawings of palps and epygines, it is highly expectable that *P. vlijmi* has been routinely overlooked and often confused with the sibling species *P. proxima*. A careful examination of several fresh specimens from all over Europe as well as previously studied material (e.g. Tongiorgi’s collection) allowed us to find some valid morphological features to separate the two species. According to our studies *P. proxima* and *P. vlijmi* males show differences in leg I coloration, ventral abdomen hair, palpal tibia length and hair, and palp internal structures. On the contrary females are almost indistinguishable because of the great similarity in habitus and epigyne shape. *P. vlijmi* appears to be widely distributed in the Mediterranean basin while *P. proxima* seems to be widespread in Central Europe. According to these findings, the analysis of Greek specimens (Terra typica of *P. proxima* sensu stricto) opens an interesting nomenclature issue concerning the identity of the two species.

DNA barcoding symposium:

Beyond barcoding: genomic collections and the Global Genome Initiative

Jonathan A. Coddington

National Museum of Natural History, Smithsonian Institution, Washington, DC, USA

In spiders, genetic barcoding relies on one, abundant marker (COI) that is easy to amplify and relatively durable if stored suboptimally. Although certainly a good choice to launch the global program for genetic identification of species, COI has analytic, diagnostic, and practical drawbacks. It seems fairly obvious that within a few years genetic identification and related technologies will become more sophisticated. These advances will demand changes in fieldwork, museum, and research protocols. The Global Genome Initiative is a new international collaboration that attempts to anticipate and prepare for these developments.

Oral presentation - Systematics & Evolution:

The evolution of sex ratio distortion in *Pityohyphantes phrygianus*: where are the males?

Melanie A. Cotterill & Sara L. Goodacre

School of Biology, University of Nottingham, NG7 2RD, UK

The linyphiid spider *Pityohyphantes phrygianus* provides an interesting system in which to investigate the evolution, maintenance and mechanism underlying a distorted primary sex ratio. The sex ratio of this species deviates significantly from a 1 : 1 ratio with most individuals producing an excess of females. Fisherian selection predicts that there should be rapid selection to restore an equal sex ratio in solitary species such as these given that kin selection appears unlikely. The persistence of a bias thus appears counter intuitive. Sex ratio in *Pityohyphantes* is influenced by female abdominal position in the web after mating and females thus have the potential to alter the sex ratio of their offspring simply through changing their behaviour. In this study we investigate the factors that influence the female behaviour that controls sex ratio. We show that male mating behaviour, female size and the presence of maternally acquired endosymbiont infections all influence the post-mating behaviour of females, thereby maintaining a seemingly detrimental and evolutionarily unstable sex ratio in the wild.

Plenary speaker:

Olfaction-based behaviour in a mosquito-eating jumping spider

Fiona Cross

School of Biological Sciences, University of Canterbury, Private Bag 4800, Christchurch 8140, New Zealand

Jumping spiders (family Salticidae) are known for having unique, complex eyes and a capacity for spatial vision exceeding that for any other animals of a similar size. Not surprisingly, the vision-based behaviour of these animals has been emphasised in the literature. However, recent research on *Evarcha culicivora*, a salticid from the Lake Victoria region of East Africa, illustrates that having exceptionally good eyesight does not preclude highly developed capacity for also using olfaction. There are numerous contexts in which *E. culicivora* shows specialised use of vision and olfaction as well as an interplay of these two modalities and, by examining these contexts, we have come to a better understanding of cognitive specialisation with this animal. *E. culicivora*'s predatory strategy is unique because it feeds indirectly on vertebrate blood by seeking blood-carrying mosquitoes as its preferred prey. *E. culicivora* can identify this unusual prey by sight alone and by olfaction alone, but these two sensory modalities also work together, with the odour of blood-carrying mosquitoes priming *E. culicivora* to find this prey by sight even when the spider has never encountered this particular prey before. Moreover, *E. culicivora* targets the genus *Anopheles* as its preferred mosquitoes, this being an especially interesting prey choice. *Anopheles* is notorious for being the genus to which all human malaria vectors belong, and *Anopheles gambiae* is especially known for being anthropophilic. By examining *E. culicivora*'s olfaction-based behaviour, we have discovered that this spider is also anthropophilic and that it has an exceedingly complex mating system that is interrelated with its predatory strategy. These are important insights into *E. culicivora*'s biology that would not be known by examining its vision-based behaviour alone.

Oral presentation - Physiology & Functional Morphology:

Ultrastructure and functional significance of papillae on the pedipalps of camel spiders (Arachnida, Solifugae)

Paula E. Cushing & Patrick Casto

Denver Museum of Nature & Science, Denver, Colorado, USA

Arachnids in the order Solifugae, commonly called “camel spiders,” are peculiar desert dwelling arachnids whose biology is poorly known. They hold their pedipalps anteriorly while moving through the environment. Their pedipalps are covered in sensory setae. Males of certain species in the families Eremobatidae, Solpugidae, and Karschiidae have setal structures called papillae on the ventral surface of their pedipalps that are hypothesized to function as mechanoreceptors and possibly chemoreceptors. We used transmission electron microscopy (TEM) and scanning electron microscopy (SEM) to examine the structure of papillae on the pedipalps of *Eremobates docolora* in the family Eremobatidae and to test the hypotheses as to the function of these structures.

Student poster presentation - Systematics & Evolution:

From Piz d'Err to Triglav: assessing and preserving spider diversity of Switzerland and Slovenia

Klemen Čandek¹, Matjaž Gregorič¹, Holger Frick^{4, 5}, Christian Kropf⁵ & Matjaž Kuntner^{1, 2, 3}

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Our international pilot project focuses on permanent preservation of spider tissue and their genetic material for a subset of Central European fauna. We targeted a quarter of the known spider diversity shared between Slovenia and Switzerland, estimated at 275 species. Using automated and manual sampling methods and immediate freezing, we conducted focused field work at 33 localities in the Swiss Alps, and 52 localities in Slovenia. We are processing thousands of adult specimens for expert identification and have currently reached over 300 species from 30 families, but the totals will grow further. The final products that will be made freely available will be DNA barcodes and images of representatives of this fauna, which will provide a unique identification tool.

Impact of degraded forest ecosystems on spider communities

Ludmila Černecká¹ & Ivan Mihál²

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Only a small part of central European forest ecosystems have been preserved in their original or close-to-original natural state. Forest use and management are dominant anthropogenic activities and causing very often disturbances in these ecosystems.

Our aim is to highlight impacts of different forestry practices on biodiversity of spider communities in managed temperate forests.

We will focus on how altered light conditions in forest understory may affect the spider communities. We expect that the new-created open niches in clear-cuts will be colonised mostly by non-forest spider species.

The study will be carried out in two beech and one oak forest stands, 70–100 years old, all situated in central Slovakia (Kováčová, Jálná, Stožok). At each locality, there are 3–4 study plots established, each representing a specific forest management type (clear-cut, thinning and non intervention management).

We will compare the results of the three different managed forest stands with the natural, 350-year-old primeval beech forest in the Site of community importance (SKUEV0044) and National nature reserve Badínsky prales.

Two different methods are used for collection of the spiders: pitfall traps for ground-dwelling spiders and cardboard traps for tree trunk species. The illumination of the forest stand will be evaluated with the use of hemispherical photography.

The survey is maintained in two growing seasons, as separate short survey periods are often affected by weather. Research is actually in the first phase and started recently.

We acknowledge the support of our research by the Grant VEGA 2/0157/11: Fragmentation and formation of new habitats after forest disturbances: ecological plasticity of species and their communities.

Oral presentation - Systematics & Evolution:

Unravelling the Oonopidae puzzle (Araneae)

Charlotte De Busschere, Eva Gaublomme, Léon Baert

Royal Belgium Institute of Natural Sciences, Brussels, Belgium

The morphological and ecological mega-diverse spider family Oonopidae is explored within an intensive Planetary Biodiversity Inventory (PBI) project that joins more than 30 investigators. Within the last years morphological and genetic data has been obtained in order to discover, describe, and document a hitherto little-explored spider family. The family Oonopidae has traditionally been divided into two subgroups based upon the degree of sclerotization of the body, *i.e.* Molles and Loricati,. Here we present a preliminary generic phylogenetic reconstruction based upon the 18S fragment which enables us to discuss this traditional division. Moreover, the currently obtained phylogenetic relationships allows us to evaluate the biogeographic history among 33 genera on a wide scale. Finally, we discuss in more detail preliminary divergence patterns within the genus *Orchestina*.

Poster presentation - Systematics & Evolution:

On the identity of the poorly known species *Zelotes strandi* (Nosek, 1905) (Araneae: Gnaphosidae)

Christo Deltchev

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The present paper considers the taxonomic status of the poorly known species *Zelotes strandii* (Nosek, 1905) (originally in *Prosthesima*) described from island Prinkipo (Asia Minor), on the basis of single female specimen. There are no any new records concerning the taxonomy and distribution of the species till now. Having the possibility to examine the collection of A. Nosek kept in Vienna Museum and material collected from different regions in Bulgaria, now we can present the description of unknown male and, redescription of the female provided by new drawings and photos.

Student poster presentation - Systematics & Evolution:

Prof. František Miller's collection of money spiders (Araneae: Linyphiidae) deposited in the National Museum in Prague (Czech Republic)

Petr Dolejš & Antonín Kúrka

Department of Zoology, National Museum – Natural History Museum, Cirkusová 1740, CZ-193 00 Praha 9 – Horní Počernice, Czech Republic

Professor RNDr. František Miller, DrSc. was born in Kročehlavy near Kladno on 27th January 1902. After graduating at the Faculty of Science of the Charles University in Prague, he started to teach at the secondary schools in Štubnianske (today Turčianske) Teplice, Žilina (towns in Slovakia), and Jindřichův Hradec (a town in southern Bohemia). He became a director of the secondary school in Soběslav during the Second World War. In 1947, he habilitated at the University of Agriculture in Brno and worked there until his death (14th January 1983).

Prof. Miller studied spiders since the 30's, published 54 scientific papers and acted as a co-author in ten more articles. His publishing activity culminated in 1971 when his spider identification key was published as a part of the "Klíč zvířeny ČSSR IV". His brilliant drawings are still being used for spider determination by araneologists throughout Europe.

Prof. Miller collected more than 80 thousand specimens of spiders during his precise work. Linyphiidae, the most numerous family in the Czech Republic, constitute twelve thousand specimens. Majority of the spiders were collected in the surroundings of Prof. Miller's places of work. His collection was bought by the National Museum in Prague in 1983 and deposited into the zoological collection of the Natural History Museum under accessory numbers 100/83 and 103/83. The spider collection, which is being prepared and revised according to current arachnological knowledge, contains also 180 type specimens, 105 out of them belongs to Linyphiidae. The type specimens are very important because new species were described according to them, and they bear the scientific name. Therefore, a precise attention and care are given to the maintenance of the type specimens.

This research was funded by the Internal Grant project of the National Museum in Prague: 2011/04/IG-PM.

Ontogeny of the spinning field in wolf spiders (Araneae: Lycosidae)

Petr Dolejš, Jan Buchar & Jaroslav Smrž

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Wolf spiders possess four types of spinning glands: Piriform (Pi) glands produce attachment discs, ampullate glands are used for producing drag lines and attaching a cocoon to the spinnerets, tubuliform (Tu) glands (present in adult females only) produce fibres for cocoon, and finally aciniform (Ac) glands whose function is still not satisfactorily explained in wolf spiders [1]. Among araneoid families, Ac fibres are used for wrapping prey, constructing sperm webs, ballooning, as bridging lines, and as a part of a cocoon wall. The ampullate glands that produce drag lines during interecdysial period are the primary ampullate (1° A) glands. Those ampullate glands that produce drag lines during proecdysis, are the secondary ampullate (2° A) glands. There are two 2° A glands on each anterior and middle spinneret but only one of them is functional. The other 2° A gland is not functional and its vestigial spigot is called a tartipore. The 2° A glands switch their roles after each moulting [2]. In araneids, several Pi and Ac glands were found to be also tartipore-accommodated (t-a) [3, 4]. The aim of this study was to investigate ontogeny of the spinning field in lycosids in order to examine positions and behaviour of Pi and Ac spigots, and to suggest a possible role of Ac glands in wolf spiders.

The spinnerets of four model species (*Tricca lutetiana*, *Arctosa alpigena lamperti*, *Xerolycosa nemoralis*, and *Pardosa amentata*) were investigated using a scanning electron microscope (JEOL JSM-6380 LV). Spinnerets of all shaded exuviae from the same individual were inspected in order to describe positions and behaviour of all spigots.

During the early instars, all Pi glands were t-a. A new Pi spigot appeared after each ecdysis. Approximately in the middle of juvenile ontogeny, one non-t-a Pi gland appeared and persisted till the adult stage of the spider. Majority of Ac glands were t-a but, in comparison with Pi glands, there were more than one non-t-a Ac glands. Surprisingly, one of the latter finished its function before the adult stage of *X. nemoralis* and an Ac nubbin appeared.

As the majority of Pi and Ac glands were t-a (i.e. there were functional and non-functional glands switching their roles after each ecdysis), we conclude that they also play some role during proecdysis (as 2° A glands do). We hypothesize that Pi glands produce attachment discs for lines leading from 2° A spigots and that Ac glands produce a “scaffold” to anchor the spider’s body when moulting.

This research was fully funded by the Grant Agency of the Charles University: GAUK 109110.

Inventarisation of spiders (Araneae) in the area of Zrmanja river

Mihael Drakšić & Petra Škuljević

Biology Students Association BIUS, Section for spiders, University of Zagreb, Zagreb, Croatia

The inventarisation of spiders (Araneae) in the area of Zrmanja river has been conducted for the purpose of obtaining faunistic data on spiders of Zrmanja river. The research was conducted as a part of biological camp Zrmanja 2010, organized by BIUS (Biology Students Association). Section for spiders spent a total of 12 days doing fieldwork over two periods – from 30th April to 6th May 2010 and from 27th September to 2nd October 2010. The research covered Zrmanja river and its most relevant tributaries. It made preliminary insight into the rich faunistic biodiversity of Zrmanja river. During the research, the attempt was made to explore all the representative habitats but because of the limited amount of time and specific exploration period most of the area remained unexplored. A total of 36 localities along the major part of Zrmanja canyon have been explored. Until now, 85 specimens, including 45 females, 11 males and 29 juveniles have been processed, and 27 species belonging to 14 families have been determined. The noted fauna is typical in the areas of dry Mediterranean grasslands, which are prevalent along the river and outside the canyon, while some specific species typically represent the fauna of wet and often flooded grasslands surrounding the river. The diversity of spiders reaches its peak during May in the Mediterranean area and it is followed by minor peak in September. These periods match the periods during which fieldwork was performed, but time spent on terrain and applied methods didn't allow more precise analysis of Zrmanja river's spider fauna. The collected material is still being processed, so the number of found species is expected to grow. To get a more detailed insight into the spider fauna of Zrmanja river, more precise research during the entire season has to be made, and a greater diversity of collecting methods focused on certain ecologically specific species groups has to be applied.

Oral presentation - Biogeography:

**Caribbean Biogeography: insights from the buthid scorpion genus
Centruroides Marx, 1890**

Lauren A. Esposito, Lorenzo Prendini & Rosemary Gillespie

Division of Organisms and Environment, University of California, Berkeley, California, USA

A unique and highly complex geological history has resulted in the rich floral and faunal assemblages of the Caribbean. Questions concerning the origin and diversification of lineages in this region are fascinating because of the interplay of complex island histories, the proximity of continents, and the varying dispersal abilities of endemic organisms. However despite great scientific interest, there are as yet no unifying principles to explain the origin and diversification of Caribbean organisms. The present investigation focuses on the buthid scorpion genus *Centruroides* Marx, 1890 to test the role of vicariance vs. dispersal by using a fossil calibrated phylogeny together with known geological history, and explores the patterns of colonization and speciation within the Caribbean islands. The results of this investigation indicate that scorpions, a major group of predatory arthropods with moderate dispersal ability, are ideal organisms for understanding Caribbean biogeography.

Oral presentation - Ecology:

Ground-living spiders at polluted sites of industrial enterprises of Chernivtsi city (Ukraine)

Mariia Fedoriak

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In recent years, numerous attempts to assess the effectiveness of spiders for biomonitoring of anthropogenic pollution have been made. Results of some studies prove that spiders can be successfully used to indicate air pollution (Andre, 1977; Clausen, 1984; Maelfait & Hendrickx, 1998; Koponen, 2011). On the other hand the data as to the applying of certain synecological indices while analyzing spider assemblages at the polluted sites are sometimes contradictory (e.g. Lebrun, 1976 and Andre, 1977).

We conducted a synecological study of ground-living spiders at heavily polluted green sites on the territories of 6 industrial enterprises and at 6 slightly polluted green sites (public gardens, city parks) of Chernivtsi city. Spiders were collected using pitfall traps in May-June of 2008.

Altogether, we have caught 21 species belonging to 9 families in the industrial areas and 32 species belonging to 12 families in the areas of public gardens and city parks. The species richness was lower in the industrial areas than in the areas of public gardens and city parks of Chernivtsi. Differences were found in the species diversity of spiders at heavily and slightly polluted sites, the averages of Shannon-Wiener's diversity index being 1.17 and 1.59 (ranges 0.38–1.76 and 0.94–2.01) respectively. Spider assemblages at industrial sites are characterized by a phenomenon of super dominance of one species (except of the territory of Bus-trolley Company and Factory Industria). *Pardosa lugubris* (Walckenaer, 1802) (Lycosidae) sensu strictu was the most abundant species dominating in 4 of 6 industrial enterprises areas sampled. *Pachygnatha degeeri* Sundevall, 1830 (Tetragnathidae) dominated in the Brick factory to a great extent (92.3% of adults). Significant correlation (Spearman's rank correlation) between certain synecological indices and some pollutants burdens was found.

Both species richness and relative abundance of Linyphiidae were much lower at all sites of surveyed industrial enterprises compared with the areas of public gardens and city parks (3 and 13 species; 0.9 and 35.5% of adults respectively). Similar tendencies have been found for spiders at heavily and slightly polluted sites in the Subarctic (Koponen, 2011) as well as for spiders of different urbanized territories of Ukraine (Fedoriak, 2011). It suggests that Linyphiidae species are sensitive to technogenic pollution and can be used as effective indicators in biological monitoring.

Poster presentation - Physiology & Functional Morphology:

Male reproductive system and spermatozoa of a basal araneomorph spider (*Austrochilus forsteri*, Araneae: Austrochilidae)

Denis Fischer, Elisabeth Lipke & Peter Michalik

University of Greifswald, Zoological Institute and Museum, Department of General and Systematic Zoology, Germany

Spiders are well-known for their peculiar reproduction including sperm transfer by modified prosomal appendages and high diversity in sexual behaviors. Moreover, numerous studies have shown a remarkable structural diversity in the male and female reproductive system. Nevertheless, the morphology of those organ systems is still not studied in detail for many spider groups. In the present study, we focus on the male reproductive system of a representative of the basal araneomorph superfamily Austrochiloidea (*Austrochilus forsteri*) for the first time. The male reproductive system consists of paired long tubular testes and convoluted deferent ducts. Electron microscopy techniques and computer-based 3D reconstruction revealed the following characteristics of the spermatozoa – (1) tubular acrosomal vacuole, (2) long postcentriolar elongation, (3) small implantation fossa, (4) electron-dense material around the centrioles, (5) 9+3 axonemal pattern. In general, *A. forsteri* sperm show much similarity to mygalomorph spermatozoa. Interestingly, at the end of spermiogenesis the typical coiling process occurs, but sperm do not conjugate nor includes a secretion sheath (“capsule”) when reaching maturity status. Thus, sperm might be transferred coiled but not encapsulated into the female, which represents a new form of sperm transfer in spiders. Functional and phylogenetic implications are discussed.

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Peculiarities of spider fauna (Araneae) of the Altai

Alexandr A. Fomichev

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The history of studying the fauna of the Altai Mountains has over 130 years old. The first collections of spiders in this region were made by G. N. Potanin in 1876–1877, and the first publication appeared in 1895 (Simon, 1895). To date, published over 30 papers in some way dealing with Russian Altai spider fauna. The total number of species recorded in the region is about 460. It is relatively few in comparison with neighboring Tuva Republic, where more than 630 recorded species. While it is clear that the fauna of the Altai Mountains studied not enough, however, already possible to access the originality of the spiders of this region in comparison with the faunas of adjacent regions (Tuva Republic, Xingjiang and East Kazakhstan). Among the most studied spiders of Altai are Salticidae and genus *Acantholycosa* in the family Lycosidae. One of the main features of Altaian araneofauna is the presence of many local endemics, especially among the wolf spiders (Lycosidae) inhabiting kurums (stony debris). There are no endemics among Lycosidae in neighboring Tuva. Another feature of the fauna associated with a high taxonomical diversity of some taxa, so the number of species of the genus *Acantholycosa* in the Altai and adjacent regions of Sayan Mountains is 19 (it is 75% of its global diversity), while in other regions the number of species does not exceed 5. Given the lack of incomplete knowledge of fauna and a high level of endemism, we suggest that the overall species diversity of spiders of Altai may not be less than 600 species.

Student poster presentation - Systematics & Evolution:

The mechanism of sperm transfer in the haplogyne spider *Pholcus phalangioides* (Araneae: Pholcidae)

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University of Greifswald, Department of General and Systematic Zoology, Germany

In polyandrous species, sperm from different males generally compete over access to a female's ova. Consequently, a male has a better chance of fathering a high proportion of offspring if he transfers a large number of sperm. In addition, rapid sperm transfer may be advantageous if the female is able to terminate mating. The speed of sperm transfer, however, may be constrained by the given transmission mechanism.

In spiders, the mechanism of sperm transfer is largely unknown but it is generally assumed that sperm numbers are a function of mating duration. Here, we investigate the mechanism of sperm transfer in the haplogyne spider *Pholcus phalangioides*. Males possess U-shaped pedipalps whose genital bulbs lack membranous, inflatable elements (haematodocha) characteristic of the male palps of entelegyne spiders. During mating, the palps are inserted into the female genital opening simultaneously and perform rhythmic twisting movements. The frequency of these pedipalp-movements (PPM) slows down considerably in the course of copulation. In a previous study, the number of PPMs was shown to be significantly correlated with copulation duration and with paternity success (Schäfer et al. 2008). Furthermore, the number of PPMs was shown to be related to male size.

To test whether the number of sperm transferred is determined by copulation duration or by the number of PPMs, mating experiments were staged with virgin male and female *P. phalangioides* and interrupted after a predetermined time interval (10, 20, 30 or 40 min). The number of PPMs a male performed per given time period was registered. Spiders were fixed at -40° C immediately after mating. The number of sperm transferred to the female sperm storage site as well as the number of sperm that remained in the male pedipalps was estimated using a highly reliable protocol. Male size was included in the analysis as a covariate. Our study contributes to unraveling what determines the rate of sperm transfer in a haplogyne spider.

Poster presentation - Systematics & Evolution:

Slovak spider fauna – updating checklist with new country records

Peter Gajdoš

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The present study provides the updated Slovak check list of spiders. According to the Catalogue of Slovakian Spiders from 1999 (Gajdoš et al. 1999), 892 spider species belonging to 37 families were found in the territory of Slovakia (uncertain citations about 35 species were not counted). Although this is a considerable number of recorded spider species for such a small country as Slovakia, every year there are reported other new species to Slovakia. Within seven years since publishing the Catalogue, first records of 17 species in Slovakia have been published (Gajdoš, Svatoň 2007). During last five years other 14 species (*Psilochorus simoni*, *Dysdera dubrovninnii*, *Eresus kollari*, *Eresus moravicus*, *Parasteatoda tabulata*, *Agyreta olivacea*, *Glyphesis taoplesius*, *Pelecopsis loksai*, *Zora paralela*, *Clubiona leucaspis*, *Gnaphosa alpina*, *Parasyrisca arrabonica*, *Micaria lenzi*, *Philodromus marmoratus* and *Sibianor laeae*) have been recorded as new to Slovak fauna. Faunistic data on these species and notes to their bionomy and distribution are summarised in this study. So far, 924 spider species are known for Slovakia.

Adaptive significance of bright body colorations in web-building spiders

Wenjin Gan

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The function of body coloration in web-building spiders has received much attention in recent literature and there is increasing empirical evidence that a spider's bright body coloration can lure insect prey, thus increasing its foraging success. Many visually-oriented predators such as wasps are also known to use color signals to search for spiders. However, most previous studies testing function of body coloration of web-building spiders have exclusively focus at species level. Our field surveys showed that the abundance ratio of conspicuous to inconspicuous orb-weaving spiders was about 4 : 1 in the same habitat. However, the evolutionary significance of diverse spider color patterns at community level remains unexplored. In this study, using orb- weaving spiders in tropics as model systems, we investigated the role of body coloration in the context of foraging intake and predation risk at the community level in the field. We video recorded brightly colored and inconspicuous orb-weaving spiders that lived in the same habitat and measured: (i) the number of approaching prey and predators; (ii) hit rate; and (iii) attack and/or capture rate. Totally, we video recorded 241 individuals of spiders belonging to three families (Araneidae, Nephilidae, Tetragnathidae), eight genera, and 14 species. Our results showed that bright body coloration of spider's functions as a visual lure to attract prey, but this was only observed in spiders from the Araneidae. Although more predators approached to webs of spiders with bright body coloration, but there was no significant difference in predator hit/attack rate between conspicuous and inconspicuous web weaving spiders. Thus, our results provide strong support for the hypothesis that bright body coloration of orb-weaving spiders acts as a visual lure for prey at the community level.

Oral presentation - Systematics & Evolution:

Systematics of the spider genus *Sintula* (Linyphiidae: Araneae) with notes on its diversity in Europe, North Africa and Israel

Efrat Gavish-Regev

Department of Zoology & The National Collections of Natural History, Tel Aviv University, Israel

Linyphiidae, the second richest family-level lineage of spiders (4412 species in 587 genera), are medium to small sheet-web weavers. Linyphiids are most diverse in the northern temperate regions; less than 10% of the described linyphiids are known from North Africa and the Middle East. Nonetheless, several species recorded as occurring solely in semi-arid or arid regions. *Sintula* Simon, 1884, consists of 17 described species, 12 of which are found in Europe, four in North Africa and one in both North Africa and Europe. At least four species of *Sintula* were found in intensive surveys in Israel. One species was collected solely from the Negev desert, both in crop fields and in natural arid habitats; two additional species were collected from the Judean foothills, in a transition zone between the arid-desert and the Mediterranean climate zones. A fourth species was collected both from the Judean foothills and the northern Mediterranean part of Israel. We describe the genitalic and somatic morphology of *Sintula* and discuss the genitalic diversity in relation to species distribution across temperate and arid zones.

Student oral presentation - Systematics & Evolution:

Phylogeny and behaviour of Asian *Anelosimus* species

Seok Ping Goh

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Spiders of the genus *Anelosimus* are well documented and studied in Europe, North America and South America. These spiders show varying degrees of social behaviour, with majority of those studied exhibiting social or subsocial behaviour. In this presentation, I will present my findings on newly described species of this genus from Asia. In particular, this presentation would include previously unknown notes on the life history of solitary *Anelosimus* species (*A. agnar*, *A. linda*, *A. membraneceus*, *A. seximaculatus*, *A. chonganicus*) and subsocial species (*A. crassipes*, *A. kohi*). These species are also included into a previous phylogenetic analysis, which places the solitary Asian species in a clade, close to solitary species (*A. pacificus* and *A. ethicus*). The solitary and subsocial behaviour of Asian *Anelosimus* species will be discussed.

Student poster presentation - Systematics & Evolution:

Spiders from the Fruška Gora Mt. – new records and 15 species new to Serbia

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Fruška Gora is a south Pannonian Island Mountain, which was proclaimed a National Park in 1960. Although the oldest spider records for the Mountain were given in 1897 by Chyzer & Kulczynski the spider fauna of this region is still poorly known. The recently updated list of the Mountain has only 220 spider species (Grbić & Savić, 2010) and the capture records were not based on an extensive scientific inventory.

The chosen locality for this research, Komesarovac, was proposed as part of an enlargement of the National Park. Therefore in 2010 some pitfalls were placed in this locality to collect further arguments for the expansion of the boundaries. The collecting was designed as a little pilot project to a proposed later long – term research on spiders of the Fruška Gora Mt. Four habitats were selected for the investigation: two meadows (irregularly grazed by sheep), a deciduous forest and a pine forest. Duration of the collecting period was 5 months (from April till August).

As a result of this pilot research, a total of 586 individuals of 108 spider species were collected. Among those, 41 were recorded for the first time at the Fruška Gora Mt. and 15 species represent new records for the Serbian fauna. Most of these species would have been expected for the poorly explored Serbian spider fauna. However, the most interesting record is *Pelecopsis loksai* (Szinetar & Samu 2003), a species that was for now only known from Hungary.

Student oral presentation - Ecology & Behavior:

Optimal foraging, not biogenetic law, predicts spider orb web allometry

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The “biogenetic law” predicts that the ontogeny of an organism often recapitulates the pattern of evolutionary changes. Morphological evidence has offered both support for and refutation of the biogenetic law suggesting it is not a general rule. However, biogenetic law in behavior remains underexplored. Spider webs are a physical manifestation of the animals’ behavior and thus offer an interesting model for the study of ontogenetic changes related to behavior. The architecture of the classical “wagon-wheel” shaped orb web changes through ontogeny in most spider families, and particularly obvious are the changes in symmetry. As the ancestral orb web was supposedly symmetrically circular, some studies consider ontogenetic changes from symmetric to asymmetric webs to reflect the biogenetic law. Alternative hypotheses suggest that such ontogenetic changes optimize the function of the webs, e.g. prey catching. Here, we explore two alternative hypotheses, the optimal foraging versus the biogenetic law, which could explain allometry in *Leucauge venusta* orb webs that range in inclination from vertical to horizontal. We show that, through ontogeny, vertical webs in *L. venusta* become more asymmetrical, but that this is not the case in horizontal webs. Our results thus fail to support the predictions of the biogenetic law hypothesis, and instead support the hypothesis of foraging area optimization in response to spider size.

Student poster presentation - Systematics & Evolution:

Microtrichobothria in Buthidae (Arachnida: Scorpiones)

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Scorpions possess a number of trichobothria of different lengths on their pedipalps. For a long time the so-called microtrichobothria were simply seen as short trichobothria. In *Euscorpius alpha* (Euscorpiidae) this is indeed the case. However, in buthids (*Mesobuthus gibbosus*, *M. cyprius* and *Buthus occitanus*) microtrichobothria are different. We investigated these organs by means of compound light microscopy, scanning electron microscopy and transmission electron microscopy. Preliminary results show that the microtrichobothria of buthids have a distinctive ultrastructure. They appear short, translucent and probably have a pore at the tip which suggests a chemosensitive function. In addition, the cup-shaped trichobothrial base shows peculiar lamellae. Possible functions of these structures are discussed.

Plenary speaker:

Interacting traits and secret senses – arachnids as models for studies of behavioral evolution

Eileen Hebets

University of Nebraska, USA

Arachnids are extremely well equipped to both extract salient information from their environment and to transmit salient information through their environment utilizing a diverse array of sensory structures. Many of these sensory structures are highly specialized and are unique to particular arachnid groups; and as such, offer the opportunity for researchers to explore broad questions regarding the evolution and function of sensory systems. These diverse sensory systems can also be heavily integrated into the complex behavioral dialogues witnessed across many arachnid groups, such as those observed in agonistic interactions or courtship displays. Recent work has built upon foundational physiological and morphological studies by utilizing new technology and integrating across traditional disciplines to examine the function of specific sensory modalities in complex behavioral displays. These studies have revealed, in part, that previously unrecognized sensory modalities play predominant roles in well established behavior – such as the use of near field sound in the antenniform leg vibration displays of the amblypygid *Phrynus marginemaculatus*. Additionally, researchers have taken advantage of the ability to manipulate signaling environments as well as phenotypic traits in many arachnids to uncover the underappreciated importance of trait interactions in display function – such as the interaction between foreleg ornamentation and courtship rate in the wolf spider *Schizocosa stridulans*, or the interaction between seismic and visual signals in the wolf spider *Rabidosia rabida*. Currently, spiders represent an impressive 34% of studies focused upon multimodal communication and the opportunity exists to increase this percentage. I argue that arachnids are ideal organisms for studies addressing the evolution and function of sensory systems and associated communication systems and that such studies are extremely timely. Furthermore, the field of Arachnology has a strong tradition in systematics and phylogenetics, in addition its strength in behavioral studies. Arachnid systematists and phylogeneticists are at the forefront of the field and as such, our knowledge of the phylogenetic relationships of certain arachnid groups is vast. The opportunities for integrating behavioral studies with evolutionary theory and questions are considerable and it is an exciting time to be an arachnologist. I argue that the future of arachnology is in cross-disciplinary collaborations and that arachnids can become model organisms in behavioral evolution

Oral presentation - Systematics & Evolution:

Systematics, phylogeny and biogeography of ant-eating spiders (Zodariidae) with special reference to forest dwelling Afrotropical taxa

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This thesis aims to test the hypotheses on the biogeographical origin and history of Afrotropical forests by reconstructing the phylogeny of different taxa of forest spiders belonging to the Zodariidae. Mainly the species of *Mallinella* (Zodariidae) will be studied by the means of morphological characters and DNA sequences (mitochondrial and nuclear). The species are relatively abundant but restricted to forest areas and habitats with a well developed litter layer. The reduced ability to disperse makes it an ideal model to test hypotheses regarding the origin and timing of isolation of the Afrotropical forests. Thus, an increased knowledge of the evolutionary history of these taxa will test the following hypotheses: the origin of taxonomic affinities between the different Afrotropical forest areas and the history of their endemism are the result of a single break or multiple fragmentations / reconnections as a result of climatic changes. The study will be carried out in the framework of a molecular/morphological phylogenetic analysis of the family Zodariidae on a worldwide scale.

The effects of fragment area, isolation and habitat diversity on ground-dwelling spider assemblages in dry sandy grassland fragments in Hungary

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Nowadays, reduction and degradation of natural and semi-natural habitats contribute to the loss of biodiversity. During the last few decades there has been an immense decrease in the size and continuity of diverse natural and semi-natural grasslands in whole Europe. Therefore, grasslands are the most sensitive to habitat alteration and fragmentation. There are invertebrates in high species number in natural and semi-natural grasslands especially the threatened rare and endemic species. Sandy grassland is the most threatened ecosystem in Central Europe. Thus, nowadays there is a growing demand for the conservation of this habitat type. We investigated the effects of fragment area, isolation and habitat diversity in the conservation of ground-dwelling spider assemblages living in fragmented landscape in dry sandy grasslands in the Nyírség region (East Hungary). We collected spiders using pitfall traps at eight dry sandy grassland fragments from 2001 to 2009 in every two week from April to October. Classical theory of island biogeography suggests that the species richness increases with the size and decreases with the isolation of patches. However, this general rule is disguised by the ecological features of the species, and biodiversity conservation should focusing on the rare, usually habitat specialist species. The habitat diversity may also an important factor for species richness, since large areas usually have more habitats therefore the number of species may be higher in these areas. During the 9-year study period, altogether 10,544 spider specimens belonging to 106 species were collected from the eight dry sandy grassland fragments. We identified twenty-one species (about 20% of the collected species) as habitat specific species (open-habitat species associated with sandy soils). Contradicting the classical theory, there was a significant negative relationship between the total number of spider species and the grassland area, while the relationship between the ratio of generalist species and the habitat size was not significant. The overall species richness and the isolation of studied grassland fragment didn't show a significant relationship, while the ratio of generalist species increased with the increasing of isolation. However, the ratio of habitat specific spider species (open-habitat species associated with sandy soils) increased with fragment size and the decrease of isolation. The habitat diversity didn't show any effect on spider species richness. Our results pointed out that there was an important difference among the patterns of the total species pool and the specialist species. Generalist species can penetrate from the adjacent non-native deciduous tree plantations, croplands and edge habitats resulting in an increase in overall species richness in these fragments with a smaller size and/or higher isolation. In contrast, the habitat specialist species can survive and reproduce greater numbers only in the dry sandy grassland habitats; therefore, they need larger and less isolated patches. We conclude that conserving the biodiversity of dry sandy grassland inhabiting ground-dwelling spiders it is recommended to preserve all grassland patches and to avoid further fragmentation and isolation of the patches.

The spectral transmission of the principal-eye corneas of jumping spiders: implications for ultraviolet vision

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Ultraviolet (UV) vision plays an important role in inter- and intra-specific communication in many animals. However, UV vision and its adaptive significance have been investigated in only about 1% of more than 5000 species of jumping spiders (Araneae: Salticidae), renowned for their unique, complex eyes that support exceptional spatial acuity, and visually based behaviour. To appreciate the adaptive significance of UV vision, it is important to establish whether salticids can perceive UV and whether the perception of UV varies with ecological factors such as light environment. In this study, we measured the UV-transmission properties of the principal-eye corneas of 128 salticid species. We found that the corneas of all measured salticid species were able to transmit UV light, making the perception of UV possible. Three classes of corneal spectral transmission curves were identified; the majority of species had a Class II curve with a less-steep slope and a gradual onset of the transmission cut-off; all the remaining species had a Class I curve with a very steep slope and a sharp cut-off except that one species had a Class III curve with an intermediate step, which appeared as a shoulder on the descending part of the transmission curve. The T_{50} cut-off transmission values in salticid corneas vary with species and light habitat. The corneas of species inhabiting open bush had a higher relative transmission at short wavelengths in the UV than forest species. This is the first investigation of corneal transmission in spiders and suggests that UV perception is widespread in salticids.

Student poster presentation - Ecology & Behavior:

Spider dispersal in wheat and plantation areas of Israel

Pao-Shen Huang

Department of Life Science, Tunghai University, TaiChung City, Taiwan

Most immature and some adult spiders use ballooning as a form of aerial movement to disperse. A principal behavioral component of ballooning observed in araneomorph spider is climbing to a high point and then performing tip-toe behavior. In this first study I investigated the compositions and movement tendency of spiders in wheat fields and adjacent plantations in an Israeli agroecosystem. Climbing traps were established in wheat fields and adjacent plantations to estimate spider composition and wind tunnel experiments were conducted to access the ballooning tendency of spiders. Spider specimens were collected from climbing traps once every two weeks for a year and were used in wind tunnel experiments. Different patterns of compositions and ballooning tendency peaks were observed between crop areas and adjacent plantations. Peaks in ballooning tendency were not synchronized across habitat types. Abundance and composition of spiders in wheat fields and adjacent plantation differed but some spider families were present in both habitats. Preliminary results of wind tunnel experiments showed that in two habitat types spider taxa exhibiting ballooning tendency differed. These results suggest that aerial dispersal might be one factor generating the observed spider diversity pattern in agroecosystem in Israel.

Poster presentation - Systematics & Evolution:

Intraspecific genital variation: annoying fact or misinterpretation?

Bernhard A. Huber

Alexander Koenig Research Museum of Zoology, Adenauerallee 160, 53113 Bonn, Germany

In an ideal world, species-specific structures like arthropod genitalia would be conspicuously variable among species but invariable within species. It is obvious that invariability does not exist in a biological system but the minimal genital variation that occurs within populations does usually not pose a problem. However, the way to deal with minor variation among populations is far from obvious. The extent of difference that is believed to reflect reproductive isolation is often a largely arbitrary taxonomical decision. In a recent revision of *Pholcus* and closely related taxa (Huber 2011), 35 of 106 “species” represented by material from more than one population showed genital variation that was interpreted to be intraspecific. Most of these cases need further study and some will likely turn out to result from unjustified lumping. I argue that in such cases lumping is nevertheless the scientifically preferable procedure. This is because the taxonomic null-hypothesis states that all organisms are the same species. In ambiguous cases, this null hypothesis cannot be rejected and the specimens should be lumped until further data become available.

Oral presentation - Systematics & Evolution:

Multiple convergent shifts among microhabitats in Pholcidae: Does ecological plasticity help explain pholcid diversity?

Bernhard A. Huber

Alexander Koenig Research Museum of Zoology, Adenauerallee 160, 53113 Bonn, Germany

There are few convincing examples of traits that are repeatedly and consistently associated with increased diversification (de Quieroz 2002). I explore ecological plasticity – the evolutionary ability of a taxon to invade new microhabitats – as a potential explanation for the high diversity (morphological and numerical) of pholcid spiders. Pholcids occur in several basic kinds of microhabitats: in the leaf litter, in large protected spaces (among rocks, between buttresses, etc.), and on the underside of green leaves. Evolutionary shifts among these microhabitats have occurred repeatedly and independently, and these shifts are usually associated with significant morphological changes. Recent molecular data do not only support many of these shifts but have also revealed generic misplacements due to convergent similarities that result from identical microhabitats (Dimitrov, Astrin & Huber in press). A preliminary comparison of species numbers in genera where no shifts among microhabitats are known and genera in which one or several shifts have occurred suggest a correlation between evolutionary ecological plasticity and numerical species diversity.

Oral presentation - Biogeography:

Spiders of Socotra – news from the dragons blood island

Vladimír Hula & Jana Niedobová

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Spider fauna of Socotra Island (Yemen) is not well known. There were just a few studies based on sparse material collected mainly by Antonius van Harten. The problem was, that most of the material was collected in very small numbers and, except the most common species, nearly all spiders were described based on one sex only (c.f. Weselowska, van Harten, 1994, 2002, or Deeleman-Reinhold, van Harten, 2001). The same situation is known from historical times – collections of I. Balfour (*Moggridgea socotrana*, Migidae, is known from one female only). We investigated fauna of Socotra island in previous years (c.f. Hula, Niedobová, 2011), but our last visit (June 2012) brought a lot of news.

We have found 6 other new families new for the Socotra spider fauna (Idiopidae, Corinidae, Agelenidae, Oecobiidae, Ctenidae, Dictynidae) and a lot of other species not mentioned before (for example we collected more than 100 specimens of Pholcidae – there were only one species known). Other news came from family Salticidae. Excerpt complement in previous study we have some new records from genus *Myrmarachne*, then one spider from subfamily Spartaeinae and others. It is sure that there will be big taxonomic progress, but it will need time.

We do not collect specimens only, we also collected ecological data about known species. The most interesting are data about nearly unknown spider of genus *Moggridgea*, *M. socotrana*. This spider has similar habitat requirements like other species from the genus (c.f. Griswold, 1987), but it prefers mainly endemic trees of Socotra only. The richest populations were found on bark of Dragons blood tree *Dracaena cinnabari*, Frankincense tree *Boswellia elongata* and rare myrrh tree *Commiphora socotrana*. It is night active and feeding probably mainly on ants. Such information we tried to collect for all species even for described one.

It seems that there will be no possible other investigation due to political situation. We know that there will be still a lot of possibilities to visit Socotra, but it will be other island – with international sea-port, double human population, with millions of goats and no *Dracaena* trees.

This research is supported by grants of Ministry of Education, Youth and Sport of the Czech Republic no. LA10036/MSMT.

Poster presentation - Ecology & Biogeography:

The Southwestern Alps are a hot spot of divergence among the *Eukoenia spelaea* group (Arachnida: Palpigradi)

Marco Isaia, E. Lana, Mauro Paschetta & E. Christian

University of Torino, Department for Life Science and System Biology, Torino, Italy

Three *Eukoenia* species have been described after specimens collected in caves of the SW-Alps and their foreland: the first recognized “cavernicolous” palpigrade *E. spelaea* (Peyerimhoff, 1902), distributed with several infraspecific taxa over the Alps, the Western Carpathians and the Northern Dinarides; and the related, endemic species *E. strinatii* Condé, 1977 and *E. bonadonai* Condé, 1979, from both of which solely the holotype has been known. Prior to our study a single immature specimen (“*E. cfr. spelaea*”) has also been reported from this region. Over the last years, extensive sampling in six caves and mines of the Ligurian, Maritime and Cottian Alps yielded rich material (for palpigrade standards) that can be embedded within the morphological spectrum of the *E. spelaea* group. In the present case geographic proximity proved to be a misleading guideline for species affiliation because none of the newly detected populations appears most closely related to the closest neighbour *E. strinatii*, exclusively known from the type locality (Bossea cave, Ligurian Alps). Particular character states and morphometric analyses reveal distinctness of all the populations. Such divergence among related palpigrade populations in a small area has never been reported before. The seemingly random routes of divergence and unexpected variation, even in “good” characters used in traditional taxonomy, impede species delimitation, thus we refrain from any untimely taxonomic act. The high number of paramedian setae on the opisthosomal sternites IV–VI proves the population from Maritime Alps to be conspecific with *E. bonadonai*. The populations of the more northern caves (Cottian Alps) fit into the vast range of morphological variation of *E. spelaea*. Although the Caudano cave population (Ligurian Alps) lives next to the type locality of *E. strinatii*, it belongs either to *E. spelaea* or – if the still unknown males had an elevated number of sternal setae – to *E. bonadonai*.

Oral presentation - Biogeography:

Five years of ATBI in the Maritime natural park (SW-Alps, Italy): what about spiders?

Marco Isaia, Mauro Paschetta, Alberto Chiarle & B. Rizzioli

University of Torino, Department for Life Science and System Biology, Torino, Italy

Given its remarkable biological diversity, the Alpine district of Maritime Alps has been defined as a key area to understand the dynamics that shaped the fauna of the Italian peninsula as well as the Western European one. The core of this area is the Natural Park of Alpi Marittime, a protected area of more than 30,000 hectares, ranging from 1200 to 3300 m asl and encompassing a wide variety of montane habitats. The Park has been recently chosen by the European Distributed Institute of Taxonomy (EDIT) for the first European All Taxa Biodiversity Inventory (ATBI), a research project founded in the frame of the Sixth Framework Programme of the European Commission (Work Package 7) with the main aim to apply the science of taxonomy to the conservation of biodiversity. An ATBI not only compiles lists of species, but also collects ecological information on habitat, distribution, time and date of occurrences of the observed species, as well as abundance and biology. Thanks to our work within the ATBI in Maritime Alps (122 sampling events on 82 localities plus several ecological researches based on standardized collection methods), knowledge on spider fauna of the Park increased from 54 to 257 recorded species. Up to now, Linyphiids are the most diverse family, with 69 species collected, followed by Gnaphosids (31) and Lycosids (29). A remarkable presence of endemic species (10%) was found, confirming also for spiders, the biogeographical peculiarity of the area. Several new records were reported for a number of rare and almost unrecorded endemic species like *Vesubia jugorum* (Lycosidae), *Turinyphia clairi* (Linyphiidae), *Cybaeus vignai* (Cybaeidae) and *Dysdera cribrata* (Dysderidae). Representing a typical example of cold-adapted species with narrow ecological requirements and a distinctive life history, the potential of *Vesubia jugorum* in terms of studies on global warming has been preliminary explored and is currently under development. Ecological researches using spider as key groups focused mainly on the most representative habitats of the Park, namely pastures and beech woods. Concerning pastures, statistical analysis showed that both species richness, spider abundance were lower in heavily grazed areas. Endemic assemblages were richer and more abundant in lightly grazed type, which also hosted the most taxonomically diverse assemblages. Additionally, results about further studies about pasture spider communities in relation to altitudinal gradients will be briefly presented. Concerning beech woods, the role of spiders as bioindicators was evaluated in the frame of an ecological study focusing on forest management, comparing spider assemblages collected in coppice, regular standards and forest clearings. The highest spider abundance was recorded in clearings and a positive correlation between spider abundance and the presence of herbaceous vegetation was detected. Additional non-standardized surveys in beech woods and hygropetric habitats provided material for further taxonomical studies, including the description of three new species to science.

Poster presentation - Ecology & Biogeography:

Madagascar – A biodiversity hotspot for the spider family Mysmenidae (Araneoidea, “symphytognathoids”)?

Anne Janzen¹, Peter Michalik¹, Charles Griswold² & Lara Lopardo¹

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Madagascar is not only a biodiversity hotspot, but is also one of the eight most important hotspots concerning species richness, diversity and number of endemics of plants and vertebrates and habitat loss in the world. The spider fauna of Madagascar is particularly rich in endemism levels (29% of its spider genera and 85% of its spider species). However, no mysmenid species have ever been described to date from the island. Our goal is to report and describe the distribution and diversity of Mysmenidae in Madagascar, based on material intensively collected between 1993 and 2003. A total of 441 specimens were assigned to 39 preliminary morphospecies. We performed an extensive comparative morphological study and a preliminary phylogenetic analysis of 20 morphospecies (represented by several available specimens). Our preliminary analysis resulted in the identification of 11 species, the discovery of one new genus, and suggested generic placement for the nine new species, together with new distribution records for *Microdipoena guttata* and *M. nyungwe*. New species are placed as following: five new species within *Mysmena*, two new species within *Chanea*, one new species within *Mysmenella*, and two new species within a new genus. Results of this study also indicate that the characteristics of Madagascar as a mixed island might have influenced the composition of the current mysmenid fauna. *Microdipoena nyungwe* links Madagascar to Africa; *M. guttata* links Madagascar to America; and the new *Chanea* species link Madagascar with Asia. Mysmenidae shows a rather wide geographical distribution across the island, with all species occurring in relatively humid habitats except for one new *Mysmena* species, which is distributed in rather dry areas along the western side. With only 123 mysmenid species described to date in a worldwide availability of potential habitats; it is evident the lack of knowledge concerning the global diversity of the family. Madagascar seems to house one of the highest densities of mysmenid species per area known so far. Furthermore, the Madagascan mysmenid fauna is far from being extensively studied: examination of remaining Madagascar material suggests that additional 23 new species might be awaiting description. Such potential increase in mysmenid species density would further support our hypothesis of Madagascar as a hotspot for the spider family Mysmenidae.

Student oral presentation - Systematics & Evolution:

The Linyphiidae (Araneae) fauna of Mediterranean region from Turkey

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In this study, 27 species belonging to the family of Linyphiidae were investigated from Mediterranean Region. As a result of the examined species; the genera of *Abacoproeces* Simon, 1884, *Styloctetor* Simon, 1884 and *Agyneta* Hull, 1911 with the species of *Megalephyphantes nebulosus* (Sundevall, 1830), *Araeoncus tauricus* Gnelitsa, 2005, *Erigonoplus globipes* (L. Koch, 1872), *Centromerus subalpinus* Lessert, 1907 and *Lepthyphantes* sp. are new record for Turkey spider fauna.

Oral presentation - Biogeography:

Genus *Siro* Latreille, 1796 and related genera (Opiliones, Cyphophthalmi, Sironidae) in the European fauna

Ivo Karaman

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According to present knowledge, family Sironidae is distributed in the western Palearctic (Europe and Asia Minor) and in Nearctic (genus *Suzukielus* Juberthie, 1970 from Japan does not belong to this family). It is present in the areas which have had a permanent land phase during the last ca. 200 Ma, or that had been in close contact with such areas. Rough picture of the distribution of this family is connected with the existence of the Laurasia paleocontinent.

The core of the diversity of the family is located in the southern parts of Europe with 6 currently known genera. In North America, this family is presented with at least two genera, *Holosiro* Ewing, 1923 and *Neosiro* Newel, 1943 which were wrongly synonymized with the European genus *Siro* long time ago. Based on the study on 4 known and one new European species of the genus *Siro*, a new species from Austria related to this genus and some North American sironids, I was able to define diagnostic characters of the genus *Siro*. It could be defined by the specific structure of the ventral prosomal complex and the presence of the protruding anal region in females.

The Sironid fauna of the northern European territories, which were devastated during Pleistocene is represented by two fossil species, *Siro platypedipus* Dunlop & Giribet, 2003 and *Siro balticus* Dunlop & Mitov, 2011. Both species are not showing diagnostic characters of the genus *Siro* and could not be assigned to it. *Siro balticus* is closely related to a group of North American sironid species which could be classified within the genus *Neosiro*.

First insight into epigean spider fauna of the peak areas of central Dinarides

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The area of South-eastern Europe, especially karstic Dinaric region represents one of the most preserved natural areas in Europe and is a hotspot of European biodiversity and a centre of endemism. The central part of the Dinarides is situated on the border area between Croatia and Bosnia and Herzegovina, encompassing mountains Dinara, Ilica, Troglav and Kamešnica. The central part of the Dinarides does not cross the 2000 meters elevation line, with the highest peak on 1913 m (Troglav). The climate is harsh alpine with significant daily temperature variations, and the mean annual precipitation of the highest peaks are around 2000 mm. Due to the inaccessibility and configuration of the interest area, the highest peaks of the central Dinarides are very poorly faunistically investigated, offering only scarce data on the biodiversity there present. Also, the recent war significantly influenced the state of research on this area, both during the war, and today, due to the fact that large areas of terrain are still under mine fields and unreachable to the researchers. Although the first written record on spider species in Croatia dates to the year 1774, the first thorough research on spiders in Croatia begins at the end of the 19th century. Since than most of the research has been focused on coastal area, while the data on spider fauna of mountainous area, especially of central Dinarides, are very scarce. As a part of the research made for the background study for the protection of the Dinara massif, a two short field trips were taken in August 2009 to Dinara Mountain and in July 2011 to Troglav Mountain. Within this research 141 spider specimens were collected. Among these, 67 were adult and could be identified to species level. Altogether, 30 different species, belonging to 12 families were identified. For two species a suitable description couldn't be found in the available literature, so the species so far remained unidentified. Almost all collected species are characteristic for dry, open, rocky grassland habitats, mostly of mountain areas. The rest of the species are ubiquitous, generalist species, found on different types of habitats. Three species are for the first time recorded in Croatia (*Clubiona leucaspis*, *Thanatus coloradensis*, *Pardosa bifasciata*) and eight in Bosnia and Herzegovina (*Inermocoelotes halanensis*, *Drassodes cupreus*, *Zelotes hermani*, *Meioneta rurestris*, *Pardosa albatula*, *Heliophanus lineiventris*, *Steatoda albomaculata*, *Liocranum cf. perarmatum*). Especially interesting are the findings of the species *Marpissa balcanica* (Kratochvíl, 1932), by now recorded only in the continental part of Croatia, near the city Slavonska Požega (Kratochvíl, 1932) and in Bosnia and Herzegovina, in unnamed cave in the valley of river Miljacka (Kratochvíl, 1934); and of species *Inermocoelotes halanensis* (Wang, Zhu, & Li, 2010), so far only known from the Velebit Mountain in Croatia, described according to single female specimen collected in 1970. This research represents first contribution to the knowledge of the epigean spider fauna of the highest peaks of central Dinarides.

Student poster presentation - Ecology & Behavior:

Diurnal and nocturnal populations of web-spinning spiders and their prey along a tropical head water stream.

Sean P. Kelly

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Web-spinning spiders represent an important link between aquatic and terrestrial food webs as a major consumer of emerging aquatic insects from streams, lakes and rivers. Some clades of spiders such as the genus of *Tetragnatha* appear to have clear associations with riparian habitats and they are seen as being specialists at trapping weak flying, emerging aquatic insects. Studies have shown direct links between aquatic ecosystems and terrestrial web-spinning spiders but the majority of these studies have been limited to temperate regions and little is still known about this relationship in tropical ecosystems. In this study a small headwater stream was chosen in the Luquillo Mountains of Northeastern Puerto Rico. A 100 meter reach of stream was selected and both diurnal and nocturnal spider sampling was conducted within 3x3 meter grids along the stream and comparison grids were sampled 10 meters into the forest. This study focuses on five families of web-spinning spiders Araneidae, Pholcidae, Tetragnathidae, Theridiosomatidae and Theriididae. For each web encountered, measurements such as distance to water surface and distance to stream edge will aim to show that certain clades of web-spinning spiders are more likely to be found alongside streams than in neighboring forests and also that certain clades of web-spinning spiders are only actively hunting at night. In order to help explain the influence that prey abundance may have on web building behaviors, nocturnal and diurnal Malaise trap sampling of flying insects was conducted at the same time as spider sampling. This study aims to show which groups of tropical web-spinning spiders are more dependent on stream habitats and if they are more likely to be actively hunting during the day or at night. With this information researchers will have a better understanding of which clades of spiders to focus on in order to better understand the effects of stream ecosystems on terrestrial food webs in tropical forests.

Oral presentation - Biogeography:

Spider fauna of semi-arid eastern Colorado agroecosystems: diversity, abundance, and effects of crop intensification

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Spiders are critical predators in agroecosystems. Crop management practices can influence predator density and diversity, which, in turn, can influence pest management strategies. Crop intensification is a sustainable agricultural technique that can enhance crop production while optimizing soil moisture. To date, there is no information on how crop intensification affects natural enemy populations, particularly spiders. This study had two objectives: to characterize the abundance and diversity of spiders in eastern Colorado agroecosystems and to test the hypothesis that spider diversity and density would be higher in wheat in crop-intensified rotations compared with wheat in conventional rotations. We collected spiders through pitfall, vacuum, and lookdown sampling from 2002–2007 to test these objectives. Over 11,000 spiders in 19 families from 119 species were captured from all sampling techniques. Interestingly, the hunting spider guild represented 89% of the spider fauna captured from all sites with the families Gnaphosidae and Lycosidae representing 75% of these spiders. Spider densities and diversity were greatest during the years when precipitation was greatest at all sites, possibly due to an increase in weed growth. Therefore, crop structural features may be a better indicator of spider community attributes than crop intensification. Overall, spider densities were low in these semi-arid cropping systems, and crop intensification effects on spider densities were not evident at this scale.

Oral presentation - Physiology & Functional Morphology:

Effect of lambda cyhalothrin and emamectin benzoate on survival, growth, and behavior of *Plexippus paykulli* Savigny et Audouin, 1827 (Araneae: Salticidae)

Shafaat Yar Khan, Sadia Nawaz, Hafiz Muhammad Tahir, Muhammad Khalid Mukhtar & Muhammad Arshad

Department of Biological Sciences University of Sargodha, Sargodha Pakistan

During present study, the effect of Lambda Cyhalothrin and Emamectin Benzoate on survival, behavior, and growth of *Plexippus paykulli* was assessed. Spiders were captured from the ornamental plants of University of Sargodha and were exposed to insecticide treated filter papers. Mortality was found significantly high in *Plexippus paykulli* after exposure against different concentrations of Lambda Cyhalothrin, while non-significant mortality was observed against Emamectin Benzoate.

Non significant difference was observed in time spent by *Plexippus paykulli* on Emamectin Benzoate treated surface, while time spent by spider on surface treated with Lambda Cyhalothrin was found significant. Locomotory time was significantly reduced after exposure to field application rate of both insecticides. Growth of *Plexippus paykulli* was also retarded with field application rate of Emamectin Benzoate and sub lethal dose of Lambda Cyhalothrin i.e. ¼ field application rate. Predatory efficacy was significantly reduced with both insecticides, however in group of individuals treated with Emamectin Benzoate; efficacy was recovered within 24 hrs.

Results of present study suggest that Lambda Cyhalothrin is highly toxic, causing mortality, affecting locomotory, avoidance and predatory behavior, while Emamectin Benzoate was least toxic to *Plexippus paykulli*, under laboratory conditions, Therefore Emamectin Benzoate can be used in IPM, but it is recommended that its side effects on other non-target species should also be tested.

Student oral presentation - Systematics & Evolution:

A molecular phylogeny of the subfamily Argyrodinae (Theridiidae) – host choice and biogeographical patterns of kleptoparasitic argyrodine spiders on the Major Antilles

Heine C. Kiesbüy & Ingi Agnarsson

Department of Biology, University of Vermont, Burlington, VT, USA

In resolving biogeographical patterns, knowledge regarding the dispersal capability and habitat requirements of the species of interest, coupled with information of geographical barriers on a geological time scale, are crucial to understand their distribution and diversification. The kleptoparasitic spiders of the genera *Argyrodes*, *Faiditus* and *Neospintharus* (Theridiidae: Argyrodinae) furthermore require the presence of suitable host species webs. Phylogenetic knowledge of this subfamily is poor and as a part of a larger Caribbean Island Biogeography project, we collected argyrodine spiders, together with their hosts, from the Major Antilles, and assembled material from other areas worldwide. From these we sequenced the CO1 and ITS2 loci and used a combination of morphological and DNA barcode (COI) evidence to identify species and estimate species richness, and the two loci to estimate the phylogenetic relationships among the species to reveal biogeographical and host choice patterns. We discuss the biogeography of Argyrodinae in the Major Antilles, and reveal higher diversity of species, and broader spectrum of host choice, than hitherto documented in the area.

Student poster presentation - Systematics & Evolution:

The supply with oxygen and nutrients of the prosomal ganglion of *Mitostoma chrysomelas* (Hermann, 1804) (Opiliones, Dyspnoi, Nemastomatidae) with special emphasis on the pattern of intraganglionic tracheae

Bastian-Jesper Klußmann-Fricke & Christian S. Wirkner

Allgemeine & Spezielle Zoologie, Universität Rostock, Germany

Of the 11 extant arachnid orders, Opiliones (harvestmen or daddy-long-legs) constitutes the third largest in species diversity. However, the knowledge of their internal morphology, despite numerous studies from the classical period of morphology at the beginning of the last century, is still superficial. Using classical serial sectioning and innovative methods such as MicroCT in combination with computer-aided 3D-reconstruction we studied the morphology of the tracheal and vascular system in *Mitostoma chrysomelas*. As all opilionids, *M. chrysomelas* possess only a short tubular heart in the dorsal midline of the opisthosoma which is equipped with two pairs of valve-like ostia. Posteriorly the heart extends into a short posterior aorta which supplies the hindgut and the posterior digestive glands. Anteriorly the heart extends into the anterior aorta from where hemolymph is released into the perineural sinus supplying the prosomal ganglion with hemolymph (and nutrients). The special focus of this study is the pattern of tracheae in the prosomal ganglion, which establish oxygen supply for the nervous system. We found two pairs of tracheae which emanate the main tracheal trunks and run into the prosomal ganglion ramifying into a large number of small tracheols. These provide an extremely dense supply of the ganglion. Furthermore, we can show that the pattern of tracheae corresponds with the organization of the fused neuromeres incorporated into the prosomal ganglion. The supplying tracheae continue always around the borders of the neuropile structures of a neuromere. There are striking similarities between the pattern of tracheae in the prosomal ganglion of opilionids and the pattern of vessels which supply the prosomal ganglion of scorpions suggesting that the tracheal system functionally replace the arterial system for oxygen supply.

Student oral presentation - Systematics & Evolution:

Detailed description of capillarisation in an arthropod: a study of the prosomal ganglion in *Brotheas granulatus*, Simon, 1877 (Arachnida, Scorpiones)

Bastian-Jesper Klußmann-Fricke, S. W. Pomrehn & Christian S. Wirkner

Allgemeine & Spezielle Zoologie, Universität Rostock, Germany

It has long been known, that the prosomal ganglion of scorpions is supplied by an extremely dense meshwork of vessels bearing close resemblance to the vertebrate capillary system but its detailed pattern has never been described in greater detail. Lane et al. (1981) also described a vertebrate-like blood-brain barrier in the walls of the cerebral vasculature of a scorpion. Using MicroCT in combination with computer aided 3D-reconstruction we provide the first detailed description of the pattern of vessels in the prosomal ganglion of *Brotheas granulatus* (Scorpiones, Chactidae). The entire prosomal nervous system in scorpions is supplied by a network of vessels branching off the major arterial subsystems of the anterior aorta. The most prominent of these arteries are the nine transganglionic arteries, which run through the nerve mass along the body midline, branching terminally, i.e. below the neuropiles, into smaller vessels. These vessels reticulate into a dense network between the surrounding somata and the centrally located neuropile structures of the ganglion. We can demonstrate that a true capillarisation is present in the prosomal ganglion of scorpions. This means that afferent vessels which deliver hemolymph into the ganglion and efferent vessels which transport the hemolymph out of the ganglion are present. This would imply that the hemolymph never gets in direct contact with the tissue(s) of the nervous system which is additionally separated from the hemocoel by an outer layer of connective tissue (i.e. the neurilemma).

Student poster presentation - Ecology & Behavior:

Croatian Arachnological Society 'Narcis Damin' – CARS

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Even though the oldest written record about one arachnid species in Croatia dates to 1774, a small number of literature references on the subject have been published so far. Foreign researchers have done a majority of the work and the Croatian authors are considerably less represented. The number of Croatian authors first raised in the late 19th century, a time when Narcis Damin, the first dedicated Croatian arachnologist was active. Among numerous experts who conducted research on spiders of Croatia, only a few of them were Croatian until the end of the 20th century. With the rapid increase in the number of interested Croatian arachnologists, an idea of organizing into a arachnological society was born. Croatian arachnological society 'Narcis Damin' – CARS, named after the most famous Croatian arachnologist, was founded in May 2012. CARS is a non-profit, voluntary and independent civil society organization involved in promotion and development of arachnology in Croatia. The goals of the society are to further scientific research of all the arachnid orders and promote arachnology in Croatia, inventarization of Croatian arachnofauna, raising awareness of the importance of arachnids in ecosystems and to facilitate the collaboration between researchers and institutes on the international level.

Poster presentation - Systematics & Evolution:

The spider fauna of Osogovo Mountains, hot spot region in Central Balkan Peninsula

Marjan Komnenov

Macedonian Museum of Natural History, Skopje, Macedonia

In order to increase our arachnological knowledge of the eastern part of Macedonia, an investigation of the spider fauna of the Osogovo Mountains was conducted in the period of 2007 to 2010. The material was collected from 95 sites by pit-fall trapping and hand collecting.

In total 451 species from 203 genera and 38 families has been recorded. Eight species are new to science, two species are new to Europe, 14 species are new to the Balkan Peninsula and 145 species are new to the spider fauna of Macedonia. The number of registered species is high and represents about 70% of the Macedonian spiders. According to their current distribution the established species are classified into 31 zoogeographic categories, combined in 5 chorological complexes (Cosmopolitan, Holarctic, European, Mediterranean and Endemics). The composition of the Osogovo Mountains spider fauna shows Palearctic and European character. Endemics and Mediterranean species emphasize the local character of this fauna.

The faunistic diversity of 451 spider species shows that Osogovo Mountains are a territory of considerable species richness. This conclusion is supported by the existence of 38 endemic species. Such high diversity can be also reflection of the unique geographic position on Macedonia in the Balkan Peninsula as a transition zone between the European, Mediterranean and Central Asiatic spider fauna.

Oral presentation - Ecology:

The spider and harvestman fauna (Araneae, Opiliones) of undercooled scree slopes in the Austrian Alps – Significance and threat in times of climate change

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Undercooled scree slopes, also referred to as “ice cellars” or “cold holes”, are special habitat types, which have been documented in many places of the Eastern Alps but also occur in some Central European mountains outside of the Alps. Due to the formation of basal ice during the winter, the undercooled scree slopes emit cold streams of air during the warm season. The invertebrate fauna, including spiders, harvestmen, carabid beetles, staphylinid beetles and true bugs, of the interstitial was investigated with pitfall traps at 5 talus sites in the eastern Alps of Styria, Austria.

In total 116 spider and 13 harvestman species were determined. The most frequently recorded spider species is the linyphiid *Anguliphantes monticola*. It represents 11% of all spider specimens and shows a consistently high degree of dominance at all sites. Normally, this species occurs in subalpine forests, alpine grasslands and raised bogs. The results further indicated the occurrence of (i) a highly independent cold-adapted arachnid fauna with rare and endangered species (13 first records of spiders in the Styrian province, e.g. *Robertus lyrifer*, *Asthenargus paganus*, *Pardosa sordidata*, *Clubiona kulczynskii*), (ii) alpine species far below their known vertical distribution (e.g. *Oreonetides vaginatus*), (iii) the dominance of species with arcto-alpine and boreo-montane distribution ranges (e.g. *Robertus lyrifer*, *Diplocentria bidentata*, *D. rectangulata*, *Xysticus obscurus*) and (iv) a high percentage of endemic spiders and harvestmen (*Troglohyphantes noricus*, *T. subalpinus*, *T. tauriscus*, *T. thaleri*, *Cryphoeca lichenum lichenum*; *Paranemastoma bicuspidatum*, *Ischyropsalis kollari*, *Leiobunum subalpinum*). The space utilization of several invertebrate species in the investigation sites reflects the microclimatic conditions with a high degree of separation. In the site “Untertal” near Schladming the boreo-alpine erigonid spider *Diplocentria rectangulata* is strictly confined to the cold-air emission plots and is absent in the reference sites, as well as in the warm-air emission plots; a contrasting pattern is seen for the forest-spider *Cybaeus tetricus*.

In view of the fact that several species show a clear-cut niche separation with respect to temperature, the current climate warming poses a serious threat to these species communities. Further threats are timber harvest, the construction of farming and forestry roads, other mechanical impacts on the moss cover, e.g. by means of grazing or game feeding, and anthropogenic effects on hydrology such as the tapping of springs.

Poster presentation - Ecology & Biogeography:

Ground-living spiders in wooded habitats under influence of man on an island, Finland

Seppo Koponen

Zoological Museum, University of Turku, Finland

Spiders were collected by pitfall traps in the southwestern archipelago of Finland. Wooded study habitats on a small-sized (1.2 km²) island were: 1) natural open ash grove, 2) dense mixed grove (old overgrown wooded meadow), 3) wooded aspen pasture and 4) wooded meadow, both restored ten years earlier, 5) natural wooded meadow. Highest species and family numbers were found at the natural sites (1 and 5) and the lowest in the dense grove (site 2). Linyphiidae dominated, both in species and individual level, in the groves. Lycosidae were abundant on the wooded meadows, and Gnaphosidae on the wooded pasture. The highest faunal similarities were between the groves (70% species in common) and between the wooded meadows (64%). The lowest similarity was found between the dense grove (17%) and the ash grove (23%) with the aspen pasture. The sites 3 and 4 had, ten years after clearing, diverse spider faunas. The fauna at the site 4 resembled that on the corresponding natural site (5), showing success in the restoration. Altogether 84 species of spiders were caught. The proportion of Gnaphosidae species (16 species found) is high. Most species found in the study are common in southwestern Finland and many occur in the whole country. *Pardosa lugubris* was most dominant at three sites, *P. pullata* and *Diplostyla concolor* both at one site. Two species, *Enoplognatha thoracica* and *Micaria fulgens*, are included in the Finnish Red Data Book.

Oral presentation - Behavior:

Web architecture variability of orb-weaver spiders manipulated by polysphinctine parasitoids

Stanislav Korenko

Department of Agroecology and Biometeorology, Faculty of Agrobiological, Food and Natural Resources, Czech University of Life Sciences Prague, Kamýcká 129, 165 21 Prague 6, Suchbát, Czech Republic

The group of polysphinctine parasitoid wasps, which are exclusively associated with orb weaver spiders, induce variable changes in the web architecture of their hosts. These induced changes serve as a protection against predators and environment during parasitoid pupa stage. Induced web architecture changes are mostly species specific, but some of them occurs in a large group of spider hosts and they seem to be universal within group. Observation of the induced web architectures revealed that manipulated orb weaver spiders are forced (1) to build three-dimensional structure, (2) to reduce the sticky threads, (3) to reinforce threads and (4) to use stabilimentum as camouflage. Published and unpublished data have been summarised in this study. Two main forms of orb weaver manipulations induced by polysphinctine larvae have been distinguished. Spiders belonging to genera *Araneus*, *Aran-iella*, *Argiope*, *Leucauge* and *Nephila* were forced to completely change their two-dimensional web to three-dimensional web. Spiders belonging to genera *Alocyclosa*, *Cyclosa*, *Leucauge* and *Mangora* modified only particular parts of the web and the general two-dimensionality of web had been remaining.

Student poster presentation - Ecology & Behavior:

***Oxyopes lineatipes* (C. L. Koch, 1847) (Araneae, Oxyopidae): a common spider in physic nut plantation and their tolerance to a potential acaricide**

Ondřej Košulič¹ & P. Vichitbandha¹

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Spiders are among the most abundant predators of insects of terrestrial ecosystems. In agroecosystems spiders play an important role as the generalist pest control agent. In order to investigate the potential use of the new natural product in pest control in physic nut plantation, the experiments were separated to two parts. Firstly, we performed spider faunistic investigation of physic nut plantation in an experimental farm of Kasetsart University which is located in central Thailand (Kampaeng Saen campus, Nakhon Pathom province). Spiders were collected by two methods – pitfall traps and sweeping of herb vegetation between 1.5 month period in November–December 2011. In total 650 individuals were collected, and identified to 19 families level. Then, we selected the most abundant representative of every spider families. As a result, *Oxyopes lineatipes* (C. L. Koch, 1847) was selected for next experimental step as a nontarget organism model, since it was the dominant species found in physic nut plantation. Secondly, the plant extracts of *Embelia ribes* Burm. f. (Myrsinaceae) leaf by fixed-bed contacting method with hexane was evaluated together with two commercial pesticides; Amidine (a synthetic acaricide) and Azadirachtin (another natural product). The extraction was dissolved into four concentration levels (0.616% w/v; 1.907% w/v; 2.748% w/v and 3.5% w/v), with 10% ethyl alcohol. Commercial pesticides, Amidine (20% w/v EC) and Azadirachtin (0.1% w/v SN), were dissolved in water with 1 : 1000 ratio. Water and 10% ethanol were served as control solution. Gender, size and condition of spiders were noted or measured, and will be used to determine the effect of spider stage on ability to survive in above test conditions for discussion. Within 2 hours in laboratory studies, 83% of *O. lineatipes* were poisoned by Amidine, but neither by 0.616% *E. ribes* plant extracts, Azadirachtin nor water. However, the higher concentrations of *E. ribes* plant extract resulted in higher mortality of *O. lineatipes* than 50% of total trials but within the longer period of time; 116 hours, 103 hours and 10 hours, respectively. All of *O. lineatipes* died after contacted with Amidine for 21 hours, but some spiders still tolerated and were alive in all other treatments at the end of an experiment (116 hours). Thus, we should reduce the usage of commercial synthetic pesticides and carefully evaluate the proper concentration of the new natural product in pest control in order to reduce the adverse effect on non-target organism. The more experiments were repeated and LC50 will be presented in our next experiment.

This research was supported by grant IGA MENDELU Brno no. TP4/2012 and no. IP3/2012 from Czech Republic and KURDI grant and FLAS grant from Thailand.

Student poster presentation - Ecology & Behavior:

Ecological evaluation of spiders of the vineyard terraces in the condition of South Moravia (Czech Republic)

Ondřej Košulič & Vladimír Hula

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This study deals with the assessment of spiders diversity, abundance and environment factors which affect spiders of the vineyard terraces at the most. Among main factors that are analyzed belong management system, environment heterogeneity and microbiotop features. These factors will be assessed on the base of species diversity and abundance of spiders. Experiment has been launched in 2011. **There had been chosen 4 localities situated in the pan-nonian region of southern Moravia (Czech Republic).** Examined vineyards are under integrated pest management, one of the vineyards is under organic farming. Spiders are being collected by three methods – pitfall traps, collecting of land snail shells, and day and night sweeping.

In the examined localities we found 144 species belonging to 24 families. 21 species listed on the Red List of Invertebrates of the Czech Republic were recorded (CR, EN, VU categories). To the most significant findings belong occurrence of *Cheiracanthium pennyi* O. P.-Cambridge 1873, *Chieracanthium montanum* L. Koch, 1877, *Dysdera hungarica* Kulczynski 1897, *Tibellus macellus* Simon 1875, *Alopecosa solitaria* (Hermann, 1877), *Euryopis saukeya* Levi, 1951 and *Haplodrassus minor* (O. P.-Cambridge 1879). To the interesting finding belongs record of the steppe habitat bioindicator *Eresus kollari* Rossi, 1846 on the vineyard terraces in the region of Hodonin. The evaluation of environment factors shows that the presence of the spiders is affected by the microclimatic conditions first of all (vegetation structure, presence of the disturbed grass turf etc.) The important feature is also the heterogeneity of the surrounding environment and the presence of near situated steppe habitats from where the spiders can spread by ballooning and other ways. **In this study we found that artificial habitats such as vineyard terraces, the importance of which was found out, are certain to be the perfect habitats for a wide spectrum of xerothermic spider species of the Czech Republic.** These mentioned species need bare vegetation structure with plenty of the exposed soil surface. These required microhabitat conditions deteriorate by gradual succession and ingrowing of the habitat. Therefore, it is more than desirable to maintain some kind of management at the slope of terraces to keep these important features of microhabitat (e.g. mowing, terrain disturbing).

This study has been supported by grant IGA MENDELU Brno no. IP3/2012.

Student poster presentation - Ecology & Behavior:

Diversity of Pseudoscorpions (Arachnida: Pseudoscorpiones) of Europe

Jana Kotrbová, Zdeněk Škopek, František Štáhlavský

Department of Zoology, Faculty of Sciences, Charles University, Prague, Czech Republic

Pseudoscorpions fauna is the best known in Europe. This is mainly due to long-term tradition in the research of this arachnid order at this continent. This fact together with large heterogeneity of habitats and specific historical events (mainly during the ice ages) cause that this small continent is the most species rich area at this moment. There is noted more than 755 species in Europe belonging to 14 families. The most numerous family is Neobisiidae (12 genus, app. 401 species), following families Chthoniidae (5 genus, app. 214 species), Chernetidae (8 genus, 49 species), Cheliferidae (9 genus, 37 species), Syarinidae (5 genus, 13 species), Olpiidae (3 genus, 10 species), Garypinidae (3 genus, 5 species), Larcidae (1 genus, 6 species), Atemnidae (2 genus, 5 species), Cheiridiidae (2 genus, 3 species), Geogarypidae (1 genus, 3 species), Withiidae (1 genus, 4 species), Garypidae (1 genus, 3 species) and Bochicidae (2 genus, 2 species). These groups display different patterns of their distribution. Whereas the families Neobisiidae, Chthoniidae, Cheliferidae, Cheiridiidae and Chernetidae occur almost all over the whole Europe, the remaining families are noted mainly from southern areas of Europe. We summarize and compare the distribution of the pseudoscorpions families in Europe. Simultaneously we try to detect the main factors that influenced the recent distribution and the diversity of this order in Europe. The most important are the abiotic factors like temperature, humidity and geology. On the other hand the biotic factors, as a forestry and anthropomorphic influence, may be also important.

Student oral presentation - Systematics & Evolution:

A phylogeographic and ecological dissection of the recent range expansion of the European wasp spider *Argiope bruennichi* – Consequence of climate change?

Henrik Krehenwinkel & Diethard Tautz

Max Planck Institute for Evolutionary Biology, Evolutionary Genetics, Plön, Germany

The recent poleward range expansion of various species is commonly attributed to global warming. However, the role of genetic changes in the success of such invasions remains to be discussed. We are addressing this question by studying the range expansion of a spider species in Europe. Originally inhabiting the Mediterranean and few warm regions in Central Europe, the thermophilic wasp spider (*Argiope bruennichi*) has greatly expanded its range in the past century. Today, it can be found as far north as Finland.

In order to track the genetic background of the range expansion, we initially followed a phylogeographic approach. We genotyped 2000 specimens from all over the Palearctic for mitochondrial DNA, as well as a newly developed set of nuclear SNPs and microsatellites. Next to the contemporary specimens, we utilized about 500 historical ones from natural history collections. These samples allowed to trace genetic changes, associated with the range expansion in real time. Along with the phylogeographic work, we gathered a set of morphological measurements of the contemporary and historical spiders. Last we conducted experiments on thermal tolerance and preference of native and invasive spider populations and set up a reciprocal transplant experiment.

We find strong signatures of increasing admixture of different genetic lineages in the invasive Continental European range of the species. In addition, our morphological and ecological analyses reveal potentially adaptive changes in Northern European spider populations. Our results thus indicate that genetic admixture has led to the emergence of a differentially adapted spider lineage with the capability to invade cold, continental climate zones.

DNA barcoding symposium:

Towards permanent preservation of a fauna: deeply frozen and barcoded Central European spiders

Matjaž Kuntner^{1, 2, 3}, Klemen Čandek¹, Matjaž Gregorič¹, Ren-Chung Cheng¹, Nina Vidergar¹, Rok Kostanjšek⁴, Jonathan Coddington², Amy Driskell², Holger Frick^{5, 6}, Ingi Agnarsson^{2, 7}, Christian Kropf⁶

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Our international pilot project focuses on a new method of permanent preservation of spider tissue and their genetic material (DNA) through the protocols of the Smithsonian Institution's Global Genome Initiative. Through focused field work and expert identification we are targeting a quarter of the known spider diversity shared between Slovenia and Switzerland, roughly 300 species. Vouchers of these species are being identified, photographed, deeply frozen, extracted for DNA, and barcoded for COI, and these data will be freely disseminated to facilitate identification and research. The deposited vouchers, their deeply frozen tissues and DNA, and genetic data will represent a unique repository of current biodiversity, permanently available to future generations. Our targeted work represents a seed project, which aims to be expanded to include many researchers across Europe and targeting all spiders.

Student oral presentation - Ecology & Behavior:

The function of the cephalic hump and pits in males of the dwarf spider *Oedothorax apicatus* (Linyphiidae: Erigoninae)

Katrin Kunz & Gabriele Uhl

Department General Zoology and Systematics, University of Greifswald, Germany

The bizarre cephalic modifications that exist in many male dwarf spiders (Linyphiidae, Erigoninae) offer an opportunity to investigate the evolution of secondary sexual traits. In our focal species *Oedothorax apicatus* the cephalic structures (hump + pits) are connected to glandular tissue that produces secretions. Behavioural observations revealed that during courtship and/or copulation females are in contact with these structures, salivate on the structures and ingest secretions.

We investigated the influence of the cephalic secretions on different stages of a mating bout (courtship, copulation probability, copulation behaviour, and oviposition). We compared these parameters between different experimental groups of males that were able to offer secretions from their hump and pits, or whose cephalic hump and/or pits were experimentally covered. Males were allowed to use both pedipalps for one insertion each.

Males of different groups did not differ in courtship and mating behaviour, neither during first nor second insertion. Females accepted males for copulation irrespective of male treatment group. During the first insertion, females did not behave significantly different towards male types in any of the parameters recorded. The duration of the second insertion, however, was significantly reduced for males with a covered hump. Overall, females were more likely to salivate if they were offered secretions. Females terminated copulation with higher probability if they did not receive secretions. In conclusion, our data suggest that the cephalic secretions in *O. apicatus* males serve as a male mating effort.

Poster presentation - Behavior:

Predatory behaviour of two wolf spider species (Araneae, Lycosidae) on soybean pests in Uruguay

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Wolf spiders are one of the most representative groups of natural enemies on agroecosystems. In the case of soybean crops in Uruguay this group shows a marked dominance, with near the 70% of the abundance of natural enemies. In spite of this, the potential use of this group in Uruguayan crops has been underestimated and to the date there are no studies focused on the incidence of this group on soybean pests. In the present study we analyzed the predatory behaviour of two wolf spider species: *Lycosa poliostrata* and *Lycosa bivittata* against two common pests on Uruguayan soybean crops: ants (*Acromyrmex* sp) and crickets (*Gryllus* sp). The predatory behaviour of both species was analyzed in terms of the acceptance rate and immobilization time under laboratory conditions. For the first experiment 20 spiders of each specimens were used, an 10 for the second one. In spite of the different morphology of the preys the acceptance rate was similar for all cases with an average consumption of 73% in ants and 79% in crickets in *L. bivittata* and 75% and 80% on *L. poliostrata* for the same preys. The immobilization time was not significantly different for both preys, in the case of *L. bivittata* (ants: $4.8 \pm 3.08s$, crickets: $18.6 \pm 3.08s$, $t=0.34$, $p=0.28$). Crickets showed a higher immobilization time on the case of *L. poliostrata* related to ants (ants: $20.9 \pm 4.8s$, crickets: $39.4 \pm 10.9s$ $t=3.4$, $p<0.05$), this could be caused by the higher size of this prey. The results obtained in this study indicate that the potential use of these spiders as biological control agents can be facilitated by their predatory versatility, being able to consume prey with different defensive characteristics and morphology on similar proportions. Our future research will focus on determinate additional attributes of both species as natural enemies like the functional response.

Financial support: Agencia Nacional de Investigación e Innovación (ANII)

Student poster presentation - Ecology & Behavior:

Evaluating prey luring performance of cribellate webs built by nocturnal *Psechrus sinensis*

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Body colorations play an important role in predator-prey dynamics. Recent studies show that in some diurnal orb web spiders conspicuous body coloration can visually lure prey. In nocturnal system, the bright body color patterns of some spiders had been empirically demonstrated to function to visually lure prey. *Psechrus sinensis* is a nocturnal cribellate spider which has a dark body with bright ventral line, which concealed during daytime but exposed during nighttime. The webs constructed by *Psechrus* spiders are composed of cribellate silks and are visually very conspicuous. I wonder whether such webs could function to visually lure prey during the night and I conducted a field manipulative study on *P. sinensis* to test this hypothesis. There were four treatments in this study to evaluate prey luring performance of *P. sinensis* and its web. I manipulated the presence of *P. sinensis* and changed the color signal of webs by applying carbon powder. Infra-red video cameras were used to monitor the prey interception rates of *P. sinensis* webs in four treatments during nighttime (08:00 pm–04:00 am). Preliminary results show that the conspicuous webs of the nocturnal spider *P. sinensis* can lure prey, and I predict that both the bright body coloration and cribellate webs function as visually lure to attract insects.

Barcoding of spiders: from Switzerland to Europe

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The Swiss project

The Swiss National Science Foundation granted a three year PhD Project to test the suitability of DNA barcoding for spiders. We plan to address four different case studies to test the barcoding methods proposed by Hebert et al. 2003 and in case of insufficient results, we will try to develop and extend the CO1 barcoding method either by designing genus specific primers or using additional marker-genes. In our case study 1, we want to test if barcodes reliably reflect species boundaries in closely related spider species, or even may help to resolve long-lasting taxonomic problems. In case study 2, we want to test if barcodes recover ongoing speciation processes in morphologically more or less distinct and geographically isolated populations and subspecies or even detect cryptic species. Case study 3 tries to get information about the status of Holarctic species of being introduced to one continent or being native to both. In case study 4, we test for intraspecific variation and isolation by distance in widespread, but not very mobile species.

Additionally we aim for a large scale sampling within Europe as the geographical scale of sampling has an enormous effect on intraspecific variation and plays a major role in species delimitation.

Our aim is to obtain identification rates at global scale and to detect different processes determining the composition of regional species assemblages and global clades. If we can successfully apply barcoding on spiders in our four case studies, we will furthermore try to identify females and juveniles, which nowadays cannot, or only with great difficulties, be determined to species- or even genus-level.

The European level

Currently, seven national or supranational projects exist in Europe covering the Alpine area (Slovenia to Switzerland), Bulgaria, Germany, Russia, Switzerland, the Netherlands, and Turkey. Some projects focus only on spiders, whereas others have a much larger taxonomic scope. Most projects are clearly nationally oriented and this creates some demand for coordination of projects and availability of results. Within the website of Spiders of Europe (www.araneae.unibe.ch) we offer a module Barcoding Spiders of Europe, where we shortly explain barcoding, present the current projects, mirror the available barcodes for European spiders from the BOLD database, and offer cooperation possibilities for arachnologists with our project.

Oral presentation - Behavior:

Sexual conflict: Cause and effect of spider genital emasculation

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Sexual conflict can lead to antagonistic coevolution in which adaptations in each sex select for counter-adaptations in the other. Female sexual cannibalism and the associated male behaviors are good examples of antagonistic coevolution driven by sexual conflict. In many highly sexually cannibalistic species, males adopt a monogynous mating strategy, typically mating with one or two females (spiders have paired genitals). Nevertheless, polyandry may continue to serve interests of females. To counter female polyandry, males have evolved mechanisms that reduce female remating and/or increase the quantity of sperm transferred thereby increasing male paternity, e.g. mate guarding, male sacrifice to a cannibalistic female and genital mutilation resulting in mating plugs. In mono/bigynous and highly sexually cannibalistic spiders, male genital mutilation, the breakage of sperm-transferring organ within female genitals, is common, and typically characterized by the breakage of the tip of the palp. However, some spider species employ extreme genital mutilation or the 'eunuch phenomenon', where males emasculate their entire palp(s) during copulation. Genital emasculation seems to be maladaptive since it renders the male sterile. However, recently proposed hypotheses nevertheless explain the spider eunuch behavior as adaptive, including mating-plug hypothesis, better-fighter hypothesis, gloves-off hypothesis, remote-copulation hypothesis and increased-fertilization hypothesis. In this presentation, we review recent studies and the evidence for and against these hypotheses.

Student poster presentation - Ecology & Behavior:

The effects of wind on microstructures of MA silks produced by *Cyclosa mulmeinensis*

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In the production process of a major mapullate (MA) silk, a series of post secretion processing such as ion exchange, dehydration and rearrangement of secondary structures occurs after the spidroin protein is secreted in silk glands. Such post secretion processing may play important roles in achieving the superior mechanical properties of MA silks. Previous studies indicated that the environmental wind disturbances may cause *Cyclosa mulmeinensis* spiders to enhance the strength and toughness of their MA silk without adjusting chemical properties of silks. Such phenomenon implies that *C. mulmeinensis* spiders may apply post secretion processing during silk spinning then alter the mechanical properties of MA silks. In this study, *C. mulmeinensis* spiders will be subjected to different wind disturbance level in the laboratory for 7 days and then the microstructures of MA silks will be measured. The microstructural characteristics examined will include the level of crystallization and the volumes/distribution of crystal structures. Besides, when MA silk is subjected to supercontraction the effects of post secretion processing on silk can be eliminated. Therefore, I will compare the mechanical properties of normal MA silks to those of silks under saturated humidity condition to investigate whether *C. mulmeinensis* spiders are able to adjust their mechanical properties of MA silks through post-secretion processing.

Student poster presentation - Ecology & Behavior:

The function of ventral body coloration of the ladder-web spider *Herennia multipuncta*

HsienChun Liao

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In order to escape with little or no damage, many animals exhibit colors, structures, and behaviors that can divert a predator's attention. Many orb-web spiders build asymmetrical webs, and the ladder webs are extreme examples of modified webs built by several spider species. *Herennia* species build highly elongated webs that are as much as seven times taller than wide and are attached against tree trunks. Such web-building behavior allows spiders to maximize web area and foraging intake when they are forced to build webs in space-limited microhabitats. The dorsal side of *Herennia* is dark gray with black spots, while the ventral side is brightly orange. *Herennia* usually rests on the upper part of the ladder-web with its brightly ventrum concealed. Comparing to other diurnal and nocturnal web spiders building aerial orb webs and attracting prey with visual lures, *Herennia* spp. spiders place the ladder web against the tree trunk with cryptic dorsum exposed and conspicuous ventrum concealed. I hypothesize that the brightly ventrum may function to startle or intimidate predators. I will use digital video cameras to record the potential deimatic behaviors of *Herennia multipuncta* and their interactions with prey and predators day and night. I will then manipulate the colors of this spider's conspicuous ventrum to evaluate if such body color function to startle the predators.

Oral presentation - Behavior:

The role conspicuous body coloration plays in courtship of nocturnal fishing spiders

Tai-Shen Lin & I-Min Tso

Department of Life Science, Tunghai University, TaiChung City, Taiwan

Previous studies investigating the function of conspicuous body coloration in spiders focus on orb-weaving spiders and the results show that such signal plays an important role in attracting prey. So far, few studies had examined the role of body coloration of nocturnal wandering spiders. The nocturnal fishing spider *Dolomedes raptor* exhibits sexual color dimorphism. Female has white hairs on metatarsus of first two pairs of legs and male has white stripes on both sides of cephalothorax. To realize the function of conspicuous coloration in male *D. raptor*, we first manipulated the color signal of male spiders by using dummies. In the field the dummies with white stripes attracted significantly more female *D. raptor* than those without. The results of a field surveys show that males in the field exhibited variations in their white stripe brightness. In a laboratory experiment, whether males exhibited conspicuous white stripes or not significantly affected the acceptability of females. The results of a nutrition manipulation showed that males receiving high nutrition intake exhibited brighter white stripes and matured faster. These results demonstrate that conspicuous body coloration of male *D. raptor* seems to serve as a species recognition signal and perhaps a male quality indicator. Therefore, visual signal also may play an important role in the courtship of nocturnal spiders.

Student oral presentation - Systematics & Evolution:

Deconstruction by Reconstruction – a new approach to study complex sperm conjugation and sperm morphology in spiders (Araneae)

Elisabeth Lipke & Peter Michalik

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Sperm competition leads to a variety of morphological adaptations and cooperation strategies. One cooperation strategy is sperm conjugation, a process in which two or more sperm physically unite for motility or translocation through the female reproductive tract. Two different types of conjugation can be distinguished – primary (all sperm cells derive from a common spermatogonium) and secondary (cluster of individual sperm cells which do not have a common origin). One group well known for its different types of sperm conjugations are spiders. Primary (synspermia) and secondary (coenospermia) conjugations were described based on electron microscopy studies. However, detailed analyses of the formation and size of the different cell components are still lacking. Thus, we followed a new approach and performed the first computer-based 3D sperm reconstruction, based on serial ultrathin sections. With this methodological approach we are able to provide detailed morphometric data of spider sperm making it a useful tool for future analyses of complex sperm structures. As example we studied the primary sperm conjugation of a Caponiidae species. The synspermia of *Caponina alegre* consists of four fused spermatozoa implying an early origin of this trait within ecribellate Haplogynae. The spermatozoa are extremely long (130 μm) representing the largest spider sperm known so far (average for spider is around 30 μm). Our findings reveal enormous size differences of sperm across spiders and demonstrate the necessity of this new methodological approach.

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Type 4: Functional response of myrmecophagous spiders

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Functional response describes the relationship between the efficiency of prey capture and prey density. Four main types of functional response have been distinguished. The Type 4 functional response known only from a few predator-prey systems is characterized by a decrease in hunting frequency at high prey densities. The decrease is attributed to, for example, confusion or disturbance of a predator. We expected such a response to occur in ant-eating (myrmecophagous) predators; therefore, we performed experiments using three spider species and three ant species differing in aggression. We proposed a new mathematical model and compared its performance with three known models. We observed the type 4 response. The newly proposed model fitted the observed data best. Parameters estimated from this model were used to quantify the degree of prey capture adaptations and prey defence. In addition, we compared the survival of three spider species and used odds ratio to quantify their defensive abilities. We found out that of all the three species, specialised *Zodarion* spiders hunted ants with the highest efficiency and survival rate. These spiders are adapted to high densities of ants. *Xysticus* spiders captured ants with lower efficiency and the lowest survival rate, indicating that these spiders are adapted to the capture of solitary ant workers. *Pardosa* spiders did not capture ants but had a high survival rate. Thus *Pardosa* have evolved means to avoid contacts with ants. Defence offered by prey produced the type 4 functional response – the level of aggression was negatively related to the efficiency of prey capture. Parameters from the new functional response model of Type 4 allowed us to quantify the level of behavioural adaptations for myrmecophagous predators and inhibition by prey.

Student oral presentation - Ecology & Behavior:

Function of body color of Asian crab spiders

Yun-Jia Lo

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Crab spiders are sit-and-wait predators which can change body colors depending on the color of flowers they sit on. Results of previous studies show that the body color of European crab spiders match that of the flowers, rendering them cryptic to pollinator prey. On the other hand, the body of white Australian crab spiders can reflect UV-light and behavioral studies demonstrate that spiders are attractive to bees. However, the potential functions of body color of Asian crab spiders are still not clear. In addition, recent researches reported that the bright body spots of some nocturnal orb web spiders were attractive to nocturnal prey. In this study, I investigate the functions of body color of Asian crab spiders, especially in the nocturnal context. Firstly I surveyed the temporal activity patterns of both *Thomisus labefactus* and *Misumenops tricuspidatus* crab spiders to realize the temporal hunting pattern of crab spiders. I found that both crab spiders mainly hunted at nighttime, and the number and biomass of their nocturnal prey were significantly higher than those of diurnal prey. Secondly, I measured reflectance spectra of white and yellow morph of the two spider species and white and yellow flowers they sitted, then calculated color contrasts to realize how these spider-flower combinations were viewed from potential diurnal and nocturnal prey. The results indicate that diurnal bee and nocturnal moth can discriminate spiders on flowers, no matter what color combination. Next, I will perform field experiments by placing white and yellow spider dummies on white or yellow flower petals, and use video cameras to monitor the response of prey to these dummies at day and night. Hopefully, results of this field experiment can determine whether body colors of Asian crab spiders function to conceal themselves or to attract prey under different light conditions.

A synopsis of the genus *Zyuzicosa* Logunov, 2010 (Araneae, Lycosidae)

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Based on newly studied museum materials, an updated synopsis of the genus *Zyuzicosa* Logunov, 2010 (Araneae, Lycosidae) is provided. The genus *Zyuzicosa* belongs to the subfamily Lycosinae (close to *Lycosa* Latreille, 1804) and currently includes 11 species of large burrowing species: *Z. afghana* (Roewer, 1960) (♀); *Z. baisunica* Logunov, 2010 (♂♀); *Z. fulviventris* (Kroneberg, 1875) (♂♀); *Z. gigantea* Logunov, 2010 (♂); *Z. laetabunda* (Spassky, 1941) (♂♀); *Z. nenjukovi* (Spassky, 1952) (♂♀); *Z. turlanica* Logunov, 2010 (♂♀); and four species from Middle Asia that are described as new to science. The genus seems to be restricted to the desert regions of Central Asia, from southern Kazakhstan in the north to northern Afghanistan in the south. A synopsis of all the 11 species of *Zyuzicosa* is provided, with a key to species, distributional maps and the description of four new species names. The males of *Z. laetabunda* and *Z. nenjukovi* are described for the first time. A new combination is proposed: *Zyuzicosa nenjukovi* (Spassky, 1952), comb. n. (ex. *Tarentula* n.). Two species names are synonymised: *Z. zeravshanica* Logunov, 2010 with *Z. fulviventris* (Kroneberg, 1875), and *Z. uzbekistanica* Logunov, 2010 with *Z. laetabunda* (Spassky, 1941). New locality records are provided for *Z. fulviventris*, *Z. laetabunda*, *Z. nenjukovi* and *Z. turlanica*. Three species of *Zyuzicosa* (viz., *Z. baisunica*, *Z. fulviventris* and *Z. turlanica*) exhibit a pronounced sexual dimorphism, having typical dwarf males that are less than half the size of corresponding females.

Student oral presentation - Ecology & Behavior:

The nocturnal prey-attracting strategy of the gladiator spider *Deinopis* sp. (Araneae: Deinopidae)

Yueh-Sheng Loong

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The web-spinning spiders are traditionally considered as sit-and-wait predators, but recent studies showed that some can attract prey by using visual signals such as decorations of their capture webs. However, relevant studies mainly focused on diurnal spiders. The light environment at night is very different from that during the day. Whether the webs of nocturnal spiders can attract prey at night remains unknown. This study investigates whether the capture webs of the nocturnal net-casting spiders *Deinopis* sp. (Araneae: Deinopidae) can attract flying prey by the conspicuous visual signals. I measured the reflectance spectra of the capture webs and body of *Deinopis* sp. and calculated the nocturnal color contrasts of them when viewed by moths against the background. The results showed that the nocturnal color contrast of the webs was two times higher than that of the body, suggesting that the capture webs were visually more conspicuous than the body color at night. To test the hypothesis that the capture webs are attractive to prey, I will perform field manipulative study and the visual signals of the capture webs will be altered by spreading carbon powder on them. Behaviors of the spiders will be recorded by infra-red video cameras and prey-attacking rates of the experimental (signal altered) and the control (signal unaltered) groups will be compared. Results of my study can potentially help demonstrate that nocturnal spiders also use conspicuous web structures to visually lure prey.

Functional response of *Philodromus* (Araneae: Philodromidae) at low temperatures

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Pear *Psylla* is a small sap-feeding insect, which is considered a key-pest of pear trees. The winter *Psylla* generation invades pear trees in late winter when most natural enemies are still not active. But philodromid spiders are active even during winter. They are diurnal wanderers that overwinter in immature stage. The spiders are abundant in many orchards where they are important predators of pests. Our aim in this study was to estimate their biocontrol potential by studying their functional response on *Psylla*.

Philodromus spiders and psyllids were collected by beating pear trees in orchards in Brno, and maintained in laboratory at low temperature before the experiment. Different densities of adult *Psylla* individuals (1, 3, 6, 10, 20) were offered to starved standardized immature *Philodromus* individuals. The spiders were enclosed singly in a Petri dish (50 mm diameter). Five replicates were used for each *Psylla* density. The experiments were performed at five different temperatures: -2, 0, 5, 10, and 15° C, in order to evaluate the predation rate of *Philodromus* during the course of winter and early spring. The experiment lasted three days. The killed prey was replaced regularly over the three days.

Philodromus spiders showed the functional response of Type II: the number of captured prey increased as *Psylla* density increased. *Philodromus* spiders captured on average two *Psylla* individuals even at zero temperature. With increasing temperature the predation efficiency and the number of capture prey increased.

Philodromus spiders thus have a high potential for reducing *Psylla* densities in late winter and spring.

Student poster presentation - Systematics & Evolution:

Apulian spiders (Araneae): a little known fauna. Summary of current knowledge and new reports

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Apulia is one of the less explored Italian regions from the araneological point of view. On the basis of existing literature, we can estimate that about 280 species of spiders have been reported for this region. The data come mostly from occasional collections of araneologists in the region, while very few are studies extended in time and space to deepen knowledge of Apulian araneofauna. The largest work dedicated to the spiders of the region dates back to 1953, by Caporiacco. It reports data on more than 200 taxa, and is based on material collected by various zoologists. Since then only sporadic contributions, limited to small areas of the region or of biospeleological character, have been published on Apulian araneofauna.

Periodic sampling conducted since 2000 in widely extended agroecosystems of the region, and in natural ecosystems with low level of human activity, allowed us to collect several thousand specimens, including some of particular faunistic interest. The collections were performed by means of strips of cardboard placed around the trunks of trees, pitfall traps containing a liquid to preserve the specimens captured, by frapping, and occasionally by sight.

The identification of the material collected allows us to report species of spider new to European fauna: *Pelecopsis digitulus* Bosmans and Abrous (Linyphiidae) which was recently described from samples of North Africa. Five species new to Italian territory were also found: *Harpactea nausicaae* Brignoli (Dysderidae), reported in Greece and Macedonia, *Trichoncus auritus* (L. Koch) (Linyphiidae), present in southeastern Europe, *Habrocestum graecum* Dalmas (Salticidae), present in Greece, *Maimuna vestita* (C. L. Koch) (Agelenidae), known in some countries of the eastern Mediterranean Basin and *Zodarion gracilitibiale* Denis (Zodariidae), known in southern France.

Sixty-five species of spiders belonging to a total of 15 families were identified as new for Apulian fauna. Gnaphosidae, Linyphiidae, Philodromidae, Salticidae, Theridiidae and Zodariidae were the most represented families in the investigated habitats. Among the most interesting reports, several rare species, such as *Mecopisthes nicaeensis* (Simon), *Hypsocephalus paulae* (Simon), *Syedra nigrotibialis* (Simon) and *Walckenaeria plumata* (Millidge), all belonging to the family Linyphiidae, can be mentioned.

Survey of spiders (Araneae) in some natural areas of Apulia (Italy)

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Researches on spiders so far conducted in Apulia were mainly restricted to species living in caves or occasionally collected in the region, and in most cases date back to the last century. The aim of the present study was to characterise the araneofauna of several different sites in Apulia considered to be representative of as many habitats as possible of natural interest. Between August 2004 and July 2005, monthly samplings were carried out using pitfall traps for the collection of wandering spiders on the ground, and frapping for sampling spiders living on trees and shrubs. The spiders were collected at six sites: 1) a holm oak forest and 2) a coppice with a predominance of downy oak both in the Regional Natural Reserve Pianelle Forest; 3) an area of transition between an oak forest and crops of clover and oats in the Barsento Protection Oasis; 4) a pine forest mixed with eucalyptus trees on the bank of the Locone dam; 5) a pine forest of Aleppo pine and 6) a pseudo-steppe area both in the Alta Murgia National Park.

A total of 3096 spiders belonging to 27 families, 103 genera and 129 species were collected. For each sampling area the specific araneofauna was studied, highlighting the dominant species, uncommon or rare ones, as well as species found only in a specific site and associated with a specific habitat. Simpson's dominance and diversity indexes and Shannon-Wiener's diversity index were calculated for each sampling site, both for the total number of species and for the genera collected. A comparison between the data obtained with the two different sampling media showed that about 81% of the spiders were collected by frapping, with a preponderance of web weaver spiders. Wandering spiders belonging to the genera *Anyphaena* (Anyphaenidae), *Clubiona* (Clubionidae) and *Cheiracanthium* (Miturgidae) and all those belonging to the families Oxyopidae, Sparassidae, Uloboridae and Pholcidae were collected exclusively by frapping. Many Lycosidae, Thomisidae and Gnaphosidae, and all specimens belonging to the families Amaurobiidae, Atypidae, Dysderidae, Eresidae, Hahaniidae, Liocranidae, Nemesiidae, Scytodidae and Zodariidae were collected using pitfall traps. The slight variations in the Shannon-Wiener and Simpson indices between the investigated sites were not statistically significant.

Oral presentation - Behavior:

Dispersal in a colonial spider undergoing rapid range expansion

Yael Lubin

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Colonizing species have high dispersal ability and can establish successfully in new locations. These traits occur in many group-living species, suggesting a positive interaction between group dynamics and dispersal ability. Theory suggests, however, that group benefits will reduce dispersal tendencies. Dispersal decisions should be influenced also by environmental and demographic factors and by the condition of individuals in the group. *Cyrtophora citricola* (Araneidae) is an Old World colonial species that has colonized many locations in the New World. In Israel, it is undergoing range expansion, possibly from two sources. We investigated dispersal tendency of juveniles and adults under different experimental conditions. In a wind tunnel, juveniles and males released bridge threads with higher frequency than females. Under semi-natural conditions, young dispersed with greater frequency than adult females, but settling was enhanced by the presence of web cues, prey or prey remains. Colonies found in locations with high food availability were larger and had higher reproductive potential than where food was scarce. Preliminary data show little population genetic structuring at the local level. The results suggest high mobility of juveniles and males, together with a reproductive benefit of group living.

Student poster presentation - Ecology & Behavior:

Intra- and interspecific olfactory discrimination in *Argiope blanda* and *Argiope argentata* (Araneae: Araneidae)

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Once male spiders are mature, they leave their web in search for mates. Males are strongly selected to find virgin females if there is first male sperm precedence or if plugs are applied during mating that impede or prevent subsequent matings. Male mate choice has to be especially pronounced if males run the risk of being cannibalized. From only few species we know that males are attracted by volatile compounds emitted from the female silk or cuticle. In *Argiope bruennichi* virgin females were shown to emit a trimethyl methylcitrate from their webs whereas subadult and mated females did not emit the citrate. Males are attracted to low levels of synthetic citrate in the field and start courtship behaviour when in contact (Chinta et al. 2010).

We investigated if males of two Costa Rican *Argiope* species (*Argiope argentata* and *Argiope blanda*) likewise prefer virgin females over other reproductive stages and if they discriminate conspecific from congeneric females. We performed choice situations where the males were confronted with two silk threads from webs of subadult, virgin and mated females of the same or different species. To complement our behavioural observations, we analyzed silk extracts of both species and of all reproductive stages for the presence of trimethyl citrate or other candidate pheromones using gas chromatography. Our data will help to clarify if *A. argentata* and *A. blanda* males prefer virgin females as was shown for *A. bruennichi* (Schulte et al. 2010) and whether there are species specific recognition cues.

Student oral presentation - Systematics & Evolution:

The social spider environment: *Anelosimus* vs. *Stegodyphus* habitat niche in relation to convergent evolution of sociality

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Social spiders are remarkable for group living and prey sharing within a generally notorious cannibalistic animal clade. Permanent-group living is very rare in spiders, but has evolved independently multiple times, and is characterized by loss of pre-mating dispersal, highly female biased sex ratios, and cooperation in prey capture and brood care. Interestingly, the social species have evolved almost exclusively in tropical areas, suggesting that common ecological factors such as the prey availability in substantial quality and quantity in the tropics favours the evolution of sociality in spiders. To test this hypothesis we examined correlations of social spider distributions to several environmental factors for the two spider genera that contain most social species. Sociality should be derived from subsocial ancestors; therefore we compared species-pairs of subsocial and permanently-social species in *Anelosimus* and *Stegodyphus* by contrasting the habitats of subsocial and social species. In case of *Anelosimus*, we also considered a gradient of sociality from solitary, through subsocial to permanent sociality. We expected social species to occur in more productive environments, i.e. their habitats should be associated with higher productivity and possibly rainfall, which may in turn relate to constant and abundant insect prey supply. We applied logistic regressions to test these hypotheses. Our data confirm the positive association between permanent sociality and habitat productivity, indicating that group living in spiders evolves in response to ecological factors that facilitate benefits of cooperation and meet the elevated food demand of the group. Interestingly, in *Anelosimus* there are also differences between habitats of permanently-social, subsocial and solitary species, such that species of higher levels of sociality separate along precipitation gradients; while the productivity gradient is the most important single predictor of occurrence of permanently-social vs. solitary species. We discuss the (di) similarities of observed patterns.

Inconsistency in arachnological terminology: can it be resolved?

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There are many research fields where the same term is applied to different morphological structures and arachnology is no exception. The lack of clarity and consensus can often lead to confusion and misunderstanding when different specialists use different terms for the same feature. In this talk I will speak about various difficulties caused by inconsistency in terminology.

Objective reasons for inconsistencies can be considered as follows:

1) Different terms originate from different languages yet they describe the same structures (e.g. spermathecae/receptacula), some are used simultaneously as valid terms with their original (gender) endings (receptacula, palpus) and with English endings (receptacle, palp).

2) Terms have different etymological backgrounds: functional (e.g. conductor); topographical (e.g. median, terminal); derivative (e.g. tegular, patellar, embolic, radial); descriptive (e.g. lamella, palea); patronymic (e.g. Fickert gland).

3) The same terms can be applied to different things (e.g. haplogynes – as a taxonomic group or as a type of copulatory organ).

4) Many terms have no proper definition (genitalia, embolus, paracymbium).

5) The same terms are applied to non-homologous structures, or vice versa homologous structures may be referred to by different terms.

In many cases, such variable terminology causes no problems, but sometimes it can lead to confusion or subjective difficulties.

1) Several editors in respectful journals have their own preferences with regard to which of the alternative, valid terms should be used (e.g. epigyne or epigynum).

2) Some reviewers and editors force authors to use same terms for non-homologous structures (e.g. haematodocha and conductor in haplogynes).

In my opinion, it would be more practical to use derivative terms (the median apophysis in many groups has a retrolateral position; conductor is too functional and can be applied to different parts). In addition, it is better to use shorter terms (palp but not pedipalp; carapace instead of dorsal shield of prosoma; abdomen instead of opisthosoma). There are no reasons to create uniform terminology for the whole order and maybe it would be practically impossible. It would be better to suppress the habit of editors or reviewers to insist that authors use terms that they prefer.

Student poster presentation - Systematics & Evolution:

Multiple paternity in natural populations of three spider species as revealed by genetic markers established via 454 sequencing

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Reproductive strategies are highly diverse and entail male traits evolved to achieve matings and secure paternity. In order to estimate the fitness consequences of a given strategy we need to know its effects on paternity success preferably under natural conditions. To this end, microsatellites were isolated using a next generation sequencing method (454 Genome Sequencer FLX) for three spider species (*Pisaura mirabilis*, Pisauridae; *Oedothorax retusus*, Erigoninae; *Larinia jeskovi*, Araneidae). We established 4–5 polymorphic microsatellite markers for each species. Adult females were collected in the field either with their offspring (*P. mirabilis*) or were kept in the laboratory until egg laying and hatching of the young (*O. retusus*, *L. jeskovi*). The degree of multiple paternity is currently assessed based on approximately 10 families per species.

In the nuptial gift giving spider *P. mirabilis*, handing over a gift increases male mating success and large gifts lead to longer matings. If females forage for gifts, we expect a high degree of multiple paternity in *P. mirabilis*. Males of *O. retusus* apply mating plugs of amorphous secretion onto the female genital opening thereby reducing female multiple mating. If plugs are effective, we expect to find a single male siring all of the offspring. In *L. jeskovi*, females lose the genital scape during mating through which remating appears physically impossible. If genital mutilation prevents subsequent males from coupling to the female genital region we likewise expect only one father. Our investigations will clarify to what extent male mating strategies translate to paternity success and if paternity success as established in the laboratory offers a meaningful insight into the processes occurring in natural situations.

Oral presentation - Systematics & Evolution:

Evolutionary morphology and phylogenetic implications of sperm structure in daddy-long-leg spiders (Pholcidae)

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Pholcid spiders are characterized by a remarkable morphological diversity in their male and female reproductive systems. In order to reconstruct the evolution and reveal the phylogenetic implications of sperm structure, we studied representatives of all five subfamilies using electron microscopy techniques and computer-based 3D reconstruction. The following representatives were included in our analysis: *Gertschiola* (Ninetinae); *Artema*, *Physocyclus* (Arteminae); *Chibchea*, *Tupigea*, *Carapoia*, *Mesabolivar* (Modisiminae); *Smeringopina*, *Crosso-priza* (Smeringopinae); and *Metagonia*, *Spermophora*, *Quamtana*, *Pehrforsskalia*, *Pholcus*, and *Leptopholcus* (Pholcinae). Based on our results, several new synapomorphies for subfamilies can be proposed as e.g., the lamellate collar of electron-dense material around the anterior part of the axoneme for Modisiminae and the helical band of nucleus material for Pholcinae. One of the most surprising findings is the presence of synspermia (primary sperm conjugation which consists of several fused sperm cells) in *Gertschiola* (Ninetinae), whereas all other pholcid taxa studied have cleistospermia (individual encapsulated spermatozoa). Since (1) synspermia are known from several other ecribellate haplogyne families and (2) Ninetinae are putative sister to all other Pholcidae, we conclude that the ancestral sperm transfer form within Pholcidae may have been via synspermia. This would imply that sperm individualization evolved only once in Pholcidae and that it represents a further synapomorphy for all non-ninetine pholcid spiders.

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Coexistence among three *Philodromus* species (Araneae, Philodromidae)

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Traits related to functional niches tend to be conserved. This may lead to intensive interspecific competition among closely related spider species. Yet, some closely related species coexist. Several mechanisms were suggested to explain coexistence, namely: neutral dynamic, resource partitioning, and storage effect, which are in fact extreme ends of a continuum.

We studied which of these mechanisms is responsible for the coexistence of *Philodromus albidus*, *P. aureolus*, and *P. cespitum*. The study took place in an abandoned orchard in Brno, Czech Republic. In the study area three types of habitats were present: deciduous forest, scrub, and plum tree monoculture. Spiders were collected by beating shrubs and trees. Habitat and microhabitat preferences were studied to find differences in the spatial niche. Trophic niche differences were studied by comparing natural and potential prey of the three species. The natural diet analyses were supplemented by laboratory experiments of prey acceptance. The temporal differences in niches were investigated by comparing species phenologies.

The studied species differ in their spatial and trophic niches. Each species preferred different habitat where it was dominant. *Philodromus cespitum* occurred mostly on lower vegetation than the other two species. All species are euryphagous, utilizing similar prey types, but *P. albidus*, which occurs most evenly among habitats, utilized smaller prey than other two species.

The coexistence of the three philodromid species seems to be mediated by two simultaneous mechanisms: resource partitioning and the spatial storage effect. The spatially mediated coexistence may indicate that spatial niche dynamic (evolutionary and/or ecological) may be of particular importance in forming spider communities. The results also indicate that heterogeneous landscape and local dispersion may enhance local spider diversity.

DNA barcoding symposium:

DNA barcoding spiders on two continents: optimizing methods, getting the most out of natural history collections, and use with image libraries to enhance the value of tropical inventories

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I describe the work of the NCB Naturalis DNA Barcode Facility to optimize PCR for spider barcoding and summarize two current projects that involve barcoding spiders from the Netherlands and Vietnam.

A DNA barcode library of European spiders can draw on a combination of previously collected and curated specimens, and freshly collected specimens. Using the spider collection at NCB Naturalis, we investigated the relationship between specimen age (time since collection) and the probability of obtaining a successful barcode sequence. Considering factors such as phylogeny and body size, we estimate the probability that a given museum specimen will generate a DNA barcode sequence.

Ecological studies of diverse arthropod communities from tropical forests face several well-known challenges. Communities are generally characterized by a few common species and a very large number of rare species, and large samples are required to elucidate comparative patterns. The taxonomic literature relevant to such studies tends to be fragmentary and uneven in coverage and quality. So, ecological studies typically rely on “morphospecies” concepts. This means sorting samples using the skills of a morphological taxonomist to classify the collection, but devoting little time to determining whether or not each species has been described or what its name might be. This approach is sufficient for elucidating biodiversity patterns within a particular study, but makes it cumbersome for results to be compared between independent studies. Conscientious investigators typically deposit voucher specimens in accessible collections, which means that morphospecies concepts from different studies could be reconciled, but doing so is prohibitively time consuming. As a consequence, independent biodiversity studies on the same taxa in the same region cannot build on each other but remain limited to the scope of each individual study. In an era of biodiversity crisis, climate change, and other challenges, the scientific and public spheres have common interest in synergies that make research products more responsive to the questions of the day. Thus, practices that make it easier to compare and combine data across different inventory studies are highly desirable for deriving the maximum information value from our research investment. Using a combination of digital image libraries and DNA barcodes, we show how independent inventories can be combined and compared to increase the impact of biodiversity research.

Student poster presentation - Systematics & Evolution:

Revision of the Balkan harvestmen (Opiliones) from genus *Paranemastoma* Redikorzev, 1936: On *Paranemastoma mackenseni* (Roewer, 1923), *P. amülleri* (Roewer, 1951), *P. bimaculosum* (Roewer, 1951), *P. carneluttii* (Hadži, 1973), and *P. macedonicum* (Hadži, 1973)

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The genus *Paranemastoma* Redikorzev, 1936 is represented by many local forms in the mountains of the Balkan Peninsula. In the past, the authors described these forms usually from single specimens, and characterized them by taxonomic features which vary widely (for example, pseudo arthrosis, dorsal spots, armament) while completely neglecting the genitalia structure. This led to a great number of species and subspecies which are to be synonymized recently. Therefore one of the main priorities in the study of the Balkan opilionid fauna is the revision and redescription of the type material from genus *Paranemastoma*. This activity will help to clarify the origin, evolution and phylogenetic relations of this group of nemastomatids. After revising Roewer's and Hadži's *Paranemastoma* type material new synonymies of Balkan nemastomatids are proposed. The species *Paranemastoma bimaculosum* (Roewer, 1951) is considered as a junior synonym of *Paranemastoma kochi* (Nowicki, 1870); *Paranemastoma amülleri* (Roewer, 1951), *Paranemastoma carneluttii* (Hadži, 1973), and *Paranemastoma macedonicum* (Hadži, 1973) are seen as junior synonyms of *Paranemastoma mackenseni* (Roewer, 1923).

Student oral presentation - Systematics & Evolution:

Evaluation of the taxonomic status of populations of the tarantula *Grammostola anthracina* (Koch, 1842) (Mygalomorphae, Theraphosidae).

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In the family Theraphosidae morphologic characters are conservative and as such few are taxonomically informative: most of these came from the genitalia. Remarkably, in the theraphosid genus *Grammostola* (Simon, 1892) genitalia does not vary, making species discrimination a difficult task. *Grammosotola* is endemic to South America and presents about 20 species of which four occur in Uruguay. Taxonomic works about this genus are scarce and mostly old. *Grammostola anthracina* (Koch, 1842) is the only theraphosid species widely distributed in Uruguay, where presents large chromatic differences. There is a black morph and another brown-reddish. Previous studies show behavioral differences in the copulatory duration and patterns. However, in laboratory conditions both morphs can copulate, in addition to mate with *G. iheringi* another species present in Uruguay. Field studies have not reveal a contact zone neither between the different morphs neither with *G. iheringi*. With the hypothesis that *G. anthracina* includes more than one species we first study the distribution of the two morphs and carry out a molecular analysis based on the mitochondrial gen COI to assess the genetic differentiation of both morphs. Results show a clear geographic segregation of both morphs; the black morph is associated to basaltic formations in northwestern Uruguay while the brown-reddish distributes in the rest of the country. We genetically analyzed 30 specimens of *G. anthracina* collected at six Uruguayan localities. No haplotype is shared among specimens from different collection localities. In addition, both morphs are remarkably divergent (10.3%) at the COI gene. The black morph (4.1%) is more variable than the brown-reddish morph (1.2%). Phylogenetic analyses, together with corroborating the monophyly of both morphs, show that both are not sister to each other. The brown-reddish morph is sister to *G. burzaquensis*. Given these results, we suggest that as currently understood the taxon *Grammostola anthracina* may consist of more than one species. The name *G. anthracina* would be restricted to the brown-reddish morph. Before a new species is formally described for the black morph, additional phylogenetic analyses with a broader taxonomic coverage and detailed morphologic comparisons with other species of the genus are needed.

Acknowledgments: We thank CSIC (Uruguay), Vogelspinnen I. G. Stuttgart & Deutsche Arachnologische Gesellschaft e.V. (Germany).

Student oral presentation - Systematics & Evolution:

The huntsman spiders genus *Eusparassus* Simon, 1903: Systematic and Zoogeography

Majid Moradmand

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The genus *Eusparassus* Simon 1903 (Araneae: Sparassidae: Eusparassinae) is revised globally. These medium to large sized Sparassidae are among the foremost arthropod predators of deserts and semiarid areas. They are distributed in the vast part of the Old World from Southern Africa to Mediterranean Europe and through the Middle East toward Central and South Asia. Previously, the genus comprised 29 nominal species. After a thorough revision and several transfers, 12 Eurasian and 18 Afro-Arabian valid species are (re)described, respectively. DNA-barcodes are applied to confirm species identifications and matching different sexes. Six different species-groups are proposed on the ground of the combination of somatic and copulatory characters. The phylogenetic relationships of the species on the basis of a combined molecular and morphological analysis are under investigation. Results of the analyses associated with distributional patterns and geological events will be used to propose evolutionary scenarios of speciation.

Oral presentation - Biogeography:

Diversity of cursorial spider fauna from Kundian forest plantation (Mianwali), Punjab, Pakistan

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The study was conducted in Kundian forest plantation (Mianwali), Punjab, Pakistan from August 2010 through June 2011. Spiders were collected by using pitfall traps from the two sampling fields (small *Eucalyptus* and tall *Eucalyptus* plus mesquite plantation). A total of 1548 spider specimens, representing 10 families, 13 genera and 20 species were captured. Family Scytodiade was the most dominant family in both fields. The contribution of family Scytodidae in tall plantation was 23.7% (193), followed by Salticidae 18.2% (148) and Lycosidae 17.5% (142). In the small *Eucalyptus* field the contribution of Scytodidae, Gnaphosidae and Salticidae was 24.4% (179), 20.3% (149) and 17.7% (130), respectively. The number of males was high as compared to females in both the fields surveyed. In the tall *Eucalyptus* plantation, 34.6% (282) specimens were immature, 39.3% (320) adult males, and 25.9% (211) specimens were adult females whereas in the small *Eucalyptus* plantation 34.4% (253) specimens were immature, 36.8% (271) adult males, and 28.70% (211) specimens were adult female. During the warmer months of the study period the number of specimens was high as compared to colder months. The abundance of spiders was more on margin as compared to the edge and centre of the fields. Richness was highest in June and lowest in November in tall *Eucalyptus* field, whereas it was highest in June and lowest in April in the other field. Diversity in tall plantation was highest in November and lowest in March, and in small *Eucalyptus* field it was highest in April and lowest in September. Evenness was highest during January in both the fields where as it was lowest in October and November in tall and small plantations, respectively.

Student poster presentation - Ecology & Behavior:

Age influences web-building characteristics and physiological parameters in an orb-web spider

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In orb-web spiders, web construction results from a succession of stereotypical patterns that produce a regular geometrical structure. However, numerous factors, such as environmental or internal conditions, are known to induce variations in web structure. Moreover, it has recently been shown that ageing alters this structure: spiders invest less silk and produce more imperfections in their web with age. However, no study has yet linked changes in the structure of webs, resulting from an altered building behaviour with age, with molecular indicators of ageing.

In this study, we analysed web characteristics of young and aged spiders (*Agalenatea re-dii*), and took into account the silk investment and the number of imperfections. In parallel, we measured two ageing molecular parameters, such as antioxidant capacities and telomere length. We found significant correlations between antioxidant capacities, chronological age and structural changes of the webs. Old spiders, characterized by lower antioxidant defences, invested less silk in their webs and performed more imperfections (per cm) than younger individuals. While telomere length was not correlated to chronological age, spiders building webs with an increased total number of imperfections possessed shorter telomere length that could be an index of cellular senescence.

Spiders and especially, the orb-webs species are therefore a promising invertebrate model to study the intricacies of ageing processes, linking behavioural and physiological age-related changes.

Oral presentation - Ecology:

Spatial arrangement overrules environmental factors to structure synanthropic harvestmen communities

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Synanthropic harvestmen communities are characterized by high proportion of neozoa. Analyses of the spatial and environmental predictors of native and non-native assemblages help to disentangle the relative importance of spatially and environmentally controlled processes.

We studied the wall-dwelling harvestmen communities from 52 localities in the Grand Duchy of Luxembourg and recorded 14 species. Four of which were non-native species that accounted for 64% of the sampled individuals, with the neozoon *Opilio canestrinii* being the dominant species (54%).

We used Moran's eigenvector maps as spatial predictors and GIS-derived landcover variables at different radii (500 m, 1000 m, 2000 m) as environmental predictors in a variation partitioning procedure. This study revealed a surprisingly high proportion of the pure spatial component in both the native (14.9% of total variation) and non-native assemblages (17.7%). The estimates for pure environmental variation were 9% and 12.9%, respectively. We attribute these results to the wide ecological tolerance of the species in human neighbourhoods. Even though the composition of synanthropic harvestmen communities is unique, they lack species that are strictly confined to built habitats. Most native as well as the dominant non-native harvestmen species are able to inhabit surrounding semi-natural landscapes.

Considering individual species, the European-wide endangered Wall harvestmen *Opilio parietinus* was recorded in unexpected high frequency in Luxembourg (at 33% of the sampled localities). However, the observed distribution pattern does not corroborate the hypothesis of competitive exclusion with *Opilio canestrinii*, as mentioned in literature. However, the occurrence of *O. parietinus* was positively correlated with agricultural area in the close surroundings. This finding gives room for the hypothesis that the decline of this species might be coupled with the loss of agricultural areas and associated rural structures.

Poster presentation - Ecology & Biogeography:

A GIS model predicting potential distributions of a lineage: A test case on Hermit spiders (Nephilidae: *Nephilengys*)

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Although numerous studies model species distributions, these models are almost exclusively on single species, while studies of evolutionary lineages are preferred as they by definition study closely related species with shared history and ecology. Hermit spiders, genus *Nephilengys*, represent an ecologically important but relatively species-poor lineage with a globally allopatric distribution. Here, we model *Nephilengys* global habitat suitability based on known localities and four ecological parameters. We geo-referenced 751 localities for the four most studied *Nephilengys* species: *N. cruentata* (Africa, New World), *N. livida* (Madagascar), *N. malabarensis* (S-SE Asia), and *N. papuana* (Australasia). For each locality we overlaid four ecological parameters: elevation, annual mean temperature, annual mean precipitation, and land cover. We used linear backward regression within ArcGIS to select two best fit parameters per species model, and ModelBuilder to map areas of high, moderate and low habitat suitability for each species within its directional distribution. For *Nephilengys cruentata* suitable habitats are mid elevation tropics within Africa (natural range), a large part of Brazil and the Guianas (area of synanthropic spread), and even North Africa, Mediterranean, and Arabia. *Nephilengys livida* is confined to its known range with suitable habitats being mid elevational natural and cultivated lands. *Nephilengys malabarensis*, however, ranges across the Equator throughout Asia where the model predicts many areas of high ecological suitability in the wet tropics. Its directional distribution suggests the species may potentially spread eastwards to New Guinea where the suitable areas of *N. malabarensis* largely surpass those of the native *N. papuana*, a species that prefers dry forests of Australian (sub)tropics. Our model is a customizable GIS tool intended to predict current and future potential distributions of globally distributed terrestrial lineages. Its predictive potential may be tested in foreseeing species distribution shifts due to habitat destruction and global climate change.

Student poster presentation - Ecology & Behavior:

Seasonal dynamics of abundance and species diversity of spiders (Araneae) in the environs of Murmansk city (Russia)

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Spider fauna of the Kola Peninsula has been rather well studied. However, ecological aspects of spider population still have been given a little attention.

Spiders have been collected by pitfall traps during the period of 30. IV – 15. IX. 2010 in two habitats in the vicinity of Murmansk, on the western coast of Kolskiy Gulf (68° 54' N, 033° 01' E). The study was performed in two nearby sites differing in vegetation (true birch forest ver. sparse birch brushwood) and a level of anthropogenic impact (different distances from a road).

A total of 1280 adult spiders belonging to 62 species of 10 families were captured. Two dominant families are distinguished. Linyphiidae amounts to 69% of the total species diversity and 72% of the total abundance. The same parameters for Lycosidae are 11% and 19%, respectively. The rest families are represented by few species with low abundance. The most common linyphiid genera are *Centromerus*, *Erigone*, *Hilaira*, *Macrargus*, *Oryphantes*, *Tenuiphantes*, *Zornella* and *Walckenaeria*. *Pardosa* is predominating among Lycosidae. The most speciose genera are *Walckenaeria*, *Tenuiphantes* and *Pardosa*.

Linyphiidae is the most diverse family in both habitats under study. In the brushwood, the maximum values of linyphiid and lycosid abundance is nearly equal, whereas Linyphiidae clearly predominates in the forest site. These two dominant families are characterized by different seasonal dynamics. In Linyphiidae, a clear spring peak of species richness and total abundance is observed in May. In June, the number of registered linyphiid species decreases, and their number is reduced by two or more times until they become relatively constant. A small additional increase in the number takes place in September.

The dynamics of abundance in different linyphiid species have their own pattern. For instance, *Macrargus rufus* and *Tapinocyba pallens* have the maximum abundance in spring, while *Centromerus sylvaticus* is more numerous in autumn. *Hilaira hermiosa* has also the third peak in summer; *Erigone atra* has spring and summer peaks.

In Lycosidae there is only one summer peak of number and species richness: the abundance begins increasing from late May and decreases from late June to late August. It is worth noting that this dynamics is mainly determined by the abundance of one dominant species *Pardosa lugubris*.

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Oral presentation - Behavior:

Alternative mating strategies balance reproductive success of size-mismatched males in the Golden orb-web spider *Nephila senegalensis*

Rainer Neumann & Jutta Schneider

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In the Golden orb-web spider genus *Nephila*, fecundity-selection on female body size has led to reversed sexual size dimorphism and a strongly male-biased operational sex ratio, resulting in intense male-male competition. Monopolisation of a single female through mate-plugging and mate-guarding is the inferred ancestral male mating strategy in *Nephila*. This behavioural strategy is associated with special traits (e.g. copulatory organ breakage) that limit males' capacity to re-mate. However, male monopolisation attempts are no longer successful in phylogenetically derived *Nephila* species and males have regained their re-mating capacity. These evolutionary changes have led to an increased potential of rival males achieving fertilisations, and female polyandry occurs in most *Nephila* species. Therefore selection is expected to induce novel adaptations to regain reproductive success.

In the African *Nephila senegalensis*, males exhibit pronounced intrasexual size-variation, with large males outweighing small males more than four times. As male-male contests in animals are usually won by large males, we expected size-dependent strategies to balance reproductive success between males. In order to investigate the role of extreme male size-variation in male-male competition and alternative mating strategies, adult males were assigned to 3 distinct size classes (small, medium and large). In each mating trial, 2 size-mismatched males competed for mating with one female. We conducted trials so as to stage competition between males in all possible combinations of different size classes. Males were allowed to cohabit with the female in mating arenas to simulate long-time competition which regularly occurs in natural populations of this species. Proportions of paternity were estimated using the sterile male technique. Our results show that small males achieve shorter male-female cohabitation periods than medium and large-sized males due to female cannibalism, which is reflected in a reduced number of mating opportunities. However, small males perform significantly longer copulations than their larger competitors, thereby increasing their chances in sperm competition. Our findings suggest that size-dependent mating strategies balance reproductive success in males of *N. senegalensis* and that the evolutionary maintenance of extreme male size-variation can be partially explained by these behavioural adaptations.

Oral presentation - Ecology:

Spiders of sandy grassland: an experiment on Moravian Sahara (Czech Republic) – preliminary results

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The spider fauna of continental sands host very valuable spider fauna. It is not about rarity of the habitat only, it is about destruction and afforestation too. During past century there where almost 95% of sandy areas afforested in the Czech Republic. It leads to the total change of the microhabitats, and extinctions of some other invertebrate and vertebrate organisms (butterflies, birds, lizards etc.). Part of this region was changed for agricultural use, mainly for crop fields. From point of view of spiders, sandy habitats host one of rarest spider community in the Czech Republic. From the year 2008 there started a project about “re-cultivation” of sandy crop fields.

There where established a study field close the city Hodonín (48° 52' 39.655" N 17° 7' 55.665" E, Czech Republic) where the crop field where changed to the agricultural grassland. The locality where chosen as a reference plot for observation of climatic change impact on agricultural grasslands. There where applied several cultivating agents (e.c. zeolites, industrial compost etc.) for increasing of water capacity in soil. Through absurdity of this work, we established three lines of pitfall traps there (one in the middle of plots and two on potential surroundings habitat – dry and semi-humid edges of surrounding forests). The collecting period was between years 2008 and 2011 (May to September).

The most interesting result where faunistic. Rare linyphiid spider *Sintula spiniger* (Balogh, 1935) was found and this record first from the Czech Republic. Other data are interesting too. We found one male of *Taranucnus setosus* (O. P.-Cambridge, 1863) on sandy dry locality as a new record from Moravia. From year 2008 also came a first record of *Mermessus trilobatus* (Emerton, 1882) from Moravia. From other important species is necessary to mentioned common occurrence of rare psammophilous species *Titanoeca psammophila* Wunderlich, 1993, *Sitticus zimmermanni* (Simon, 1877), *Haplodrassus bohemicus* Miller & Buchar, 1977 and others.

Although these data are just preliminary, we can say some interesting results not supported by proper statistics yet. Interesting is sympatric occurrence of close relative species of *Pardosa lugubris* group – *P. alacris* and *P. lugubris* what is not so common phenomenon. Also observation of spreading of rare psammophilic species is not often reported – we found that some species (like *T. psammophila* or *Tricca lutetiana* (Simon, 1876)), occupied former field relatively quickly (within two years after habitat change).

This study was supported by project IGA MENDELU No. TP05/2011 and TP 03/2012.

Oral presentation - Behavior:

Spiders of the genus *Cybaeus* L. Koch, 1868 (Aranei: Cybaeidae) in Russian Far East

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Cybaeidae is comparatively small family which contains 177 species from 10 genera up to date. Most genera occur in Palaearctic except for *Symposia* and *Vagellia* known for tropics only. More than half species of Cybaeidae occur in East Palaearctic especially in Japan. 83 species of this family have been reported there to date and 81 of them are endemics of Japan islands.

Cybaeus is the biggest genus of the family and currently contains 146 species (about 80% diversity of the family). Its limits are unclear and it seems that the genus should be split into several genera. For example Bennett (2005) consider that *C. perditus* Chamberlin & Ivie, 1932 and some undescribed species deserve a separate genus.

While collecting material in Maritime Province of Russia and looking material from museum collections we understood that there is not only one species of *Cybaeus* in this region. It was impossible for us to identify most of specimens except for these belonging to *C. confrauentis* and therefore we undertook this survey. As a result nine new species of this genus were founded there in total.

Most of species from the Russian Far East can be easily identified thanks to shape of copulatory organs, size and pattern.

Although tegulum and male palpal tibia is rather uniform among *Cybaeus s.l.*, epigyne in this genus is extremely polymorphic. Diagnostic characters in male palp are as follows: shape of patellar apophysis, presence or absence of teeth on patellar apophysis, proportions of cymbium (relative length of the tip), shape of terminal part of conductor, type of embolus and course of embolus.

Females have less distinct differences in epigyne than males have in the shape of the palps. Several species have distinct differences in shape of fovea, shape of sclerotized area and in shape of internal structures (vulva).

Somatic characters. According to size, all species from Far East can be divided into three distinct groups, small-sized (carapace less than 3 mm.), medium (3–4.5 mm) and large (carapace over 4.5 mm). Almost all species have distinct abdominal pattern, but no clear differences have been found in it. Besides abdominal pattern, some species have developed carapace pattern (cephalic part darker than thoracic one). Several species has legs with annulations.

Biology notes. Spiders of the genus have quite complicated mating behavior which differs in different species. Males trying to copulate with a female perform a particular kind of dance. It includes a series of swinging by first pair of leg, vibrations of abdomen and so on.

Poster presentation - Systematics & Evolution:

Two closely related species of *Alopecosa* (Aranei, Lycosidae) from Russian Far East

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Two extremely related in general appearance species of *Alopecosa* (*A. tanakai* Omelko et Marusik, 2007 and *A. kaplanovi* Oligier, 1983) have been found in south part of Russian Far East. Both of them have almost identical pattern of abdomen and carapace. Thereby identification these species in the field is impossible. However, their copulatory organs differ very well. The female of *A. tanakai* can be easily distinguished from that of *A. kaplanovi* by the shape of septum, apical pockets, receptacula, the fovea ornamentation of white hairs and dark colored surroundings of the epigynal plate. Males of these two species are easily distinguishable by shape of tegular apophysis, palea and tegular lamella.

In addition to structure of copulatory organs *A. tanakai* and *A. kaplanovi* differ well by their ways of life and habitat preferences. Females of *A. tanakai* construct burrows (about 4–5 cm deep) at well heated places where they copulate with males and then keep their cocoons. Unlike *A. tanakai*, *A. kaplanovi* never build any burrows. The species inhabit different types of habitats. *A. kaplanovi* occur at dry meadows, whereas *A. tanakai* live at forest borders and sparse growths of trees.

Both species pass the winter at adult stage and occur since end of March. Adult spiders of the second generation appear at end of August and autumn.

A. tanakai occur in south part of Russian Far East (Maritime Province) and adjacent territories of China (Jilin Province). *A. kaplanovi* is known only from Maritime Province to date, but it is quite probable that this species will be found in China and Korea.

The origins and phylogenetic relationships of the Mediterranean ctenizid trapdoor spiders (Ctenizidae, Mygalomorphae)

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The family Ctenizidae is a prototypic, worldwide-distributed trapdoor spider group, which includes a modest number of genera (9) and species (125). The monophyly of the family has been questioned on the basis of both morphological and molecular evidence. Two sub-families have been traditionally recognized within Ctenizidae: Ummidiinae, which includes the genus *Ummidia*, *Conothele* and *Hebestatis*, although the latter has been recently removed from the group, and Ctenizinae, which includes the remaining 6 genera. Unlike Ummidiinae, Ctenizinae do not show any synapomorphic characters and thus it is probably either a para- or polyphyletic group.

The family is represented in the Mediterranean Basin by 3 genera and 9 species. *Cteniza* and *Cyrtocarenum* mostly endemic to the region, (subfam. Ctenizinae), while the bulk of *Ummidia* diversity (subfam. Ummidiinae), is found in the New World. All three genera are ground dwelling, medium-sized or robust spiders that dig underground burrows lined with thick silk with one outer trapdoor and, occasionally, a second smaller inner one.

Here, we aim to unravel the phylogenetic relationships of the Mediterranean species within the family Ctenizidae. We pay special attention to the position of the Mediterranean *Ummidia*, which was long considered an anthropogenic introduction to the region, although the recent description of several Iberian species casts some doubts on this hypothesis. We use a multilocus approach combining DNA sequence information of 3 nuclear genes: the ribosomal 28S and the protein coding genes EF1-gamma and Histone 3. Overall, we analyse more than 30 individuals representing all known Ctenizidae genera (except *Latouchia*) and closely related genera *Migas* (Migidae), *Myrmekiaphila* (Cyrtaucheniidae) and *Segregara* (Idiopidae).

Our phylogenetic hypothesis indicates that Ctenizidae is not monophyletic and supports a deep split between two main clades that do not corroborate the traditional subfamily divisions. One lineage includes *Cteniza* and *Cyrtocarenum* and the other comprises Mediterranean *Ummidia* plus American *Ummidia* and Australian *Conothele*. Although relationships among these three groups lack strong support, deep genetic divergences among Mediterranean species corroborate recent hypotheses that *Ummidia* has been long established in Europe. Results also show that Iberian *Ummidia* species are related to different North African lineages, suggesting independent colonization events. Finally, our results provide further support for the exclusion of *Hebestatis* from Ummidiinae despite strong morphological affinities.

Student poster presentation - Systematics & Evolution:

Habitat segregation of Lycosids in the Natural park of Lagoni di Mercurago (NW Italy)

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Differences between species and environmental factors drive the distribution of species and ultimately the composition and diversity of communities. Understanding the species turnover patterns is crucial to addressing how the edges of species' ranges are delineated between adjacent habitat and could be useful to detect the presence of niche segregation.

In our study habitat ranges of Lycosids were studied in two freshwater ponds of the Natural Park of Lagoni di Mercurago (Piedmont, NW-Italy). Samplings were performed during spring and summer 2010. We used ten transects of five pitfall traps to collect ground dwelling spiders along a habitat gradient starting at the pond surface and extending through the adjacent terrestrial ecosystems. Floating pitfall traps were used to sample species dwelling on the water surface. Five concentric belts of ten meters were identified, encompassing different habitats: aquatic habitat (belt A), aquatic-terrestrial interface (belts B and C) and terrestrial habitat (meadow or mesophilous wood) (belts D and E). We first analyzed the distribution of each species in the five concentric belts to identify the dominant species and the presence of stenoecious/eurieciuous species. To assess species turnover, Whittaker's beta diversity was calculated between each pair of concentric belts and was described using a ternary plot using presence/absence of species. We also calculated diversity indices and taxonomic diversity indices to evaluate which belt had the higher values of diversity.

In total we collected 295 Lycosids belonging to 13 species. Their distribution suggests distinct habitat ranges along transects. *Pirata piraticus* was found to be exclusive of the aquatic habitat (only collected in floating pitfall traps) and dominant in this belt, while *Pirata uliginosus* was dominant in the two adjacent belts (B and C). *Trochosa hispanica* and *Pardosa lugubris* were dominant in the two terrestrial belts (D and E, respectively). The two transitional central belts (B and C) recorded the higher number of species (S) and the higher value of Shannon index (H') reflecting the ecotonal nature of this belts. The turnover analysis revealed a high specific turnover between the "aquatic" belt and all the other terrestrial belts while it decreased among the other habitats.

Oral presentation - Behavior:

Comparative analysis reveals drivers of the evolution of inaccurate and accurate mimicry in spiders (Araneae)

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The evolution and maintenance of inaccurate Batesian mimicry has been explained by a number of hypotheses that has been recently subjected to testing on wasp and bee mimics. I gathered data on more than 200 ant-mimicking (myrmecomorphic) and 700 non-mimicking spider species. I classified myrmecomorphic species into four accuracy levels based on morphology, from poor inaccurate mimics to very accurate ones. Using comparative methods, I investigated whether the accuracy is influenced by the relaxed selection hypothesis via testing the species' geographic distribution, type of microhabitat, and body size, and whether the accuracy is constrained by phylogeny. Myrmecomorphy has evolved independently in 17 families and 84 genera and has been found to be little constrained by phylogeny. On family level phylogeny, the occurrence of mimicry is confined to derived families, but at generic level phylogenies, mimicry is not only of derived origin. Myrmecomorphy has evolved from the cryptic phenotype and become diversified in the Neogene. Mimetic accuracy is strongly affected by other study variables: accuracy increased towards the tropics and was positively correlated with body spider size in open microhabitats, such as foliage or tree trunks. Species occurring on the ground were rather inaccurate irrespective of their body size. The results of this study show that inaccurate myrmecomorphy in spiders is a result of relaxed selection: in open habitats the selection for accuracy is stronger on more profitable and apparent mimetic species.

Summary statistics for fossil spider species taxonomy

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Spiders (Araneae) are one of the most species-rich orders on the planet today and also have one of the longest evolutionary histories of any terrestrial animal group as demonstrated by their extensive fossil record. There are currently around 1150 described fossil spider species, representing 2.6% of all described spiders (fossil and extant). Data for numbers of fossil and extant spider taxa described annually (and various other metrics for the fossil taxa) were compiled from current taxonomic catalogues. Data for extant taxa showed a steady linear increase of approximately 500 new species per year over the last decade, reflecting a rather constant research activity in this area by a large number of scientists, which can be expected to continue. The results for fossil species were very different with peaks of new species descriptions followed by long troughs indicating minimal new published research activity for most years. This pattern is indicative of short bursts of research by a limited number of authors. Were these data to represent patterns within natural populations, one would consider the latter to be at considerable risk of extinction. Given the frequent discovery of new fossil deposits containing spiders, a wealth of new material coming to light from previously worked deposits, and the application of new imaging techniques in palaeoarachnology that allow us to extract additional data from historical specimens, e.g. X-ray computed tomography and synchrotron scanning, it is important to ensure a sustained research activity on fossil spiders (and other arachnids) through training and enthusing the next generation of palaeoarachnologists.

DNA barcoding symposium:

Launching the German Barcode of Life project

Stephanie Pietsch, Jonas Astrin

Presenter: Wolfgang Nentwig

Institute of Ecology and Evolution, University of Bern, Bern, Switzerland

The German Federal Ministry of Education and Research (BMBF) is entrusting a national consortium of natural history museums and other research institutions with the task to begin barcoding the German terrestrial and freshwater biotas. During the coming (initially) three years, the BMBF will finance collecting, processing, data sharing and deposition of samples in conventional and molecular collections in order to facilitate the compilation of an open, validated DNA barcode database for German eukaryotic species.

According to taxonomic composition, most of the funds in the project will be dedicated to generate DNA barcodes of insects, but other arthropods and invertebrates, vertebrates, seed plants, bryophytes, ferns and rust fungi will also be targeted at this stage.

Web page: www.bolgermany.de (currently only in German).

Student oral presentation - Systematics & Evolution:

Comparative implications of capture silk evolution through *Hickmania troglodytes*

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For many different taxa of spider, foraging is completed through the use of various specialized web structures that must be able to capture and secure prey items. Certain mechanical properties of capture silk within a web make it functional and successful tool in foraging for prey. To understand how capture silk originated in mechanical performance we studied a very basal Araneomorph that displays derived behaviors. The ancient Austrochilid spider *Hickmania troglodytes*, commonly known as the Tasmanian cave spider, builds large horizontal sheet webs that are composed of cribellar capture silk. We collected samples of silk threads of sub-adult to adult individuals from from two sites in Tasmania, one being in the north at Mole Creek and one in the south at Hastings. Mechanical testing of strength, extensibility, stiffness and toughness took place at the University of Akron using the Nano bionix testing system. By understanding how the mechanical performance of this spider compares to cribellar capture silk of more derived taxa that have already been studied, it becomes possible to determine a minimum performance of capture silk to be biologically useful for foraging.

Student poster presentation - Systematics & Evolution:

Karyotype differentiation of Alpine scorpions of the subgenus *Euscorpilus* (*Alpiscorpilus*) (Scorpiones: Euscorpiliidae)

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The order Scorpiones is the fifth largest order of arachnids with more than 1750 described species. Despite of this diversity and its medical importance we still have only little information about cytogenetics of this group. Currently we have karyotype data from approximately 77 species which represents about 4% of all described species. The most of recent studies of this order present considerable karyotype variability with diploid number of chromosomes from 5 (*Tityus bahiensis*, Buthidae) to 175 (*Urodacus novaehollandiae*, Urodacidae). However, these differences have never been compared with genetic diversity and phylogenetic relationships. That was the main reason we decided to focus on the analysis and comparison of karyotypes of European scorpions from species complex *Euscorpilus* (*Alpiscorpilus*) *germanus* (Euscorpiliidae). Their species status had been confirmed 10 years ago based on molecular characters. One genetic analysis performed on specimens from this complex (that occurs in the Alps) shows existence of three species: *E. alpha*, *E. gamma* and *E. germanus*. Although we still have only preliminary results, our karyotype comparison corresponds with this molecular analysis. Karyotypes of all three analyzed taxa significantly differ with their diploid numbers: 58, 60 and 46.

Our results demonstrate that cytogenetic analysis may be useful for cytotaxonomic studies of the problematic genus *Euscorpilus* in Europe.

Oral presentation - Ecology:

Effect of spontaneous fire on spider communities: a case study in forb-bunchgrass steppe in Eastern Ukraine.

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Fire is considered one of the key factors in the origin and development of steppe ecosystems. However nowadays, when steppes are fragmented and isolated, the role of fire is questionable and requires a comprehensive study. We investigated recovery of the spider community after a spontaneous fire in the Striltsivskiy Step Nature Reserve (Luhansk Oblast, Ukraine). The reserve burnt entirely in August 2008. During previous studies in 1980–1990s, 108 spider species were registered in this locality: 52 in the herb layer, 60 on the ground with 46 cursorial species caught with pitfalls. In 2009, only 32 cursorial species and 4 adult herb dwellers were found. In 2011, the number of species increased to 88 (33 in the herb layer, 52 cursorial species on the ground and 3 epigeic species in the litter). In general, the species composition was close to that of the nearest unburned steppe gully, with the exception of the litter-dwelling Linyphiidae and Theridiidae. From the first to the third year after the fire, the active density of spiders increased more than twice: 11.2 to 24.7 ind./10 traps in gullies, 6.5 to 14.8 on the slope, 6.6 to 13.5 on the watershed. In 2009, the dominant complex included three generalist species in all habitats; while in 2011 nine species comprised different complexes depending on the relief and grass cover. After the fire, spiders settled the grass slower than the ground. In May–July, only rare juveniles of *Xysticus* and *Araneide* were collected by net sweeping. However, in early September, the assemblages of herb-dwellers were represented by typical for this period species, also juvenile.

Thus, assemblages of herb-dwelling and cursorial spiders recover in the burnt steppe quite quickly being diverse and abundant on the third year after the fire. Epigeic spiders that move slower and need litter as a microenvironment do not settle burnt area for a long time. Among them, there are regionally rare species, as *Minicia caspiana* Tanasevitch, *Neottiura suaveolens* (Sim.) and others that are threatened by the fire and may disappear through frequent disturbance and/or lack of refugium.

Emasculation renders *Herennia* males more aggressive

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Males of the sexually dimorphic coin spiders (*Herennia*, Nephilidae) break the terminal parts of their genital organs (palps) within female genitals during copulation, then subsequently remove the remains of their broken palps. While male spiders commonly break parts of their palps during copulation, such total emasculation (or the *eunuch phenomenon*), is rare and confined to only a few spider groups. Eunuchs are best known in the nephilids *Herennia* and *Nephilengys*. Because genital emasculation renders the males sterile, an intriguing question is why such behaviour evolves and is maintained. Previous studies have shown that males of *N. livida* and *N. malabarensis* effectively reduce female remating by severing their palps within female genitalia. However, while in *N. malabarensis* emasculation renders the eunuch males lighter, increases their stamina, and makes them better fighters compared with virgin males, the better fighter hypothesis was not supported in *N. livida*. Here, we report on a study of eunuch adaptiveness in *Herennia*. We tested for palpal plug effectiveness in preventing female remating and compared eunuch aggressiveness levels towards intact males in *H. multipuncta*. Although emasculation in *Herennia* is performed differently to both *Nephilengys*, plugging in *Herennia* effectively prevents female remating, as in both *Nephilengys*. Although *Herennia* eunuchs showed higher aggressiveness compared with virgin males, they did not also show higher agility. While the eunuch phenomenon differs among these three nephilids, we found more resemblance in eunuch mechanisms between *Herennia* and *N. malabarensis* than between both *Nephilengys* species. Although the eunuch phenomenon probably is homologous in all three taxa, the similarity between *H. multipuncta* and *N. malabarensis* can be explained by a novel phylogenetic hypothesis.

Spider Diversity along altitudinal gradient & associated changes in microclimate attributes in Nanda Devi Biosphere Reserve, Uttarakhand, India

Shazia Quasin & Virendra Prasad Uniyal

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India is a mega biodiversity country with large gaps in our knowledge on the taxonomy, status and distribution of spider fauna. Spiders globally include about 42473 described species under 3849 genera and 110 families. In India, 1520 spider species belonging to 377 genera under 60 families have been reported. Families represented by the highest number of genera and species in India are *Salticidae* (66 genera and 192 species) and *Thomisidae* (38 genera and 164 species). Knowledge on Himalayan spider fauna is even sparse than other regions, because of the difficult terrain and harsh climate that hinder inventories. Considering their functional importance in ecosystems, documentation and conservation of spiders at appropriate regional scales is necessary.

We conducted a study on spider community in Nanda Devi Biosphere Reserve (NDBR) during 2008–2011. NDBR, located in the northern part of Western Himalaya in India, is renowned for its wilderness and biodiversity, hence selected for the study. Our aim was to describe the spider fauna, investigate their community structure along altitudinal gradients and examine influences of environmental (i.e., soil pH, litter depth etc.) and climatic (i.e., humidity, temperature) covariates on spider assemblages. Fieldwork was conducted in NDBR (30° 08' – 31° 02' N, 79° 12' – 80° 19' E) for three years (2008–2010) at three sites: Site 1 Lata Kharak (LK, 2000–4000 m); Site 2 Bhyundar Valley (BV, 1800–4100 m) and Site 3 Malari (MA, 3000–4000 m). Systematically placed 10 m × 10 m dimension quadrats (n=106) were sampled along existing human trails on altitudinal gradients. Sampling was carried out using pitfall traps, sweep netting, and other semi-quantitative methods to capture spiders from all possible niches. Collected specimens were transferred to 70% alcohol for further measurements and identification. We identified the specimen's upto the species level and recorded a total of 244 species, 108 genus and 33 families during the entire sampling period. The most dominant family were Araneidae 18% (44 species); Salticidae and Thomisidae 11.5% (28 species); Theridiidae 8.6% (21 species); and Linyphiidae 7.4% (14 species). Habitat covariates (altitude, temperature, pH, humidity, litter depth and bare ground %) were sampled to investigate determinants of spider diversity. Regional species diversity (sites combined) decreased linearly with altitudinal gradient ($\beta = -0.27 \pm 0.04$) and pH ($\beta = -0.53 \pm 0.18$). We observed similar trends of local species diversity (sites separate) against altitude in LK ($\beta = -0.16 \pm 0.05$) and MA ($\beta = -1.07 \pm 0.21$). However, no significant effect of altitude on spider diversity was observed in BV. This study is the first comprehensive documentation of the spider fauna in NDBR. Furthermore, the increased understanding of larger taxonomic and ecological frameworks can facilitate the development of appropriate conservation objectives for spider fauna in NDBR. The three sites sampled, show very site-specific species composition thus emphasizing the importance of differential management interventions for different species. In future we recommend more research on the influence of anthropogenic disturbances i.e., grazing, biomass extraction and fire on the spider communities in the Himalayan landscape. Such vital information can be used for more efficient management practices, which will ultimately aid in ecosystem monitoring.

Spider assemblages as indicators of nature conservation measures in grassland patches

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Sas-hegy, a dolomitic hill, is a treasure of nature enclosed by the Hungarian capital, Budapest. Its spider fauna is well studied. More recently Csaba Szinetár and Ferenc Samu collected spiders in well defined grassland patches between 1994 and 1998. Since then the invasive syringa bush has spread considerably, and as a measure against it an eradication programme started in 2008. The eradication treatment affected some of the grassland patches studied in the 90's in part, while other patches were either fully treated or did not have eradication treatment at all. In year 2010 we sampled exactly the same grassland patches that were studied in the 90's. We used the same protocol and sampling effort applied during those studies, except that where eradication affected a patch in part, we applied the protocol to both the treated and the untreated parts. Our aim was to uncover changes in these patches focusing on the effect of eradication on natural spider assemblages. Where it was possible we compared treated and untreated parts, and also evaluated how much assemblages have had departed in species composition since the 90's. We also evaluated changes in terms of functional characters (preference for naturalness, humidity, habitat openness), and others, such as rarity. The difference between eradicated and untreated parts of the patches was remarkably little in species composition and all functional characters, which is likely to be due to the patchy eradication and quick recolonization from untouched habitats. However, in comparison to the 90's data, the eradicated patches were more similar in terms of rarity, while other ecological characters remained unchanged. We think, a very precious fauna with lots of rare species managed to persist on the Sas-hegy. Since shrub eradication seems to have created habitats that are more similar to the original ones, this might favour rare species and helps conservational goals on the long run.

Student poster presentation - Ecology & Behavior:

Effect of aposematism and mimicry on behaviour of spider predators

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We have studied an effect of visual and chemical aposematic signalisation on spider predator – an optically-oriented, colour-perceptive jumping spider *Evarcha arcuata* (Araneae: Salticidae). In a series of avoidance learning, memory and generalisation experiments, the spiders were presented with 1) larvae of two conspicuously coloured (both red) but differently chemically signalling species of true bugs: *Pyrrhocoris apterus* and *Scantius aegyptius* (Heteroptera: Pyrrhocoridae); 2) differently coloured larvae of *P. apterus* (red wild-type and white mutants) having identical chemical signal. Although the chemical defence of *S. aegyptius* was less effective than that of *P. apterus* and its mortality was higher, the learning process was effective in both species. Moreover, the generalisation of learned avoidance between the two prey species was surprisingly effective and symmetrical and both species were highly memorable for the predator. Therefore, *S. aegyptius* can be considered a mutualistic, quasi-müllerian mimic of *P. apterus* relative to *E. arcuata*. When comparing reactions to white (cryptic) and red (aposematic) larvae of *P. apterus*, we found no significant difference in reactions to both colour forms during the learning process. However, the cryptic prey was less memorable than the conspicuous one. Spiders generalised the colour forms in both directions but the generalisation from towards the red form was more effective. In conclusion, the intensity of a warning signalisation elicits a corresponding response in jumping spiders. Such results reflect complex cognitive abilities of these spiders and suggest their use as model predators for future studies. Since the experimental research of aposematism is predominantly focused on vertebrate predators (especially birds), the results from taxonomically different predators can contribute to a wholesome view.

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The chemosystematic potential of cyphophthalmid scent gland secretions: a case study on Sironidae (Opiliones)

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A pair of scent glands is characteristic for all harvestmen, and these glands are known to produce taxon-specific secretions, offering a potential pool of novel characters for integrative taxonomy. In the Cyphophthalmi, scent glands are largely developed and open atop conically protruding tubercles on the prosoma. Despite their conspicuousness, the chemistry of cyphophthalmid scent gland secretions is poorly studied: So far, two species of Sironidae, one stylocellid, and one pettalid have been analyzed, all of these showing distinguishable, but basically similar multicomponent blends of naphthoquinones and methyl ketones. Cyphophthalmid blends seem to contain much more components than the scent gland secretions of other Opiliones, and thus, are predestined for a use in taxonomy. However, due to the only exemplary information on a limited number of taxa, along with low individual numbers studied, it has neither been possible to assess family-characteristics nor to evaluate the chemotaxonomic potential of cyphophthalmid secretions on lower taxonomic levels.

We here provide a first in depth study on scent gland secretions for two genera of Sironidae, aiming to address several prerequisites for chemotaxonomy: 1) Are secretion profiles intraspecifically stable? 2) Are secretion profiles distinguishable between closely related taxa? Finally, 3) is a chemical characterization of supra-specific taxa, e.g. genera, possible?

The intraspecific range of variability of secretion profiles was tested on *Cyphophthalmus duricorius* that shows the widest geographical range of all species of this genus. We analyzed more than 1000 individual secretion profiles from several Austrian, Slovenian, and Croatian populations and found them to be indiscriminable, even when evaluated by multivariate statistical methods. Also, no differences between females and males could be recognized. Intraspecific stability of secretions was detected for *Cyphophthalmus* species from the Balkan Peninsula as well, as exemplarily shown for different populations of *C. rumijae* and *C. zetae*. Even though profiles of all *Cyphophthalmus*-species were similar, each of these species could be easily assigned to different chemical clusters, underlining the high specificity of the secretions and their discriminatory power in taxonomy. Furthermore, a comparison of the *Cyphophthalmus*-profiles to those from genus *Siro* revealed a major chemical divergence between these genera. Particularly the secretions of *Siro rubens*, *S. carpaticus*, and *S. crassus* are clearly distinct by large amounts of C₂H₅-naphthoquinones that have so far not been detected in any other cyphophthalmid. These novel compounds are neither present in the fourth European *Siro* (*S. valleurum*) nor in hitherto studied representatives of American *Siro*, and may represent a chemical autapomorphy of a highly-specialized European *Siro*-lineage.

Thus, beyond their unequivocal taxonomic value, our chemical data allow promising novel insights into the phylogenetic structure of cyphophthalmids, even at the sub-family level: with respect to Sironidae, we expect multiple chemically distinct groups which do not necessarily correspond to the traditionally recognized taxa.

Oral presentation - Behavior:

Opportunistic mating and its consequences on male survival and fitness in the cannibalistic spider *Argiope bruennichi* (Araneae: Araneidae)

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Mating with females while they are moulting and thus defenseless (opportunistic mating), is a potential male strategy to overcome female mate choice and aggressive behaviour. Mating with defenseless females seems especially advantageous in species in which the males run a high risk a being cannibalized during mating. On the other hand, males may incur considerable costs by mating opportunistically if genital coupling of male and female genitalia requires hardened female external genital structures and if sperm cannot be transferred and stored properly in moulting females.

In the orb-web spider *Argiope bruennichi*, male and female perspectives of sexual cannibalism have been investigated in detail in females with hardened cuticle. Here, the females attack the males immediately after the onset of mating. Accordingly, the probability of sexual cannibalism is high with only 20% of males surviving their first insertion (Schneider et al. 2006). Males are able to hinder a subsequent rival from using the same spermathecae by placing a broken-off genital sclerite into the copulatory duct that leads to the spermathecae, suggesting that males strongly compete over mating with virgin females.

By staging matings with moulting females, we investigated if opportunistic mating occurs in *A. bruennichi*, if it serves to increase male survival, if males can place a genital plug and consequently to what extent opportunistic mating influences paternity success. We further investigated if females are in fact defenseless or if they show signs of cooperation or aggression during opportunistic mating.

Cladistic analysis of the spider family Sparassidae Bertkau (Araneae)

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Currently, the family Sparassidae comprises 1114 species, in 85 genera, distributed worldwide. The first subfamilial classification was proposed by Simon over 100 years ago and is used to date with few modifications. Sparassidae is thus divided into 9 subfamilies (Sparassinae, Sparianthinae, Heteropodinae, Eusparassinae, Palystinae, Clastinae, Staianeinae, Chrosioderminae and Deleninae). Nevertheless, the monophyly of these subfamilies is questionable and many genera remain *incertae sedis*. The aim of this study is to propose a new subfamilial classification based on the results of a cladistic analysis. The matrix comprised 89 morphological characters and 66 taxa. Of these, 62 belonged to Sparassidae, with representatives 52 genera and all subfamilies except Staianeinae, known only from juveniles. The analysis was carried out on TNT using implied weights ($k=3$) and resulted in 2 most parsimonious trees with 390 steps each. Results confirm the monophyly of Sparassinae, Sparianthinae, Heteropodinae, Clastinae and Deleninae with few alterations. Sparassinae is now restricted to ten genera (*Cebrennus* Simon, *Nisueta* Simon, *Olios* Walckenaer, *Nolavia* Kammerer, *Micrommata* Latreille, *Macrinus* Simon, *Vindullus* Simon, the newly assigned *Quemedice* Mello-Leitão and *Caayguara* Rheims, and *Dermochrosia* Mello-Leitão, transferred from Chrosioderminae). *Sampaosia* Mello-Leitão is transferred from Eusparassinae to Sparianthinae and *Sparianthina* Banks is removed from this subfamily and transferred to Heteropodinae. *Guadana* Rheims and *Anaptoecus* Simon are newly assigned to Heteropodinae. Chrosioderminae arises as a monophyletic group including *Chrosioderma* Simon, *Damastes* Simon, *Megaloremnius* Simon and *Keilira* Hirst, sister to Sparassinae. Nevertheless, the support is weak and the synapomorphic characters are mostly reversed in the type genus. Polybetinae, originally proposed by Järvi to include *Polybetes* Simon, *Streptaedoea* Järvi and *Leptosparassus* Järvi (the two latter currently junior synonyms of *Polybetes*) is revalidated to include *Polybetes* + *Origes* Simon, in a clade sister to Clastinae + Deleninae. Eusparassinae and Palystinae are not recovered as monophyletic. Eusparassinae is paraphyletic at the base of a large clade including all Sparassidae, except Sparianthinae (with *Carparachne* Lawrence sister to *Leucorchestris* Lawrence and *Pseudomicrommata* Järvi sister to *Eusparassus* Walckenaer) and Palystinae is polyphyletic (with *Panaretella* Lawrence, *Anchonastus* Simon, *Palystes* L. Koch and *Parapalystes* Croecer at the base of a clade including Polybetinae, Clastinae, Sparassinae and Chrosioderminae, and *Sarotesius* Pocock and *Adcatomus* Karsch at the base of a clade including *Tychius* Simon, Chrosioderminae and Sparassinae. These results represent the first steps towards the understanding of the evolution of sparassid spiders. However, the diversity is still poorly known in some regions and there are many genera to be described. The inclusion of these in the analysis might help elucidate the relationships between genera currently considered *incertae sedis*.

A new subsocial crab spider from Southern Queensland

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Sociality in spiders is extremely rare and often characterised by the construction of a communal web. Only four non-webbuilding species are known to be (sub)social, three of which belong to the crab spider genus *Diaea* (Thomisidae).

We present data on a recently discovered subsocial crab spider, inhabiting sclerophyll forests of Southern Queensland, Australia. Spiders built nests from leaves, similar to those of the subsocial crab spider *Diaea ergandros*. Nests contain up to 25 spiders and some nests contain multiple adult females, indicating the species to be on a transitory stage towards sociality. *D. ergandros* females care for their offspring and are finally consumed (matriphagy). In the recently discovered species however, some nests contained spiderlings of two distinct instars, suggesting that females might produce two clutches instead of being consumed by their offspring.

Morphological analyses suggest the species to belong to the genus *Tharpyna* and molecular phylogenetic analyses are currently under way. First results suggest that sociality might have evolved twice independently in thomisids.

Student poster presentation - Systematics & Evolution:

First three dimensional investigation of the hemolymph vascular system in the European garden spider *Araneus diadematus* (Araneae: Araneidae)

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The European garden spider is one of the most common spiders in Central Europe. Despite their abundance, comparatively little is known about its internal anatomy. In the course of a comparative survey on the circulatory system in spiders we therefore examined the hemolymph vascular system (HVS) of *A. diadematus*.

The HVS of *A. diadematus* was investigated by using micro computer tomography and serial sectioning and visualized by software-based 3D-reconstruction. In order to examine the HVS for intraspecific variability 30 specimens were studied.

The HVS of *A. diadematus* consists of a tubular heart in the dorsal midline of the opisthosoma. Anteriorly the heart gives rise to the anterior aorta and posteriorly to the posterior aorta. Furthermore three pairs of lateral arteries originate from the dorsolateral part of the heart. The branching pattern of the lateral arteries in *A. diadematus* is visualized and described for the first time. The anterior aorta runs through the pedicel into the prosoma where it branches to supply the muscles and organs with hemolymph. Especially the central nervous system is supplied by a number of arteries, which show some peculiar branching patterns e.g. a unilateral origin of the transganglionic arteries in the subesophageal ganglion and the supply of the lower lip by the first of these transganglionic arteries.

Furthermore the HVS possesses various arteries with asymmetrical origins. Some cases of intraspecific variability are demonstrated e.g. for the artery of the upper and the lower lip, supraneural artery, within the third lateral arteries. The presented data are discussed in comparison to information from the literature on the HVS in Araneae.

Oral presentation - Ecology:

Can we preserve spiders on the long run in fragmented nature reserve areas?

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With shrinking and more and more fragmented of natural areas conservation attempts are often restricted to small habitat islands. Therefore it is important to gain knowledge about long-term processes that affect the survival of the original biota in such reserves. We compared detectable changes of the spider assemblages in two isolated, small area nature reserves which have over 60 years of research history. The two areas (Bátorliget, 53 ha, swamp; Sas-hegy, 35 ha, isolated dolomitic hill, mostly grassland vegetation) each had three research periods, in the 1930–1940's, in the 1990's and in the most recent years; further, out of the three sampling campaigns two were done with comparable methods at both places. Analysing the changes in the respective spider assemblages through the three sampling periods we tried to reveal the nature of the changes. We set up three hypotheses. H0: no change (no significant change in species composition); H1: random drift (species composition changes, but no functional or other kind of qualitative change); H2: directional change (both species composition and the functional, qualitative compositions change – for instance, in response to climate change, or degradation due to increased disturbance). The changes in the two reserves were remarkably similar. Preliminary results mostly support H1. Assemblages collected with identical methods were in both cases closer to each other, but nevertheless showed that over time a compositional change is detectable, even using the same methodology. However, qualitative aspects of the assemblages virtually did not change – mean naturalness, humidity and light preference, vulnerability status remained constant for the spider assemblage in both areas over the considerably long research periods. The only degradative process we could observe was the gradual decrease in the ratio of rare species. We hope that the study helps other monitoring programmes, and sets the basis for further monitoring in the two studied nature reserves.

The phenomenon of solid scent gland secretion in the Palpatores (Opiliones)

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Representatives of the order Opiliones are characterized by large prosomal exocrine glands (syn. scent glands). In the suborders Cyphophthalmi and Laniatores, both scent gland morphology and the chemistry of the secretions indicate a defensive function whereas in the Palpatores scent gland characters appear to be much more heterogeneous, in some cases leading to aberrantly organized glands with probably modified biological functions. Especially in Dyspnoi, several unusual traits – such as ozopores hidden by cuticular structures – have recently been described.

Another striking phenomenon is due to the presence of solid structures in the scent gland reservoirs. In 1991, Juberthie and colleagues (1) initially found “crystals” in the scent gland lumina of species of *Ischyropsalis* (Ischyropsalidoidea). Our recent studies revealed solid secretion not only in *Trogulus tricarinatus* (2) but also in *Anelasmacephalus hadzii* and *Dicranolasma scabrum* (all Troguloidea), pointing to a broader occurrence of solid secretion among Opiliones, or at least within Dyspnoi. Naphthoquinones and anthraquinones – solid substances at ambient temperatures – were found in the scent gland secretion of *Paranemastoma quadripunctatum* (Nemastomatidae) and have to be dissolved in enteric fluid before released as a mixture (3, 4). Other nemastomatid species also produce volatile – and thus, presumably still defensive – substances in their scent glands. Interestingly, we also found solid globules in the apical part of the scent gland epithelium cells of several species of Eupnoi, namely in the Phalangiiidae *Phalangium opilio*, *Rilaena triangularis*, *Megabunus lesserti*, and in certain Sclerosomatidae, such as *Amilenus aurantiacus* and *Gyas annulatus*. In *R. triangularis*, these globules are orange to brownish and of about 400 nm in diameter. Furthermore, the globules could not completely be dissolved in different organic solvents and appeared very stable, as evidenced by observations in the environmental scanning electron microscope.

All these data, solid secretion in both dyspnooid superfamilies, dilution and liquid displacement of hardly soluble substances and virtually insoluble globules in the scent gland epithelium cells of some species of Phalangioidea indicates different evolutionary trends that possibly lead to a functional change of scent glands in these taxa.

Oral presentation - Systematics & Evolution:

Jurassic orbweavers

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Spiders are rare fossils, especially in rocks older than the early Cretaceous, which is the age of the earliest amber with biological inclusions. Nevertheless, a few examples of Fossil-Lagerstätten – strata with spectacular preservation – are known from the Jurassic period, and these include fossil spiders which elucidate aspects of spider evolution. In this talk I briefly review the fossil record of Jurassic spiders before concentrating on the Orbiculariae from this time period. The male of *Nephila jurassica* Selden, Shih & Ren, 2011 has been discovered, and it sheds a most interesting light on the evolution of sexual size dimorphism and the timing of the loss of the cribellum in orbweavers. In addition, the first Jurassic spider ever described, *Juraranaeus rasnitsyni* Eskov, 1984, a male orbweaver, has been restudied, and this specimen, too, adds interest to the story.

Student oral presentation - Ecology & Behavior:

Mate young, kill old: reversed sexual cannibalism and male mate choice in spiders

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Female mate choice is regarded as a strong selective force significantly affecting male mating success. In extreme cases it can result in sexual cannibalism. However, even males can choose between their partners and extreme male mate choice may be an explanation of the reversed form of sexual cannibalism. This is the situation in which males kill and consume females. We examined male mate choice in the spider *Micaria sociabilis*, focusing on the role of female mating status, her size and her age. Reversed cannibalism reached its highest frequency in the period of generation overlap, i.e. when young males from the second generation met old females from the previous generation. These results suggest discrimination against old females. The frequency of cannibalism was not affected by female mating status or female size. However, with increasing male size, the frequency of cannibalism in the second generation increased. Males of the second generation were significantly bigger than males of the first, suggesting a positive link between adult body size and individual aggression.

New orb-weaver genus from Central Asia (Araneae: Araneidae)

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Araneus Clerck, 1758 seems the most species rich genus in Araneae. Currently it accounts 668 species (Platnick 2012). Many, if not the most species considered in the genus are misplaced and belong to undescribed genera or genera thought to be synonyms of *Araneus*. The genus is relatively studied only the Holarctic. Study of Central Asian *Araneus* reveals a least three species, "*Araneus*" *pallasi* (Thorell, 1875), "*A.*" *strandiellus* Charitonov, 1951 and one undescribed, that are undoubtedly have no any relations to *Araneus* and should be placed in separate genus. All three species have similar habitus, size (2.5–5.0 mm), pattern, copulatory organs and share some somatic characters (3 retrol- and 2 prolateral teeth of chelicera) and small number of trichobothria on tibia (7–9). Females have a very simple, weakly sclerotised epigyne embedded into epigastric furrow, and merged, inflexible scapus. Males have an unusual bivalve shaped palp (tegulum and cymbium concealed all apophysis and embolus) with weak sclerotised conductor; long terminal apophysis enwrapping long, filamentous embolus without cup; and median apophysis with only one pointed terminal process. The description of genus is under preparation.

This work was supported in part by the conference student grant, and Russian Foundation for Basic Research (grants No 11-0401716 and 12-04-01548).

Student poster presentation - Ecology & Behavior:

Female genital damage of *Larinioides patagiatus* (Araneae: Araneidae)

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Spiders have many strategies how to maximize their success in sperm competition. Usually males can successfully protect their sperm against future rivals by blocking female insemination using amorphous plugs or with their own genitalia (e.g. whole bulb; broken embolus, or special embolic structures, cap, scale; conductor). These strategies are only mechanical barriers that block genital opening for a limited period of time. Further, some authors (Jackson 1980, Uhl et al. 2011) observed the mating plugs removal by another male. On the other hand only little attention has been paid to female genital mutilation. This loss is permanent and may be more effective in sperm competition. It is well-known fact that in orb-weavers the entire (or a part of) scapus (e.g. *Aculepeira*, *Araneus*, *Larinioides*) or a part of the base of epigyne (*Araneus sturmi*) may be broken. In general usually subtle and thin structures are broken. Male palp is anchored with scapus by median apophysis and conductor; therefore all parts are very important for proper fixing during copulation. Females of *Larinioides patagiatus* (Clerck, 1758) have very massive, pear-shaped scapus; we observed many specimens with partially broken ones. Closer examination of the epigyne has shown that scapus is constricted in the middle, which may fit with massive bipartite median apophysis. The upper part above the constriction was broken most probably during the final rotation of median apophysis. We hypothesize that broken scapus avoids sperm competition, because it makes connection between mates impossible and is caused by males during copulation; however, proving it experimentally failed due to complication with capture of a copulating pair.

The study was supported by conference student grant and VEGA 1/0176/09.

Inventarization of spider fauna of island Hvar

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As it is the case for the whole Croatia, majority of data on the spider fauna of the central Dalmatia dates back to the early 20 century. However, some recent works on the fauna of spiders of Zadar area have been published by Dobroruka (1994) and Rucner & Rucner (1995). Contribution to the knowledge of spider fauna of Dalmatia is also given by the Association for Biological Research – BIOM through their research of Karišnica River Canyon and Lake Vrana. In order to further collect data on the spider fauna of Dalmatia, Section for spiders of the Biology Students Association BIUS, conducted a survey on spiders of the Hvar island in 2011 g.

The research was conducted as part of the project “Biodiversity research of island Hvar 2011” organized by Association of biology students – BIUS. Section for Spiders was in the field from 2. till 8. of May and from 19. till 26. of September 2011. The research encompassed island of Hvar and island of Šćedro. Over 30 sites were covered in this research. The sites were chosen depending on the type of habitat, that is, the goal was to enfold as many types of habitats as possible to collect a more diverse fauna of spiders. Habitats that were covered are: stenomediterranean pure evergreen forests and underbushes of holm oak, rocky pastures and dry grasslands, olive groves, vineyards and urban areas. Sampling was conducted either by hand or by pooter techniques. The analization of collected material is still in progress but we are expecting a large number of species.

Student poster presentation - Ecology & Behavior:

Field observations on the mating behavior of Darwin's bark spider

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The sexual biology of *Caerostris darwini*, a size-dimorphic spider from Madagascar known to produce the largest orb webs, is essentially unknown with the exception of the preliminary reports made by its discoverers suggesting that Darwin's bark spider perform genital damage, mate guarding and mate plugging, and that the males also sever their palpal bulbs to become eunuchs. Here, we report on a two week field survey in Andasibe-Mantadia National Park in Madagascar, aimed to record crucial elements of *C. darwini* natural history with a focus on its reproductive behavior. We observed male-male competition and their pre-copulatory guarding of subadult females, which ceased web building 4 to 7 days prior to maturation. Males opportunistically mated with teneral females, mostly using both palps. While adult females mostly responded aggressively to mating attempts, those copulations that succeeded were shorter and the males employed mate-binding, a behavior previously known only from very few, unrelated size-dimorphic spiders. Copulating males damaged their palps during copulation, and subsequently became eunuchs by chewing off their palpal bulbs entirely within 24 hours. We hypothesize that the palpal leftovers in female genitals function as mating plugs, as in other orb web spiders known for the eunuch phenomenon. We plan to perform additional observations in controlled lab conditions in order to better assess the adaptiveness of male (opportunistic mating, female monopolization via plugging) and female (sexual cannibalism) sexual behaviors, which may hint at evolutionary mechanisms arising through inter-sexual arms race.

Student oral presentation - Systematics & Evolution:

The epigynal morphology of erigonine spiders and its evolutionary implications

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Linyphiid spiders, the second largest spider group, show highly diverse genital morphology. A newly published study on the epigynal morphology of “micronetine” spiders proposed a groove model as a basic type of linyphiid epigynum, and considered complex micronetine epigyna to be formed by modifications on the epigynal plate: protruding, elongated and folded, forming sigmoid scape partly hidden within an epigynal cavity. However, such a formation of the micronetine type fails to interpret the formation of most erigonine epigyna, since many of them have the epigynal plate neither protruding, nor elongated and folded, and some of the variations even take place under the epigynal plate. A linyphiid phylogeny based on molecular data shows that the representatives of Erigoninae and Micronetinae are nested together, forming a “micronetine-erigonine” clade. This means, despite the great differences, the epigyna of micronetines and erigonines have a single origin. In the present study, we used scanning electronic microscopy (SEM) to study the diverse epigynal morphology of erigonine spiders. By comparative study, we found that erigonine epigyna share with micronetines a same epigynal conformation, but differ in modifications on the epigynal plate. We mapped epigynal characters onto the phylogenetic tree to reconstruct the ancestral state of the common ancestor of all micronetines and erigonines and traced evolutionary changes. The results showed that starting with different modifications on the epigynal plate: invagination, protruding, bisection and laterally folded, the erigonine epigyna evolved into different types. In the diversification of erigonine epigynal morphology, both convergence and reversion have taken place multiple times. Based on this phylogenetic framework, a series of homologous variations were proposed and tested by adding them to the data matrices of two previous studies addressing the higher level phylogeny of erigonine spiders.

Poster presentation - Ecology & Biogeography:

“Cladophora canvas” as a special microhabitat supply – Investigation of winter activity of ground-dwelling spiders in the reeds

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In permanently water-covered environments primarily the vegetation provides the habitable conditions for terrestrial invertebrates. The secret of the sometimes crowded-looking (other times deserted) habitats lays in the special (environmental attributes of these) microhabitats supplied by the vegetation. These microhabitats play a crucial role in the spiders' life cycle. These cladophoran plants offer special micro-regulated climate chambers for the spiders, used for hiding, molting, wintering. This multitude of microhabitats contributes to the richness of the main wetland habitat and results in the presence of specialist species.

On this poster we report the preliminary results of an ongoing investigation concerning this special microhabitat.

The annual fluctuation of water level is a common phenomenon in Central European lakes. Due to even a mild eutrophication filamentous green algae proliferate and form a thin layer on the surface of the water and stretched out between the reeds. As summer passes due to the heat water level decreases and this algae 'canvas' will dry out, therefore would not keep up with the decreasing water forming a little tent above the water. If the water stay low during winter this canvas remains and isolates the space under it serving as special climate chambers for ground-dwelling spiders of the reeds.

Special microclimate conditions apply here: direct sun exposure warms the canvas' surface quickly and the animals will come out with unusual high winter activity. The highest temperature has been measured here, whereas under it, the climate chambers have lower maximum values, but with less variability providing more stable condition for overwintering. Due to the evenness of the temperature in the chambers, these are the warmest places of the reeds in cloudy, colder weather conditions so spiders can hide under the cladophora sheet and find shelter.

In our study special water pitfall traps were placed at the surface of the green algae layer and at the underlying space. The temperature of the water (or ice), the inner and the outer surface of the Cladophora-canvas and the top level of the reed (2 meters) were monitored with automatic thermometers.

During the several weeks of winter collecting it has been confirmed that some spider species can be conspicuously active on the surface of the canvas even in winter. The higher activity is due to the warm dark "mat" surface (warming up quickly in direct sun exposure), visited by spiders overwintering below in the climate chambers, which are slightly colder, but with less fluctuations. Likely their preys also show this behavior.

According to our observations during the summer months it can also be characteristic that wolf spiders carrying their egg knots reside either in the upper or in the more protected lower layer according to the weather conditions.

Our study was performed at Lake Velence in Agárd, at the István Chernel Bird Observatory. This work was supported by **TÁMOP 4. 2.1/b** grant.

Poster presentation - Systematics & Evolution:

On the European *Trebacosa europaea* (*Lycosidae*): new data on the morphology and distribution

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The genus *Trebacosa* has been erected in 1981 to host *Trebacosa marxi* (Stone, 1890) originally placed into *Pirata*. Later *Trebacosa* species without further identification has been recorded from France (Villepoux 1995) and one from Ukraine (Zhukovets 2003). In 2005 two species have been described: *T. Europaea* by Szinetár & Kancsal (2005) from Hungary and *T. Brunhesi* by Villepoux from France. Platnick (2012) has mentioned “the two species are probably the same” and the earlier publication date puts *T. Europaea* as older name. Szinetár & Kancsal described only males, whereas Villepoux has described both sexes.

The last five years provided with some additional specimens identified as *Trebacosa*; some females from Hungary a female from Greece, and some of both sexes from several localities in France, thus we see the time suitable to try to conclude the status of the putative synonymy and summarize our knowledge of *T. Europaea* by examining all the specimens available from all the localities.

A slight variation of the female vulva has been observed and discussed.

Oral presentation - Physiology & Functional Morphology:

Effects of glyphosate (herbicide) and bifenthrin (insecticide) on *Pardosa sumatrana* (Lycosdae: Araneae)

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In the present study effects of Glyphosate (herbicide) and Bifenthrin (pyrethroid insecticide) on the common ground spider, *Pardosa sumatrana* were evaluated. Spiders were collected from the agricultural fields of District Sargodha, Punjab, Pakistan using suction device. To record the mortality spiders were exposed topically to the different concentrations of Glyphosate and Bifenthrin. Mortality was recorded till 48 hours after the exposure. To test the residual effects only the recommended field rate concentrations of Glyphosate and Bifenthrin were used. We observed a significant difference in mortality with dose and time in topical exposure experiment. Males were found to be more susceptible compared to the females. LT 50 values against Glyphosate at field rate concentration were 21.49 and 25.27 for males and females respectively. However, for Bifenthrin LT 50 value were 17.60 and 21.21 for males and females. Results of the residual toxicity experiment showed that herbicide exposed soil cause about 15% mortality even after 10 days of exposure. However, mortality was 25% after 10 days with the soil exposed to the insecticide. It is concluded Glyphosate and Bifenthrin are thread to the studied spider species in the area.

Oral presentation - Systematics & Evolution:

Re-dicovering the arachnid fauna of the Brazilian Amazon

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The Amazon forest is frequently regarded as one of the most richest spot in the world in the terms of fauna and flora. For arachnids on the other hand at least 70% of the total area of the Amazon basin remains unexplored, and from 50 to 90% of the material collected in the few explored localities is composed of new taxa. Several species already described for the Amazon are also represented only by the type material, never being sampled before, and not rarely the type series are in bad conditions so far these species are not recognizable posing an impediment to the description of new taxa, obfuscating the knowledge of the diversity in the basin. We have been searching for the positive identities of selected groups of arachnids distributed in Amazonia, Opiliones Sclerosomatidae, Cyphophthalmi, Ricinulei, Araneae Uloboridae and others, we have been mapping accurately their distributions by confirming the records present in the literature and the new ones, checking the taxonomic status of the specimens cited in the registers, when possible, providing qualitative and quantitative sampling in localities never sampled before and the type localities. As part of this work we have recently joined a team of very experienced arachnologists to collect in two localities in the Amazon of major taxonomic importance, the Ducke Reserve, in Manaus and the Jufari River, a branch of the Negro River located in Roraima. As a result we have sampled more than 40 individuals of ?*Gen enigmaticus* Martens, 1969 a species known only by the type material and that the proper placement in one of the known genera is uncertain. The male of the Ricinulei species *Cryptocellus iaci* Tourinho, Lo Man Hung & Bonaldo, 2010 was also sampled for the first time and its inclusion in the *foedus* group is now possible based on the characters of the male apparatus. Several new species and new registers for several species included in 25 families of spiders were also sampled and the forth species of the family Guassiniidae (Opiliones) were collected and identified. Additionally, important new data on both aggregation and maternal care in *Phareicranaus manauara* (Pinto-da-Rocha, 1994) (Cranidae) and the first case of biparental care in Opiliones for *Protimesius longipalpis* (Roewer, 1943) (Stygnidae).

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Movable epigynum evolved in linyphiids

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Genital morphology is highly diverse and is very informative in studying animal evolution and for phylogenetic reconstruction. A great body of evidence has shown that sexual selection plays an important role in genital evolution. With diverse genitalia, cryptic female choice is thought prevalent in spiders. Linyphiid spiders, as the second largest spider group, have complex genitalia with great variations in morphology. Comparing to exaggerated diversification of male palps, epigynal morphology is relative conservative. However, the epigyna in some groups are movable, which suggests some special significance in cryptic female choice. In the present study, we try to infer the evolution of movable epigyna in linyphiids on a phylogenetic framework. DNA sequence data for five genes (mitochondrial CO1, 16S; nuclear 28S, 18S, histone H3) and morphological data on epigyna were collected. We constructed a higher-level phylogeny of linyphiid spiders based on molecular data; mapped the epigynal characters onto the phylogenetic tree, and traced back the ancestral state and evolutionary changes. Our results show that movable epigyna independently evolved in linyphiids several times. Comparative study of epigynal morphology indicates that epigynal movability in different linyphiid groups resulted from modifications of different parts of the epigynum. Taxa with a movable epigynum usually have a complex male palp with exaggerated modifications. This implies that female choice in these groups is probably exerted by the female's selective cooperation, based on the stimuli provided by males, and that different types of epigynal movability may result from different selective mechanisms.

Poster presentation - Systematics & Evolution:

A new species of *Troglohyphantes* from a Turkish cave (Araneae: Linyphiidae)

Tuncay Türkeş, Aydın Topçu, Osman Seyyar, Nurcan Demircan & Hayriye Karabulut

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A new species of *Troglohyphantes* Joseph 1881 is described from Turkey. Differences between the new species and related species are discussed. The morphological characters to distinguish this species from the closely related species are indicated and illustrated. Notes on habitat and some SEM photos belongs to this species are also given.

The origin of a mating plug: a 3D analysis of the male palp in *Oedothorax retusus*

Gabriele Uhl, Oliver Vöcking & Elisabeth Lipke

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One of many existing male strategies to secure paternity is the production of a solid mass that covers the female genital opening after mating. Such mating plugs have been found in a wide range of animal taxa, from nematodes to mammals. In entelegyne spiders, mating plugs are particularly common, probably as a consequence of the separate copulatory ducts that occur in the female genital tract. Here, sealing one or both of the copulatory openings does not prevent the female from egg-laying but can reduce female remating success with rival males.

In the erigonine spider *Oedothorax retusus*, females show amorphous masses on their copulatory openings after mating. The size of the mating plug is related to copulation duration and a male has to mate for a certain time period in order to produce an effective plug (Uhl & Busch 2009). The plug production site in *O. retusus* must be found in the male copulatory organ since only the male palp is in contact with the female genital region in the course of mating. A previous study on the palpal gland of two *Amaurobius* species demonstrated that the plug material is transferred to the female via a duct that is not connected to the spermophore, which suggests that the application of plug material and the transfer of sperm are separate processes (Suhm et al. 1996).

We scrutinized the male palp of *O. retusus* for glandular tissue using Micro-Computer-Tomography as well as histological sectioning. This combined approach allowed us to determine the position and extension of the gland precisely. The massive gland is situated in the center of the palp surrounded by the tube-like, winding spermophore. The gland does not possess a separate duct, instead it releases its product into the posterior third of the spermophore. The position of the gland's entrance suggests that the plug material can only be applied at the end of sperm transfer. This finding corroborates our previous observation that plug efficacy is related to copulation duration. The application of plug material at a late stage during mating may have consequences for female choice since it potentially allows the female to decide against a male by ending copulation prematurely.

Species richness of Ground Dwelling Spiders along the altitudinal gradient in Nanda Devi Biosphere Reserve, Western Himalaya, India

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Spiders are the important invertebrate predator of most terrestrial habitats, playing important role in shaping their arthropod communities. Despite of their fundamental roles in the natural ecosystem, they have largely been ignored in conservational studies. They are sensitive to a wide range of environmental factors including season. The present study was carried out in Nanda Devi Biosphere Reserve (NDBR). In the present study, we attempted to investigate the effect of season on ground dwelling spider assemblages along the altitudinal gradient in Nanda Devi Biosphere Reserve (NDBR). Spiders were collected by using pitfall traps and by ground hand collection method. Collected specimens were transferred to 70% alcohol and identified up to genus and species level. Voucher specimens were deposited at Wildlife Institute of India, Dehradun. Three sites – Site 1: Lata Kharak (2000 m – 4000 m); Site 2: Bhyundar Valley (1800 m – 4200 m) and Site 3: Malari (3000 m – 4000 m) with substantial altitudinal range were selected. Sampling was carried out from March 2009–October 2010 over three seasons: winter (November–February), summer (March–June), monsoon (July–October). In total 61 species were collected from the sampling sites. The results showed that the overall species richness decreased with altitude in all the three sites. Contrasted with site 3 (Malari), site 1 (Lata Kharak) has an overall more species richness, while site 2 (Bhyundar Valley) has lower species richness in comparison to Lata Kharak (Site 1). In site 1 species richness decreased linearly with altitude ($p < 0.005$, $df=1$) in all the three seasons (summer $r^2=0.64$; monsoon $r^2=0.66$; autumn $r^2=0.62$). A significant interaction between season and altitude in this site ($X^2=7.07$, $p < 0.005$) was observed. In site 2, linear decline of species richness along the altitudinal gradient ($p < 0.05$, $df=4$; summer $R^2=0.46$; monsoon $R^2=0.72$; autumn $R^2=0.53$) was also observed. Species richness was negatively influenced by altitude and decreased linearly and significantly in site 3 ($p < 0.05$, $df=1$) and there was also an interaction effect with season and altitude ($X^2=10.22$, $p < 0.005$). There was slightly more species richness at each site in summer than monsoon and winter as compared to winter. The expected species richness was higher in summer in all the three sites. The study was important as it provides the first comprehensive inventory of ground dwelling spiders from this region. Checklist and interactive keys for collected spider species were produced and would be accessible in the public domain in future. Study thus accelerates the rate of description, documentation and understanding of ground dwelling Himalayan spider diversity.

Student oral presentation - Systematics & Evolution:

Advances in the phylogenetic systematics of the spider genus *Ixchela* Huber, 2000 (Araneae: Pholcidae) with morphological and molecular evidence (COI and 16S)

Alejandro Valdez-Mondragón

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The spider family of Pholcidae is composed of five subfamilies, 84 genera and 1138 species worldwide. Although there have been several contributions to the knowledge of pholcids from North and Central America, there are a lot of unknown species in this region. Mexico has representatives of the five subfamilies of Pholcidae, with 13 genera and 152 species. The genus *Ixchela* is distributed in Mexico and Central America, being a little-known genus with only five described species: *Ixchela abernathyi*, *Ixchela furcula*, *Ixchela pecki*, *Ixchela placida* and *Ixchela simoni*. Currently, there are around 20 new species of the genus *Ixchela* in the process of description, and the first phylogenetic analysis of the genus is presented. The objective of this work was to test the monophyly of the genus *Ixchela* with morphological and molecular data using two mitochondrial genes (COI and 16S). The phylogenetic analyses were done using Maximum Parsimony with the program TNT. The morphological matrix has 20 taxa and 37 characters; using equal weights obtained 18 most parsimonious cladograms (MPC), the strict consensus tree supported the monophyly of the genus with nine synapomorphies and with high Jackknife values (99%). Using implied weighing with seven arbitrary *K* values, the analysis found only nine MPC with similar topologies to those found with equal weighing, and supported the monophyly of *Ixchela* with high Jackknife values (99%). Although the monophyly of *Ixchela* was supported by morphological data, there was no internal resolution between species, only few clades were found but with low Jackknife support. With molecular data, each character matrix was composed of 19 taxa and 683 characters (COI), and 19 taxa and 480 characters (16S). Separate analyses supported the monophyly of *Ixchela* with Jackknife support value of 75% (COI) and 96% (16S), yielding better internal resolution than morphological data. In separate molecular analyses (COI and 16S), COI yielded better internal resolution within *Ixchela* than 16S found six clades, whereas 16S recovered only one clade. Using combined evidence (morphology + COI), the analysis found 36 MPC supporting the monophyly with 98% of Jackknife value, recovering three internal clades of six recovering with COI and the clade recovered with 16S. With combined molecular evidence (COI+16S), the analysis found only one MPC supporting the monophyly with 97% of Jackknife value, recovering five of six clades found with COI, and found the only clade found with 16S. Finally, the analysis with total evidence (morphology+COI+16S) found two MPC supporting the monophyly of the genus with 100% of Jackknife value, with the same topology as the tree found with COI+16S. The molecular data produced better internal resolution than the morphological data alone, establishing solid relationships within the genus *Ixchela*, although there are around 10 additional new species to be described and included in the final analyses.

DNA barcoding symposium:

In search for the absolute truth – or how close can we get to absolute certainty?

Peter van Helsdingen

European Invertebrate Survey – Nederland, Naturalis, Leiden, Netherlands

Identification of a specimen is a subjective process which depends on the ability of the identifier to understand a description and decipher illustrations of morphological characters. Identifying a specimen is a subjective activity. The use of an identification key leads to a solution, a species name, through a system of positive or negative selection of morphological characters used in the key. The only objective element in this field of is the absolute link of a scientific name to a unique specimen, the holotype. The use of DNA as a tool for recognition of a species again is a subjective procedure with a fair chance on chaotic results. A plea for standardization of procedures in a protocol involving specialists for each taxonomic entity.

Poster presentation - Systematics & Evolution:

Streamlining spider DNA barcoding protocols: High throughput DNA extraction and a new *cox1* primer

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The aim of our pilot project was to streamline the existing DNA barcoding protocols for spiders. We used recently gathered exemplars of 15 species selected to represent all major spider clades, and attempted to identify the best automated DNA extraction and mitochondrial cytochrome C oxidase subunit I (*cox1*) amplification protocols emphasizing the standard barcoding region. We optimized the extraction of the genomic DNA using the Mag MAXTM Express magnetic particle processor, an automated high throughput DNA extraction system. We processed a wide range of spider tissues of varying size and quality and were able to improve the protocol of an internal program and increase the efficiency of the procedure. We then tested the utility of ten primer pairs routinely employed for targeting arachnid *cox1*. The best results were obtained with the standard Folmer primers (LCO1490 / HCO2198), which capture the standard barcode region, and with the CI-J-2183 (Jerry) / C1-N-2776 (Maggie) primer pair, which amplifies the extension of the standard barcoding region. However, Jerry forward primer is designed too close to the HCO2198, and thus in practice the resulting sequences from the two primer pairs almost never overlap. Therefore we designed a new forward DNA primer "Tom", 60 base pairs upstream of the Jerry binding site. The Barcode of Life Database (BOLD) and National Center for Biotechnology Information (NCBI) databases were used to identify the optimal primer in the conserved region in that area. The use of Tom allows overlapping of the sequence obtained with the standard Folmer primers with the sequence of the new Tom/Maggie primer pair and assembly of this part of the *cox1* gene sequence without leaving the gap between the two regions. We provide the best PCR protocols for these primer sets.

Plenary speaker:

The secrets of silk

Fritz Vollrath

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Spider silks, like the silks of other arthropods, use proteins as the structural components and water as the solvent. Protein and water combine and separate – under ambient pressures and temperatures – to make the silk thread, which can be so tough that it outperforms even the best man-made fibres.

So far, our studies of spider silks and webs have lead us to a number of important discoveries ranging from tunable nano-scale composite structures (that absorb energy hydro-electrically) to complex self-assembling micro-machines (that absorb energy mechanically) all the way to the building of complex webs cleverly engineered to absorb energy aerodynamically. All these ways-and-means are the works Nature's 'Design by Evolution', which is a powerful albeit rather time consuming process, to create and fabricate highly functional – and energy efficient – materials, devices and systems.

Importantly, silks are not only interesting as highly evolved natural materials but seem to have a bright future both as models to guide our understanding of energy efficient biopolymers but also as prototype models to guide the design of totally novel polymer systems be it for medicine or engineering. www.oxfordsilkgroup.com

Alpine endemism: Reconstructing the faunal history of *Megabunus* harvestmen

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The European Alps provide a suitable geographic model system to tackle central questions about the evolutionary history of species living in high altitudes.

This study uses integrative taxonomy to reliably delimitate species and aims to reconstruct the history of five Alpine-endemic species of the harvestman genus *Megabunus* (Opiliones: Phalangidae: Platybuninae: *M. armatus*, *M. bergomas*, *M. lesserti*, *M. rhinoceros*, *M. vignai*). These vicariant species inhabit rocky areas associated with established glacial refugia and their vertical distribution ranges from the montane zone to the high-alpine zone.

In more detail, information from landmark-based geometric morphometrics, traditional morphometrics, mitochondrial and nuclear DNA and chemical analyses of scent-gland secretions plus cuticular hydrocarbons is combined.

We densely sampled all species at known as well as previously unnoticed populations throughout the Alpine region (Nice – Lower Austria). The results of our dense sampling corroborate the geographical parthenogenesis hypothesis in *M. lesserti*. Clues for geographical parthenogenesis were also discovered in *M. vignai*. All nominal species were monophyletic with respect to 16s mtDNA, but mitochondrial data revealed the presence of geographically well separated clades within species. AFLP phylogenies show a similar, but not identical picture. Geometric morphometrics analyses were successfully applied of the cephalothorax and largely support the mtDNA clades. Chemical data are being processed. To sum up, all methods show partial congruence and the results indicate the potential presence of cryptic species and clearly show the advantages of integrative taxonomy.

Poster presentation - Behavior:

Wrap-attacking coincides with silk decorating in orb web spiders

André Walter & Mark A. Elgar

Department of Zoology, University of Melbourne, Victoria 3010, Australia

Spider orb webs are highly developed prey capture devices. Their sophistication is based on a combination of inconspicuousness and a maximal capture area by minimum use of silk. The behavioural response of orb weavers to capture events, however, may vary depending on the type of prey, its relative size and the condition of the spider. Orb weavers use two basic strategies to subdue prey, venom-injecting bites and wrap-attacks. Recently, the latter has been suggested to be physiologically linked with the silk decorating behaviour in *Argiope* species, because the silks used for decorating and wrapping both mainly consist of products of the aciniform glands. However, this potential link has been only described for *Argiope* spiders and otherwise just hypothetically inferred from phylogenetic data. We here tested whether silk decorating and wrap-attack behaviour are coinciding by studying the prey-capture performance of four Australian orb weavers that share the same habitat using two types of prey – House flies and House crickets. For comparison, we chose two silk decorating species – *Gea theridioides* and *Araneus bradleyi* – vs. two non-decorating species – *Backobourkia heroine* and *Araneus hamiltoni*. Each spider was fed with one item of either prey type every other day for five subsequent events.

Our results reveal that all four species are generally capable of performing wrap-attacks. However, all spiders more frequently used those attacks when fed with the larger prey, House crickets. The decorating species thereby used wrap attacks significantly more often in both feeding regimes. Our results illustrate the importance of wrap-attacks for overcoming large prey and support the hypothesis that silk decorating and wrap-attacking may be linked in orb web spiders. Further investigations, however, should reveal the proximate mechanisms explaining a potential inevitability of that link.

Oral presentation - Behavior:

Circular web decorations and the prey attraction hypothesis

André Walter, Mary Shuttleworth, Brooke Martinuzzo, Jonathan Thomas, Michelle Cieleish & Mark A. Elgar

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Web decorations are putatively well understood animal signals. These extra structures in orb webs of spiders have been the subject of numerous studies for more than one hundred years. However, apart from a substantial lack of knowledge on the evolutionary origin of web decorating the debate about functions of the decoration signal remains lively. One of the most compelling explanations addresses its role as a prey attractant. The diversity of web decoration patterns is very high across different spider taxa rendering a general validity of such an effect unlikely. Web decorations in the araneid genus *Argiope* consist of zigzag-shaped silk bands arranged in species-specific patterns. Accordingly, four different main arrangements in the webs of these spiders can be classified: linear, cruciate, circular or irregular shapes. While prey attracting effects have been revealed for linear and cruciate forms, it has not yet been unambiguously shown for the latter two.

We tested the prey attraction hypothesis for silk decorations in *Argiope mascordi*. This species builds both cruciate and circular decorations. Thus, we comparatively investigated both patterns in terms of their prey attracting signal effect on House flies (*Musca domestica*). Adult females were allowed to build webs in Perspex frames, and in a first experiment they were assigned to one of six experimental groups. To test for differences that may derive from different UV-contrasts pairs of webs, either containing a circular decoration or not, were placed in front of three different backgrounds: UV-light reflecting white paper, UV-absorbing black paper and rock-tiles resembling the natural background. Subsequently, the three pairs of webs were placed in a flight arena containing 30 house flies for one hour, and the prey capture success of each web was recorded. We could not detect any significant differences in prey interception rates, neither related to the different backgrounds nor the presence of a circular decoration. In a second test we used the same setup with three frames containing either a circular, cruciate or no decoration in front of the UV-absorbing black background. Again, we could not detect any differences in prey interception rates depending on the decoration pattern. Consequently, we conclude that silk decorations of *A. mascordi* do not serve as prey attractants. As *A. mascordi* does not build webs into the vegetation but almost exclusively on exposed rocks, we discuss its decoration as an anti-predator signal.

Effect of low temperature on *Argiope bruennichi* (Scopoli, 1772) density

Wioletta Wawer

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In the recent decades, a strong expansion of thermophilous invertebrates to the north has been observed. It is probably associated with warming of the climate. Thermal conditions belong to the main factors which determine the expansion of southern species. Low temperature seems to be an essential factor restricting the expansion of spiders which, thanks to passive dispersal, show outstanding capabilities to extend their range. *Argiope bruennichi* is a good example of such an expansion. Although this species quickly widens its range, it has been absent in north-eastern Europe for a relatively long time.

The present research was done in the context of expansion history of *A. bruennichi* and climatic factors. It included two regions which differed in terms of territorial occupancy and climatic conditions. In each region, population size and density of *A. bruennichi* were studied in a few selected localities. A comparative analysis showed the very low density in northernmost places of its occurrence where winters were very hard and where the wasp spider had appeared in the last decade. As a result, a hypothesis about the decisive influence of low winter temperatures on the survival rate of the nymphs in a cocoon was put forward. However, results of content analysis of the cocoons collected in spring in two regions were surprising. It turned out that the survival rate of young specimens was 70% higher in the regions characterized by hard winters than in the areas where they were mild. The results indicate that *A. bruennichi* population survival is probably strongly dependent on spring freeze which is particularly heavy in the area of "Polish cold pole".

Inbreeding depression and cryptic female choice in *Argiope australis*

Klaas W. Welke & Jutta M. Schneider

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Mating with close relatives may reduce the fitness of an individual through the expression of deleterious recessive alleles and the loss of heterozygosity in inbred offspring. This inbreeding depression can reduce the fitness of an individual dramatically and is suggested to be a main selective force for the evolution of polyandry (multiple mating by females). Polyandry opens the stage for post-copulatory sperm interactions inside of the female such as sperm competition and cryptic female choice. Through post-copulatory choice females may discriminate between the ejaculates of several mating partners and compensate the costs of inbreeding.

Polyandry is quite common in the entelegyne spider genus *Argiope* and females are capable to partly compensate the costs of inbreeding post-copulatorily. The paired spermathecae of entelegyne spider females form the perfect venue for post-copulatory choice mechanisms. Only recently it had been shown that females of *Argiope lobata* use cryptic female choice to bias paternity towards non-siblings and thereby discriminate against inferior sibling males.

In this present study we measured the actual costs of inbreeding in the wasp spider *A. australis* and we investigated whether females use inbreeding avoidance mechanisms prior, during, or after copulation. Inbreeding depression was assessed by creating an inbred and an outbred generation and comparing their adult body size, adult weight, and their lifespan. We also observed all of these copulations to find any signs for discrimination between siblings before or during mating. Post-copulatory choice mechanisms were investigated by mating females to both a sibling and a non-sibling male and counting the sperm of each individual male.

Our experiments revealed negative effects of inbreeding in *A. australis* after only a single generation. The most apparent effect was the reduction of adult lifespan of inbred females by almost 50% and a bit less for males. We found no effect on body parameters in females whereas inbred males were smaller and lighter than outbred ones. Our results suggest that inbreeding avoidance mechanisms are highly adaptive in *A. australis*, but similar to other studies we found no pre-copulatory discrimination between siblings.

The sperm counts revealed no strong indications for cryptic female choice but we found that sperm numbers transferred or stored by non-sibling males were slightly higher. However, these differences were only present in second copulations of females suggesting that they use polyandry to trade-up to inferior mating partners. The lack of statistical significance in the sperm counts may be due to limited power of our data set rather than absence of the mechanism in *A. australis*. Since we found stronger evidence for cryptic female choice in *A. lobata* we tentatively suggest that polyandry is a widespread mechanism to avoid incompatible genomes in *Argiope*.

Sexual cannibalism benefits offspring survival in *Argiope bruennichi*

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Polyandry may provide females with benefits that directly affect their condition and fecundity and/or that enhance the quality of their offspring through receiving better or more compatible paternal genes. In polyandrous species with sexual cannibalism, females may gain considerable nutritional benefits through consuming a mating partner. However, in many spiders with high rates of sexual cannibalism, males are very small compared to the females and nutritional gains through sexual cannibalism are considered small or absent. While this is widely accepted, no study has tested for effects of multiple mating with and without sexual cannibalism on female and offspring fitness. We designed an experiment that simultaneously investigated direct and indirect benefits of polyandry and sexual cannibalism in the orb-web spider *Argiope bruennichi*. We used monandrous and polyandrous females that were either allowed to consume their mating partner or not and recorded fecundity traits and offspring survival under simulated overwintering conditions. We found that female mating rate did not affect fecundity or offspring survival. But independent of female mating rate and the number of males consumed, cannibalistic females produced bigger clutches with heavier eggs. Cannibalistic females produced offspring with a prolonged survival time compared to the offspring of females that were prevented from eating males. This prolonged offspring survival was independent of female mating rate and the number of males consumed.

How effective are mating plugs in the dwarf spider *Oedothorax retusus*?

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A male mating strategy to avoid or reduce sperm competition is the production of a mating plug. Mating plugs often consist of secretory substances that are produced in accessory glands. Previous studies on *Oedothorax retusus* (Linyphiidae, Erigoninae) showed that a secretory substance can be found on one or both female genital openings after mating. In *Oedothorax retusus* plug size was shown to be correlated to copulation duration with larger plugs being more probable after long copulation. In double mating trials with short remating interval, the efficacy of a plug was shown to depend on mating duration of the first mating suggesting that larger plugs are highly effective whereas small plugs do not impede remating (Uhl & Busch 2009).

We investigated the efficacy and durability of the mating plug depending on the interval between first and second mating. We staged double matings with different time intervals and investigated mating success of subsequent males as well as female behavior during courtship and copulation. We used two experimental groups: in group A females were allowed long first copulations (3 minutes) whereas in group B females were allowed to mate for only 1 minute. Second copulations were staged after the following time intervals: 15 minutes, 1 hour, 1 day, 3 days and after oviposition. By amputating a palp in each male we forced successive males to insert the remaining palp into the same copulatory duct.

Remating probability significantly differed between treatment groups. In group A remating probability was highest in trials with short mating intervals and decreased with increasing interval, suggesting that plug material hardens over time. In group B subsequent males were prevented from mating, irrespective of interval length. Our results demonstrate that the efficacy of the mating plug in *O. retusus* strongly depends on mating duration as well as on the remating interval.

Student oral presentation - Systematics & Evolution:

Comparative and functional morphology of claw tufts in representatives of eleven spider families

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Many wandering spiders bear hairy attachment pads (claw tufts) on the tips of their legs. The pads consist of hierarchically-branching adhesive setae (Homann, 1953). Amongst spider families and even species, these show remarkable differences in morphology. Adhesion of claw tuft has been recently shown to be effected by substrate topography (Wolff and Gorb, 2011) and ambient humidity (Wolff and Gorb, 2012). Thus, one can hypothesize that differences in the claw tuft morphology might be adaptations to specific environments. In the present study, claw tuft microstructure of representatives of nine dionychan and two lycosoid families was studied using scanning electron microscopy. General patterns of the claw tuft microstructure were shown to be consistent with claw tuft function. Claw tufts of the majority of species studied show a similar gradient in size and shape from anterior to posterior legs: the dimension of pads increases, while setal density decreases. Accordingly friction forces of separated claw tufts on glass increase from anterior to posterior legs in the ctenid *Cupiennius salei*. Additionally, there is also a gradient of both the seta and spatula size within the claw tuft: setae become larger from the proximal to the distal part of the claw tuft, and spatula size increases in the same direction at the level of individual seta. Different hierarchical levels of claw tuft organisation are differently expressed in different species: species with lower setal density usually have broader setae. Smaller spatula size often correlates with a higher density of them. Differences are discussed according to the ecology of species. Adhesive setae are classified by their complexity and tip geometry indicating a possible evolutionary trend in setal specialization from unstructured tactile setae to lamelliform adhesive setae with fringed tips.

Oral presentation - Systematics & Evolution:

Treating Fossils as Terminal Taxa in Divergence Time Estimation Reveals Ancient Vicariance Patterns in the Palpimanoidea Spiders

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Incorporating fossils into biogeographic studies can have a profound effect on the resulting conclusions, particularly when fossil ranges are non-overlapping with extant ranges. This is the case in archaeid spiders, where there are known fossils from the Northern Hemisphere, yet all living members are restricted to the Southern Hemisphere. To better understand the biogeographic patterns of archaeid spiders and their Palpimanoidea relatives we estimate a dated phylogeny using a relaxed clock on a combined molecular and morphological dataset. Rather than dating the phylogeny based only on molecular data with the dates coming from node calibrations derived from fossils in a semi-arbitrary fashion, we treat fossils as terminal tips within a Bayesian framework, allowing a much more natural and less subjective connection between data, uncertainty, and inference than has been possible with previous methods. Estimation of ancestral biogeographic ranges is then performed, using likelihood and Bayesian methods to take into account uncertainty in phylogeny and in dating. Our analyses suggest that the diversification of the northern and southern archaeid lineages was congruent with breakup of Pangaea into Laurasia and Gondwanaland. This analysis provides a rare example where a dated phylogeny confirms a biogeographical hypothesis based on vicariance due to the breakup of continental plates.

Student poster presentation - Systematics & Evolution:

Systematics and phylogeography of the Asian spider family Liphistiidae

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Liphistiid spiders, the most basal branch of living spiders, are unique among all spider groups in possessing abdominal tergites in addition to spinnerets positioned in the mid of abdomen. To date, 89 species in five genera have been described in the family Liphistiidae, and their range is restricted to South-east and East Asia. Although since their discovery in 19th century previous studies on liphistiids have almost exclusively only focused on taxonomy, the liphistiid systematics and phylogeny are still poorly understood. The main reason for this is primarily their rarity in collections and their limited geographic distribution. During our recent intensive collecting in China we found that liphistiid spiders are locally rather abundant, and regionally diverse. Here, we first present the taxonomic changes of the family Liphistiidae since it was established, and then show the distribution of four liphistiid genera in East Asia according to the literature records and our recent collections. The main focus of our project, on which progress we report here, is the phylogeography of the lineage in East Asia, and thus we present preliminary phylogeographic hypotheses for the origin, the route of dispersal and biogeographic barriers in the region.

Oral presentation - Systematics & Evolution:

Evolutionary and taxonomic implications of the ground spiders' (Araneae, Gnaphosidae) male palpal organ morphology

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A detailed morphology of the male copulatory organs of ground spiders (Gnaphosidae) is presented. The homology of several palpal elements within the family Gnaphosidae is established; possible homology these structures with those in other spider families is discussed. The ground plan of the gnaphosid genital bulb is compared with the bulb of other genera of Entelegynae. The ground-plan of gnaphosid palp is based on tripartite organization, including three basic sclerites: subtegulum, tegulum and embolus bind together by inflatable membranes. Comparative analysis of palps shows that all gnaphosid spiders on their male palp organization may be divided on three groups.

Zelanda has the most "primitive" close to common ancestor construction of palp. Its basic characteristics are: tripartite bulb divided on subtegulum, tegulum, and embolus, flexibly jointed by inflatable membranes (basal hematodocha, middle hematodocha, and distal tubular membrane). *Encoptarthria* has apical division of the bulb subdivided onto distal sclerotized tube (in *Zelotes* Platnick & Shadab, 1983 have described an intercalated sclerite that according recent study corresponds to distal sclerotized tube of *Encoptarthria*) and embolus itself. Both sclerites flexibly connected between each other. *Gnaphosa* represents progressive simplification of bulb construction that leads to fusion of proximal side of embolus with distal end of the tegulum. The embolus in this spider is firmly attached to the tegulum and distal tubular membrane is reduced. This pathway, very probably, represents most general trend in the male bulb evolution in gnaphosid spiders.

Chemical defence against ants of web building spider and its evolution

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Spider webs are efficient at capturing prey. However, the web also exposes the resident spiders to many potential predators, such as ants, especially in tropical terrestrial ecosystem. Surprisingly, ants are rarely observed foraging on the webs of orb-weaving spiders, despite the formidable capacity of ants to subdue prey and repel enemies, the diversity and abundance of orb-web spiders, and the nutritional value of the web and resident spider. We explain this paradox by reporting a novel property of the silk produced by the orb-web spider *Nephila antipodiana* (Walckenaer). These spiders deposit on the silk a pyrrolidine alkaloid (2-pyrrolidinone) that provides protection from ant invasion. Furthermore, we proved that this compound represents an adaptive response to the threat of natural enemies, rather than a simple by-product of silk synthesis: while 2-pyrrolidinone occurs on the silk threads produced by adult and large juvenile spiders, it is absent on threads produced by small juvenile spiders, whose threads are sufficiently thin to be inaccessible to ants. This defensive mechanism, so far, has been found to be widely employed by web building spiders.

Student poster presentation - Ecology & Behavior:

Phylogenetic diversity of arboreal spiders in a temperate forest

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The Araneae make up the majority of predatory arthropods in many temperate ecoregion, and the spiders are potentially useful as indicator species for studying biodiversity patterns and ecological processes. However, since it is difficult to identify spiders to species level at their immature stage, local spider diversity might be underestimated. Here, we used canopy fogging to collect spiders in 324 European beech trees (*Fagus sylvatica* L.) of Würzburg University Forest during 18 months (2005–2007). Among 21054 collected spiders, only 7881 individuals (37.4%) were able to be identified to 92 species belonging to 18 families by morphological features. Therefore, we used the cytochrome *c* oxidase subunit I (COI) as a barcode to identify the large proportion of juveniles. Using the molecular results, we constructed the phylogenetic super tree with branch lengths by Neighbor-Joining (NJ) and Maximum Parsimony (MP). Furthermore, we also analyzed the phylogenetic diversity and functional diversity of arboreal spiders in this temperate forest.

Changes in composition of the ground living spider communities in non-forest habitats in the Poloniny after 12 years (Slovakia)

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In the work we present the first results with evaluation of the changes in the composition of spider communities in selected non-forest ecosystems of the Poloniny National Park in time horizon more than 10 years. The study area belongs to the most valuable regions of the high ecological importance. During the last decades territory came through several political and socio-economic changes and noticeable footprints on the landscape and biodiversity, including diversity of spider fauna, are visible. In the past, the research of epigeic spider fauna in this area was realised by Gajdoš in 1999. Repeated research on the same plot was done in 2011. The spider communities have been investigated on 11 study plots by pitfall trap method. Selected investigated plots represent the characteristic types of the non-forest ecosystems, namely meadows, pastures, non-forest vegetation, abandoned grasslands and wetlands. In 1999, the majority of the study plots were abandoned due to protection of the water reservoir Starina and non-economical profitability. Implementation of agricultural grant schemes and programmes has started only from 2004 and majority of the study plots was continually managed from this year. The changes of the landuse have influence also on abundance and composition of the spider communities. In 1999 82 species belonging to 18 families were documented. During 2011 we captured more than 7000 spider specimens belonging to 161 species. In our research we were focused also on following issues: 1) changes in occurrence and abundance of endangered and priority species, 2) indication species for individual type of habitats, 3) species affected positively or negatively by particular landscape changes. In 1999 only 82 species were captured. In 2011, of the identified species, more than 20 species are listed in the Red List of Spiders of Slovakia in different category of threat (e.g. *Peponocranium orbiculatum*, *P. praeceps*, *Mastigusa macrophthalma*, *Metopobactrus prominulus*, *Neriene furtiva*, *Palliduphantes milleri*, *Pelecopsis menzei*, *Xysticus lineatus*, *Sitticus caricis*, etc.).

On bases of the results very great changes in the composition of the epigeic spider communities were documented in the studied habitats and time horizon. We suppose that the mentioned changes in the spider species composition are the reflection of the change in human landuse, as well as global climate changes.

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Conditional male mating strategies in the sexually cannibalistic spider *Argiope keyserlingi*

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Some spider species are characterised by low male mating rates and investment in only one or few females. Such mating systems are associated with exceptional male mating strategies. In the Australian spider *Argiope keyserlingi* males possess one-shot genitalia and are limited to maximally two copulations. During each copulation they damage their genitals and plug the female genital opening. After having plugged one side of a female genital opening, males can leave and search for another female. Since males face a high probability of encountering females plugged on one or both sides, they should strongly benefit from limiting their mating advances to the reproductive value of the female. Once-mated males have only one pedipalp available and since the copulation pattern is fixed, a half-virgin female with the matching side plugged is of low value, while a half-virgin female with the matching side unplugged can be inseminated.

In this study, we tested whether virgin or once-mated males were able to choose between once and double-mated females and whether once-mated males prefer females with the required genital opening unused. Furthermore, we examined whether males adapt their mate searching behaviour to the presence of alternative mating partners nearby. Therefore, males were placed in the web of virgin females that were either surrounded by webs of virgin females or by webs of once-mated females. Our mate choice experiments revealed that males strongly preferred once-mated females to double-mated females independently of their own mating status. However, once-mated males apparently did not distinguish between females with genital openings compatible with their own unused pedipalps. In addition, males always stayed in females' web after the first copulation independent of whether surrounding females of different mating status were present. Our findings suggest that male mate choice is essential when male mating opportunities are limited by high reproductive costs. Furthermore, males seem to guard the female after their first copulation and did not refrain from it even when alternative mating opportunities lured in the vicinity.

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