Argiope bruennichi shows a drinking-like behaviour in web hub decorations (Araneae: Araneidae)

A. Walter, P. Bliss, M.A. Elgar & R.F.A. Moritz

As stationary predators, araneid spiders that lack protective retreats are especially vulnerable to abiotic influences. Species of the genus *Argiope* are hub-dwelling and are therefore especially exposed to desiccating circumstances. Like other land arthropods, these spiders must balance their hygric status. Apart from desiccation avoidance behaviours, they can manage this balance by water gain through either liquefied prey items or direct ingestions of free water. However, drinking-like behaviours are sparely documented for Araneids so far. We observed *Argiope bruennichi* ingesting accumulated water droplets from the silk-overstitched web hub, a part of the web decoration. We tested whether this behaviour is a regular feature of this species. We show that *A. bruennichi* females that have been sprayed with water actively and exclusively search the hub decoration for water droplets and ingest them. All elements of this drinking-like behaviour are very stereotype among the individuals. These data suggest that hub decorations of *A. bruennichi* might have an adaptive significance by helping to balance the water metabolism, adding yet another element to the spirited debate about the functional significance of web decorations.

Keynote talk

The role of nutrition in spider physiology, behaviour and ecology

S. Toft

Nutrition penetrates many aspects of animal and human biology. In spite of this, entomologists until recently believed that nutrition was an irrelevant concern with respect to predatory animals. The argument was that the food of carnivores was likely to be of the same nutritional value whether one prey species or the other was eaten. This premise has turned out to be wrong. Spider prey differ in quality due to differences in content of defensive chemicals and the ratio of macronutrients (especially protein and lipids) differ vastly between species and between individuals of the same species. The predators themselves may vary in nutrient composition even within an individual along the phases of the life cycle, thus their demands for nutrients for spiders and other arthropod predators at physiological, behavioural and ecological levels: food utilisation, feeding behaviour and web building strategies, individual growth and development, courtship behaviour and sexual selection. The potential role of nutrient for the dynamics of food webs will be discussed based on results from the lab and the field.

To feed or to wrap: males of the trechaleid spider *Paratrechalea ornata* eat preys or build nuptial gifts according to the occurrence of female silk cues

M.J. Albo, L.E. Costa-Schmidt & F.G. Costa

By wrapping a prey and offering it as a nuptial gift, males can obtain mating or parental benefits despite some costs. Males of the Neotropical spider Paratrechalea ornata (Trechaleidae) offer to females a nuptial gift consisting in a prey wrapped with silk. What stimulus inhibits male feed and also elicits prey wrapping? We hypothesized that female silk threads could determine male decision and designed three experimental groups using males carrying a captured prey. In the treatment S, males were exposed to an arena with female silk; in SF, males were exposed to both silk and a female confined in a cell; in the control group, males were exposed to a clean arena. Gift construction was observed only in S and SF groups, with similar occurrence rate. After touching females (SF group), males did not change their pattern of gift construction. Gift construction occurrence increased with male age, while old females seemed to elicit more gifts than young ones. Being ready to mate, males diminish risks of predation, female desertion, or male-male competition. Results indicate that some cues associated with the female silk of P. ornata elicit searching behaviour and gift construction, allowing males to decide between eating or wrapping preys, according to the immediate possibilities of sexual encounter. Old males would be more able to constructed gift because they are physiologically matured, acquired experience and/or had a better body condition to assume costs of prey wrapping than young males.

Is orb-web asymmetry an adaptation to prey capture or to web building?

M. Coslovsky & S. Zschokke

Orb-web spiders build vertically asymmetric webs, in which the lower part is larger than the upper part. One hypothesis explaining this asymmetry suggests that the spider's weight imposes higher building costs in the upper part of the web, causing the spider to reduce this part of the web. We tested this hypothesis by assessing building costs of different parts of the web. We found that the specific time-cost of building (i.e. the time required to build a certain length of silk) differed between the two parts of the web and that the difference in time-costs influenced web asymmetry. Contrary to predictions, however, building costs were larger in the lower part of the web, suggesting that additional factors affect the spider's decisions while building the web, which are likely to be prey-capture considerations.

Natural history of an ant-mimicking spider, *Liophrurillus flavitarsus* (Corinnidae), from Portugal

M. Jarab & S. Pekár

We studied natural history, i.e. phenology, circadian activity, mimicry, reproduction and prey preference, of a corinnid species, *Liophrurillus flavitarsus*. This species imitates *Aphaenogaster senilis* ants in shape, colour and behaviour.

The imitation is not as precise as in *Myrmarachne* spp., for example. *L. flavitarsus* was active during the whole year with maximum seasonal activity in the autumn and spring. The reproductive period was in March and April.

This species was active during a day, mainly between 12:00 and 15:00 hour. The circadian activity thus correlated with that of *Aphaenogaster* ants. The copulation of *L. flavitarsus* lasted on average 84 min. Within two weeks after mating females produced one to two successive egg sacs, each containing on average 5 eggs. Spiderlings hatched about 25 days after laying eggs.

As concerns the prey, the spider species captured only tiny invertebrates (smaller than its body), such as fruit flies, springtails, dipluras, and spiders. The highest capture success was recorded for springtails. The attack consisted of a rapid grasp of the prey, followed by bite into prey's frontal part. After the attack, the spider held its prey in fangs, pedipals and the first pair of legs. They refused beetles, mites, ants, and millipedes.

Preliminary study on the predatory behaviour and diet of Zodarion cyprium Kulczynski 1908 and Zodarion morosum Denis 1935

C. Uruci, C. Gherzan & I. Duma

Zodarion cyprium Kulczynski 1908 and *Zodarion morosum* Denis 1935 are myrmecophile spiders. Our study presents their predatory behaviour. In the diet of these two species of *Zodarion* the main prey items were *Tetramorium* sp., *Messor* sp., *Cataglyphis* sp., *Lasius* sp.. We have observed different tactics of predation depending on the size of the ants. Smaller ants were bitten on the abdomen and medium size ants were bitten on one of the forelegs. We have observed feeding on dead ants, too. These two species of *Zodarion* present a specialized predatory behaviour, depending on the ant species.

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Antimicrobially acting compounds produced in the hemocytes of *Cupiennius salei*

T. Baumann, L. Kuhn-Nentwig, S. Schürch, C. Largiader, J. Schaller & W. Nentwig

Since invertebrates are constantly exposed to microbial infections, they had to develop immune defense mechanisms to defend themselves. These defense mechanisms, which are similar to vertebrate innate immunity, involve cellular as well as humoral responses. One of the possible humoral responses is the secretion of antimicrobial peptides (AMPs) and other antimicrobially acting factors by hemocytes. These factors can either be produced constitutively and stored in hemocytes granules, or their production can be induced upon infection. The aim of our studies is to identify and characterize AMPs and other antimicrobially acting compounds in the hemocytes and the hemolymph of the neotropical wandering spider *Cupiennius salei* (Ctenidae). This is done on one hand on protein level by reversed phase HPLC (RP-HPLC), liquid growth inhibition assays and sequencing of peptides by Edman-degradation. On the other hand, our investigations also take place on RNA level by transcribing mRNA to cDNA and using different PCR techniques and sequencing to identify the DNA sequences of the AMPs. So far, we were able to identify one antimicrobially acting acylpolyamine which seems to be common to spiders, and several peptides, whose purification and characterization is still in progress.

How spiders use their venom

W. Nentwig & L. Kuhn-Nentwig

The venom of the ctenid spider Cupiennius salei consists of neurotoxins, antimicrobial peptides, enzymes, and low molecular substances. Nearly 100 substances could be identified so far. One important reason to understand this extreme number of substances is the synergistic mode of action between them which helps the spider to economize the use of its venom. Depending on kind and size of the prey, C. salei needs 0.01 to 10 µl venom to kill a prey item. Since its venom glands contain only 10 µl and regeneration requires 8 to 16 days C. salei should use its venom very economically. To do so, C. salei needs two informations: How much venom is available in the venom glands? and how much venom does a given prey item need? By a monoclonal antibody essay, we know the amounts of venom injected by a spider into different prey types. Insects without special defence mechanism receive only the minimum amount of venom which is in the range of the LD50. Items difficult to overwhelm or dangerous prey receive considerably more venom than the LD50 suggests because they may endanger the spider. Thus C. salei is very selective with respect to the venom injected into a prey item and obviously knows how much venom it has to inject. In a series of additional experiments with different cockroach species we showed that C. salei knows the venom content of its venom glands. It also knows the venom demand of a given prey item. We identified olfactory input from the prey as critical information which enables the spider to do its decision. Thus, the support by chemosensitive hairs C. salei is able to inject very precisely the minimum amount of venom. This is the central aspect of our venom optimisation hypothesis which supposes that spiders use their venom as economically as possible.

A case of traditional use of a tarantula (Araneae: Theraphosidae) as medicine in Mexico

R. Rojo, Y. Henáut & S. Machkour M'Rabet

We present an indigenous use of the tarantula *Brachypelma vagans*, performed by some medicine men in six Ch'ol communities. The Ch'ol is an indigenous ancient group that inhabits the southeastern of Mexico. From November, 2003 until February, 2007, we made surveys to the local shamans and some of the villagers in Tila, Tumbalá, Álvaro Obregón, el Limar and Frontera Corozal in Chiapas State and Once de Mayo in Campeche State to learn about this phenomenon. We found that some people may occasionally present an illness that they call "aire de tarántula" (tarantula air) with symptoms similar to those of asthma. When that happens, they come up with the "hierbatero" who makes a beverage using tarantula and other substances. The shaman then, performs a ceremony with chants and incense, in which he prepares the beverage and makes his healing labor. In all but in on one (El Limar) the process and the materials were constant with just slight differences between them. The specimen is always killed, mixed with the preparation and is given by different means to the patient. In their traditions, the shaman gets paid with substance, either animals like hens or food.

Spider silk as a novel humidity-driven biomimetic muscle

I. Agnarsson, A. Dhinojwala, V. Sahni, & T.A. Blackledge

The abrupt halt of a bumble bee's flight when it impacts the almost invisible threads of an orb web provides an elegant example of spider silk's amazing strength and toughness. Spiders depend upon these properties for survival, yet silk's impressive performance isn't limited solely to tensile mechanics. For instance, spider dragline silk 'supercontracts' in high humidity. During supercontraction, unrestrained dragline silk contracts up to 50% of its original length while restrained fibers generate substantial stress. Here we discuss novel findings which demonstrate that dragline silk exhibits two qualitatively different responses to humidity. We show that supercontraction is a permanent, rate dependent, tensioning of restrained silk in response to high humidity, and that post-supercontracted silk differs in some mechnical properties from virgin silk. However, silk also undergoes a previously unknown cyclic relaxation-contraction response to wetting and drying, which involves cyclic intake and loss of water. These powerful cyclic contractions give silk the potential to act as a high performance, water-controlled, mimic of biological muscles, repeatedly generating work 50x greater than that of human muscle. Silk may emerge as a new and powerful model for biomimetic muscle with possibilities in designing light weight and compact actuators for various applications.

High incidence of maternally inherited bacteria in spiders

O. Duron, G.D.D. Hurst, E.A. Hornett, J.A. Josling & J. Engelstädter

Inherited bacteria are now recognised as important players in arthropod evolution and ecology. Here we test spiders for the presence of several bacterial endosymbionts, including *Wolbachia pipientis*, *Cardinium hertigii*, *Rickettsia* sp., *Arsenophonus nasoniae*, *Flavobacterium* sp., *Spiroplasma ixodetes* and *S. poulsonii*. All of these bacteria are known to act as reproductive parasites in other arthropods. We estimated incidence, prevalence, sex bias in infection, and infection diversity, for a panel of field collected specimens. In line with previous studies, we demonstrate a high incidence of *Wolbachia* in spiders (33% of species). *Cardinium* and *S. ixodetes* were also common (incidence of 23% and 19%, respectively), whilst the other bacteria were rare or absent. In two cases, *Wolbachia* was found significantly more commonly in females than males, indicating it may act as a sex ratio distorter in some species. For the other bacteria, there was no evidence for sex ratio distortion. Breeding work confirmed that *Wolbachia* and *Cardinium* were transmitted maternally in two cases, which represents the first proof of inheritance of these symbionts in spiders. Overall, this study demonstrates the majority of spider species are infected with inherited bacteria, and their role in host biology clearly requires determination.

Karyotype study on four European wolf spiders (Araneae: Lycosidae)

P. Dolejš, V. Opatová, J. Musilová, J. Král, L. Kubcová & J. Buchar

Presented study is part of a project concentrated on natural history and cytogenetics of four European wolf spiders, *Tricca lutetiana* (SIMON, 1876), *Arctosa alpigena lamperti* DAHL, 1908, *Xerolycosa miniata* (C. L. KOCH, 1834) and *X. nemoralis* (WESTRING, 1861), and taxonomy of the problematic genus *Tricca* SIMON, 1888.

Karyotypes of studied species consist of acrocentric chromosomes including X_1X_20 sex chromosome system. Male complement of *T. lutetiana* and *A. a. lamperti* contains 28 chromosomes whereas male karyotype of *Xerolycosa* species possesses 22 chromosomes only. In contrast to the remaining species, sex chromosomes of *T. lutetiana* show unusual behaviour during diplotene being despiralised.

All species display terminal, pericentromeric blocks of constitutive heterochromatin (CH). Remarkably, *T. lutetiana* and *Xerolycosa* species have only negligible amount of CH in comparison with *A. a. lamperti* and other wolf spiders studied so far [1, 2, 3, 4].

Interestingly, diploid chromosome number of *A. a. lamperti* is different from that reported in *A. a. alpigena* (DOLESCHALL, 1852) [5]. Similarly, various 2n are reported for both *Xerolycosa* species [5, 6]. Therefore, it is necessary to investigate karyotypes of other species of the studied genera as well as to confirm 2n of *A. a. alpigena*.

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Hemocyte classification of the spider *Geolycosa vultuosa* (Araneae, Lycosidae), by Giemsa, Pappenheim and acridine orange staining

S.Kemfelja, D.Đikić & O. Springer

Hemocytes of the spider *Geolycosa vultuosa* (Koch, 1838) using Giemsa, Pappenheim and acridine orange staining and their total and differential counts were studied. In all specimentes studied prohemocytes, plasmatocytes, granulocytes, oenocytoides and one type of unidentified cell were observed. Granulocytes and plasmatocytes are the most numerous cells in the hemolymph of *Geolycosa vultuosa*. Difference in total hemocyte count in studied spiders was observed.

Niche breath as a function of physiological components: salinity tolerance in some stenotopic lycosid species

C. Puzin, D. Renault & J. Pétillon

Physiological abilities partly determine the distribution of species, as for instance microhabitat partitioning [1] or differences in geographical range sizes [2]. In this study, we tested the hypothesis that the range of salinity conditions spiders can tolerate is an important parameter in their repartition between habitats. We compared survival abilities and haemolymph osmoregulation in three stenotopic lycosids: two salt-marsh species, *Arctosa fulvolineata* and *Pardosa purbeckensis*, and a forest species, *P. lugubris*. After acclimation in three salinity conditions (0‰, 35‰ and 70‰), measurements were done on body water mass, concentrations of mineral elements (ICP-MS) and free amino acids (UPLC). When salinity increases body water mass decreases and total amino acid concentration (dominated by asparagine, glutamine, alanine and proline) increases for the three species. Sodium concentration seems to be higher when salinity is equivalent to that of seawater. However, no general trend was found to differentiate the physiological components of the three species. Survival of the two halophilic species (actually superiors to that of *P. lugubris* in salt conditions), especially for *A. fulvolineata*, confirms the existence of other factors explaining their restricted ecological niche.

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Do natural grasslands enhance arable spider populations? First results of a planned landscape experiment.

F. Samu, É. Szita, K. Fetykó, E. Botos, A. Veres, B. Bernáth & A. Horváth

We carried out a landscape experiment in eight 5 x 5 km quadrates in the Mezőföld region of Hungary. We studied (i) how the proximity of grassland habitat patches at the local scale, and (ii) the amount of grassland and other non-crop habitats at the true landscape scale affect natural enemy - in this case spider - populations of arable fields. Results from the first two years of this three years long experiment showed a strong effect of proximity: cereal fields had nearly twice the abundance and species number of spiders if they had a neighbouring grassland habitat patch, as opposed to 'remote fields' in pure agricultural settings. On the other hand, when we compared remote fields across landscape quadrates, we could not show any significant correlation between the ratio of various non-crop habitats in the quadrates and spider community parameters. The study proves the usefulness of the inclusion of natural habitat patches in a landscape, and underlines the importance that they should be interspersed with fields.

Do agricultural crops change the composition of spiders in nearby desert habitats?

I. Opatovsky, T. Pluess, M.H. Schmidt, E. Gavish & Y. Lubin

The agro-ecosystem combines agricultural and natural habitats and is characterized by spatial and temporal heterogeneity. In desert agro-ecosystems, unlike those in temperate regions, there are extreme differences in biotic and abiotic conditions between natural habitats and cultivated fields. These differences result in sharp boundaries between the habitats that affect the organism movement between them ("edge effect"). This edge effect and the different characteristics of spiders influence spider habitat preference and result in distinct spider assemblages in the two habitat types.

Landscape composition can influence the diversity of arthropods, including the spider community, in the desert agro-ecosystem. In this research we tested the effects of landscape composition (percentage of natural habitat in 1 km radius) and of biotic and abiotic factors on spider assemblages in the natural desert habitat of a wheat agro-ecosystem in the Negev desert. We attempt to determine the factors that affect the habitat preference of common species. We predicted that larger areas of crops would change the composition of spider assemblages in nearby natural desert habitats.

We found that the spider assemblage was not affected by the percent of crop habitat but there was a dominant effect of geographic location and rainfall on the assemblage of the different spider species in the desert habitat. Planted tree habitat had a positive effect on the abundance of some common spider species.

Habitat loss vs. isolation: effects on spider communities in apple orchards

J.D. Herrmann, P. Eberhardt, F. Herzog, D. Bailey & M.H. Schmidt

European landscapes are dominated by agriculture, and traditional forms of land-use are increasingly replaced by intensive arable crops. This leads to the loss and isolation of seminatural habitats, which is a major threat to biodiversity. As habitat loss and isolation usually occur together, most existing studies have examined only their combined effect. To investigate the independent effects of habitat loss and isolation, we have chosen 30 apple orchards within north-east Switzerland. The study orchards were selected to vary in two respects: (i) in the amount of woody habitats in the surrounding landscape within a 500 m radius, and (ii) in isolation from other woody habitats, which were directly adjoining in half of the study sites and at least 75 m apart in the other half. We studied spiders, because they are dominant, species-rich terrestrial predators. In addition, spiders have variable dispersal power by either walking and/or ballooning. We expect a positive influence of increasing amounts of woody habitat in the surrounding landscape on density and diversity of wood-related spiders. Furthermore, the influence of isolation was expected to reduce density and diversity of cursorial spiders more strongly than spiders with aerial dispersal.

Diversity of epigeic spiders in grass-clover leys and under sown cereals

R. Pommeresche, A.K.Bakken & A.Korsæth

This study compares diversity an abundance of spiders in barley with different sub crops and in young ley. Spiders were sampled from 14 cereal and 4 grass-clover fields distributed within three different sites in eastern and central Norway. Two sites are long term experimental field trials and one is an organically managed farm. Pitfall traps were used to sample spiders from May to Sept 2004. In total 4130 spiders were found. The density and number of species varied between fields. More individuals of both Linyphiidae and Lycosidae were trapped in fields with leys compared to fields with cereals (fig 1). There was no clear difference in total density of spiders according to type of sub-crop, but more Lycosidae were found in cereal fields undersown with ley than in fields under sown with ryegrass. A higher density of Linyphiidae was found in the cereal fields at the farm (site C) than at the two experimental sites, whereas the frequency of Lycosidae was about the same at the three sites. Only minor differences in number of species were found, but an ordination technique, based on both species and number of individuals, reveals differences in the spider community structures (fig 2).



Density of spiders in different fields in 2004, at three sites (A,B,C) in Norway. Fields in systems marked with and aster are managed conventionally, the rest organically.



Ordination of the different fields based on species composition and density of spiders in each field. Rare species are down weighted. Black dots are leys, the rest cereal fields, and the fields at site B and C are defined by lines.

Predatory efficacy of three hunting spiders of rice ecosystems of Pakistan

H. M Tahir & A. Butt

The diets of three hunting spiders of rice ecosystem (i.e., *Lycosa terrestris*, *Pardosa birmanica* and *Oxyopes javanus*) were elucidated in laboratory and by direct observations in paddies from August to November 2006. In laboratory each of the three hunting spiders readily consumed larvae and nymphs of major rice pests. Generally female spiders consumed more pests compared to males. Results of direct observations showed that in August, dipterous insects were the most numerous rice pests consumed by *Lycosa terrestris*, *Pardosa birmanica* and *Oxyopes javanus*, comprising over 56.3%, 38% and over 48% of their respective diets. In contrast, in September, the proportion of dipterous insects decreased dramatically and hoppers become the most numerous pests, comprising over 50%, 51% and over 41% of all pests and spiders consumed by *Lycosa terrestris*, *Pardosa birmanica* and *Oxyopes javanus* respectively. In October, predators such as wolf spiders and aquatic Heteroptera were frequently observed in their diets. Predatory potential of these hunting spiders did not differed statistically in the laboratory. Prey preferences of hunting spiders were also investigated and compared in laboratory.

Comparative toxicity of botanical and chemical insecticides on spiders in the rice ecosystem of central Kerala, India

J. Joseph, M.J. Mathew, P.A. Sebastian & S. Murugesan

Sensitivity of spiders to widely used insecticides in the rice fields of central Kerala in India was evaluated in the laboratory in comparison with neem. The spiders selected for the study were Pardosa sumatrana (Thorell 1890) and Tetragnatha mandibulata Walckenaer, 1842. The insecticides tested were Ekalux EC 25 (Quinalphos 25% EC), Hilcron 36 SL (Monocrotophos 36 SL) and Metacid (Methayl parathion 50% EC). All these three insecticides are commonly used in the study area for the control of rice bug, brown plant hopper, green leaf hopper and other insect pests of rice. The commercial neem product used was Nimbecidine 0.03% EC. The insecticides were diluted to four different concentrations (0.02%, 0.04%, 0.06% and 0.08%). Nimbecidine was diluted to 0.2%, 0.5%, 0.75% and 10%. Spider susceptibility to insecticides and the neem products was evaluated in the laboratory by two methods viz., dipping method and topical application. The observed mortality was corrected using Abbot's equation and the LC50 (median lethal concentration) and LC90 values were calculated by probit analysis. Toxicological studies indicated that contact insecticides were more toxic to spiders. Dipping method was found to be more fatal compared to topical application. Methyl parathion, a contact insecticide, recorded the lowest lethal concentration values indicating its comparatively higher toxicity to P. sumatrana in the dipping method and topical application. The commercial neem product, Nimbecidine was safer to the spiders with very high LC50 and LC90 values and with very low mortality responses. Methyl parathion recorded the lowest LC50 and LC90 values revealing its high toxicity to T. mandibulata. Monocrotophos recorded the highest median lethal concentration values among the chemical pesticides tested indicating its comparatively low toxicity. Nimbecidine was again safer to T. mandibulata with very high LC50 and LC90 values and low mortality responses. In summary, the commercial neem product was apparently harmless to both P. sumatrana and T. mandibulata. Results of the present investigation indicate that the botanical insecticide neem can be used an as an important component of integrated pest management in rice.

Spiders as biological controller in apple orchards infested by *Cydia* spp.

M. Isaia, S. Beikes, M. Paschetta, S. Suriyanarayanan & G. Badino

Spiders have been considered commonly as polyphagous predators. For this reason, it has been argued that spiders may not be efficient in controlling pests. However, in recent years it has been demonstrated that they are able to significantly decrease the damage caused by insects to harvest. In this paper we present the results of a field experiment that has taken place in 2007 in a biological apple orchard at Caraglio (CN, North- Western Italy). The aim of the experiment was to reduce the damage caused mainly by *Cydia* spp. (Lepidoptera: Tortricidae) to apples by increasing the population of spiders living on trees through the provision of artificial refuges (polyethylene bark-traps). Compared to control, the total number of spiders found on trees, increased significantly in all trees provided with artificial refuges. The spider community was found to be strongly dominated by *Anyphaena accentuata* (42%), followed by *Dictyina arundinacea* (16%) and *Philodromus* spp. (6%). The effectiveness of spiders against pests has resulted in a significant reduction of damages, ranging from 13 to 52%. The results are proved by considering the reduced number of damaged apples (easily distinguishable by the presence of circular holes caused by *Cydia* spp. on apple peels).

Aerial dispersal of spiders in middle-east Germany – modelling of meteoro-logical and seasonal parameters

M. Rensch, C. Volkmar & J. Spilke

Since spiders play a more and more pronounced role in integrated pest management and organic farming but little is known how weather parameters influence the composition and number of aerial dispersal spiders in middle-east Germany. During the years 2000, 2002, 2003 airborne spiders were collected with a Rothamsted insect survey trap in Aschersleben (Saxonia-Anhalt) in a height of 12,2 meters from April to October. Simultaneously meteorological conditions were continuously measured at the bottom of the trap. First analysis shows that Linyphidae (42%, 2003), Theridiidae (35%, 2003), Tetragnathidae (9%, 2003) and Araneidae (8%, 2003) dominate the composition of the aeronautic spiders with a sexual ratio of 77,4% juvenile, 9,2% male and 13,4% female.

Among the adults, species of the Linyphiidae did reach a dominant position (e.g. *Erigone atra*). With a generalized linear mixed model in SAS we try to calculate which meteorological aspects are significant for long distance flights by spiders dependent on family, sex, species, and seasonal changes. This model will be used to further elucidate the possibility of using airborne spiders as biomarkers for integrated crop management and organic farming to reduce insecticide expenditure. In addition, prediction of recolonisation rates and migration tendencies will be possible.

Diversity and ecology of spiders in vegetable ecosystems of central Kerala, India

P.A. Sebastian, M.J. Mathew, S. Murugesan & J. Joseph

Being highly diverse and abundant predators, spiders are important regulators of terrestrial arthropod populations. Consequently, there have been a growing number of investigations in which spiders in agroecosystems are used as tools to gain insight into the role of generalist predators in community and ecosystem function. Study of spider community and species diversity is a prerequisite for any kind of attempt for studies of spiders and their role as biological control agents in any agroecosystem. Studies on the spider fauna of vegetable crops in India have not been undertaken so far. In view of this, a pioneering study was conducted to document the diversity and ecological dynamics of spiders in selected vegetable crops in four central districts viz., Idukki, Ernakulam, Trichur and Palghat of Kerala state in India. The vegetable crops selected were bitter gourd (Momordica charantia L.), snake gourd (Trichosanthes cucumerina L.), ivy gourd (Coccinia grandis (L.) Voigt, cowpea (Vigna unguiculata L. Walp.) and cabbage (Brassica oleracea L. var. capitata). The study was conducted for a period of 3 years from June 2002 to June 2005. Fortnightly sampling was carried out in three cropping seasons (one crop per year). In bitter gourd, a total of 3504 individuals belonging to 66 species, 41 genera and 14 families were sampled. In snake gourd, surveys yielded 1276 individuals belonging to 41 species, 29 genera and 11 families. In ivy gourd, 472 individuals belonging to 33 species, 23 genera and 10 families were sampled. In cowpea, sampling yielded a total of 862 individuals belonging to 33 species, 23 genera and 8 families. In cabbage, a total of 266 individuals belonging to 21 species, 15 genera and 6 families were sampled. In all the crops studied, Araneidae and Lycosidae constituted the taxonomically and numerically dominant families, respectively. At the species level, Pardosa sumatrana (Thorell 1890) turned out to be the numerically dominant species in bitter gourd, snake gourd and cabbage while P. pseudoannulata (Bösenberg & Strand, 1906) was the dominant species in ivy gourd and cowpea. Guild structure analysis revealed that ground runners were the abundant spider guild in all the crops surveyed. Observations on the seasonality of spiders revealed a general trend of a steady increase in population growth as the crop advanced and reaching the peak at early flowering and early fruiting seasons, followed by a decline towards the end of the vegetative growth of the crop. The results substantiate the fact that population densities and species abundance of spider communities in agricultural fields can be as high as in natural ecosystems. However, further investigations are warranted to study their interaction with the environment, breeding behaviour, prey preference, predatory potential and sensitivities to chemical and botanical pesticides in order to fully utilize them as successful biological control agents in these ecosystems.

Where do they come from? Biogeography of linyphilds from agroecosystems in the north-western Negev desert

E. Gavish-Regev, T. Pluess, I. Opatovsky, M. H. Schmidt & Y. Lubin

Linyphiidae is one of the most diverse families of spiders, with more than 4000 species. This family is cosmopolitan, with the highest diversity in the north temperate region. Linyphiidae are well studied in many regions of the world, yet they are poorly known in the Middle East. Indeed, although at least 50 spider families are known from Israel, only few families (e.g. Gnaphosidae, Theridiidae, and Salticidae) are well studied in this area.

This research is a first step in the investigation of the linyphild fauna of Israel. We describe the geographic ranges of linyphilds found in the north-western Negev desert during two studies of the Negev agroecosystems. We examined the association of the different species with climatic conditions and habitat types found in the area. We found that the two main habitat types in the north-western Negev, i.e. arid natural habitats and agricultural fields, have different linyphild assemblage and species dominance. Israel has a unique location in a meeting point between three continents - Asia, Africa and Europe. This biogeographic background, together with heterogeneity of the arid agroecosystem, variable climate and ecological conditions, and a gradient of precipitation may explain the differences in the linyphild assemblages between the two habitats.

The diversification patterns of the spider genus *Harpactocrates* provide clues to the origins of Mediterranean biodiversity

L. Bidegaray-Batista & M.A. Arnedo

The Mediterranean basin is one of the 25 biologically richest hotspots on Earth. Tertiary tectonics and climatic oscillation have been identified as causal agents of the generation of this outstanding biodiversity. The ground-dwelling spiders of the genus *Harpactocrates* provide an excellent model to test the role of historical factors in the diversification of Mediterranean biota. The genus includes about a dozen species distributed along the mountain chains of the Iberian Peninsula, the Alps and the northernmost Apennines. They are most often found at high elevation (1000 m) temperate and moist forests, suggesting a preference for cool and humid environments. We conducted phylogenetic analyses of multigene sequence data including most *Harpactocrates* species and a broad sampling of outgroups, from which we derived a molecular-clock based temporal framework. Our results support monophyly of western Mediterranean Dysderinae genera and suggest that their split from eastern relatives predated Alpine orogeny. The Alps and the Apennines were colonized from the Iberian Peninsula following diversification of the main Iberian lineages. Although Pleistocene glaciations may have played a key role in the origins of some present day species, the main evolutionary lineages can be traced back to the Tertiary period.

About *Phyxioschema* (Araneae: Dipluridae)

P.J. Schwendinger

New results on the diplurid spider genus *Phyxioschema*, based on a revision of the two described species and on new species from Thailand and Uzbekistan, are presented. Taxonomic characters are discussed and considerable variation in the genitalia of some species is shown. Female genitalia appear to be most informative for establishing interspecific relationships.

The known geographical distribution of the genus is disjunct, as is the distribution of a new species from Thailand.

Phyxioschema species occur in various habitats, from deserts to semi-evergreen rain forests; some are restricted to limestone. At least one species from Thailand has two mating seasons and two parallel generations of males per year.

Canopy spiders from savanna trees in the Afrotropical region

D. De Bakker, K. Loosveldt & R. Jocqué

So far, no data were available on the spiders of the canopy in trees of wooded savanna in the Afrotropical region. In parallel with a study focusing on the spider canopy fauna of a large array of forest types, we tried to fill this gap with the study of a number of sampling campaigns in typical wooded savanna. The canopy spider fauna of existing collections from Tanzania (Mkomazi Game Reserve) and Ivory Coast (Comoé National Parc) was analysed and compared to samples of our own campaigns in Cameroon (Faro Game Reserve) and South Africa (Limpopo Province).

These collections yielded slightly more than 3000 adult specimens distributed over more than 300 morphospecies and 23 families. The first results reveal important differences with the forest canopy fauna in connection with the family composition, with the rarity of Linyphiidae and the importance of Oonopidae and Corinnidae as striking characteristics. The paper further highlights diversity, similarities between and within sites and comparison with rainforest data.

The spiders of city subhabitats. Surprisingly high species diversity in a densely built city area

K. Van Keer, H. Vanuytven, H. De Koninck & J. Van Keer

During 4 years, a intensive faunistic study of the densely built city area of Antwerp (Belgium), was carried out. Larger green areas at the border of the city were deliberately not included in order to get a clear view on the spider fauna of densely populated and built upon city areas, without forest and countryside spider fauna record "contamination". The unexpected high species diversity of 249 species was recorded.

Among other city subhabitats like parks, sewers, non-used grounds and buildings, over 120 city gardens, surrounded by walls, were sampled. This provides a representative view on what species inhabit these "microhabitats". The faunistic results of the study are given and the recorded spider faunas of several subhabitats are compared.

A thorough ecological analysis including e.g. the influence of the degree of urbanisation on the spider fauna, is in progress.

Changes in composition of epigeic spider communities in oak-hornbeam forest in Bab after 40 years

P. Gajdos

Author compares changes in composition of epigeic spider communities in oak-hornbeam forest within horizon of nearly 40 years. In past (1971), research was realised by Zitnanska, who found 45 spider species. Repeated research was done on 2007/2008 and 79 species were documented. The number of common species found during both researches is only 26 species. Out of them only 13 species were classified to the same categories of abundance. Abundance of other common species was quite different. At present, eudominant species *Pardosa lugubris* shows the greatest changes in its abundance. On the other hand, dominant species in 1971 as *Pisaura mirabilis* and *Microneta viaria* were documented presently as subrecedent. Out of 53 species that were captured only during the current research, *Urocoras longispinus, Scotina celans* and *Ozyptila praticola* were represented abundantly. Out of 19 species that were not confirmed after 40 years, *Entelecara acuminata* was found in samples of 1971 as dominant. Based on results, huge changes in composition of epigeic spider communities were documented in horizon of nearly 40 years. They are represented mainly by increasing number of thermophilous species and by decreasing abundance or absolute disappearing of species preferred humidity. They can be reflection on climate changes.

Diversity of the spiders of Russia east of Ural

Y.M. Marusik

Until very recently, in the beginning of 80th, some 500 species of spiders were known from Russia east of the Ural. Arachnological studies in the Asian part of Russia were initiated by K.Yu. Eskov, who started to study the fauna of middle Siberia and the taxonomy of Linyphiidae, the most rich spider family in the Holarctic and least studied in Asia. During the last three decades, intensive faunistic and taxonomic studies of spiders have been performed. Detailed checklists have been published for different parts of north Asia, and over 400 species have been described by Russian and foreign arachnologists from Siberia and the Russian Far East. Up to now, more than 1800 spider species belonging to 38 families have been reported from Russia east of Ural. Siberian spider fauna consist of some 1400 species belonging to 28 families; some760 species of 38 families occur in the south part of the Russian Far East. In Siberia, there are over 250 endemic species and 28 endemic genera; 150 species and 28 genera are (sub)endemics of the south part of the Russian Far East. The latter region encompasses four families not known from other parts of Russia: viz., Ctenidae, Cybaeidae, Leptonetidae, and Pimoidae.

Diversity and faunistic features of spiders of Western Ghats of India

M.J. Mathew, P.A. Sebastian & S. Murugesan

Investigations were carried out on species composition, richness, diversity and faunistic features of spiders in the forests of Idukki district, lying along the "Western Ghats", one of the "Biodiversity Hotspots of the World". Sampling over a period of two years in four protected forests viz., Periyar Tiger Reserve, Idukki Wildlife Sanctuary, Eravikulam National Park and Chinnar wildlife sanctuary resulted in the collection of 4890 individuals belonging to 118 species, 68 genera and 23 families. The taxonomically dominant family was Araneidae while the numerically dominant one was Lycosidae. Pardosa sumatrana (Thorell 1890) (Family Lycosidae) was the most abundant species. Three new species of spiders (Ctenus idukkivensis sp. nov., Linvphia striata sp. nov. and Achaearanea icfrevi sp. nov.) were collected during the study. Out of the 118 species recorded, 7 species are new records to India. Biogeographical analysis revealed that araneofauna of central Kerala bear affinities mainly to Oriental and Palearctic regions, as well as to the fauna of Sri Lanka. Faunistic analysis also revealed a high degree of endemism. Guild structure analysis revealed 7 ecological guilds with orb weavers and ground runners equally dominant contributing 35% each to the total individuals collected. Quantitative estimation of diversity revealed the highest diversity index values and species richness at Periyar Tiger Reserve. Analysis of seasonality of spiders revealed the highest species occurrence during post-monsoon months (October to January), followed by pre-monsoon months (February to May) and the least occurrence during the monsoon period (June to August). The high species diversity and abundance of spiders in the various study sites coupled with the discovery of new species and the existence of the high degree of endemism indicate the importance of conserving spiders in Western Ghat forest ecosystems for the maintenance of overall biodiversity in this "biodiversity hotspot", which is currently experiencing alarming rate of deforestation and degradation.

African and Southeast Asian elements in spider fauna of the Western Ghats of India

A. V. Sudhikumar, J. P. Maelfait, L. Lens & P. A. Sebastian

The Western Ghats, one of the 'biodiversity hot spots' of the world, is home to large number of arachnids of which spiders have a huge share. However, compared to other hot spots of the world, spiders of the Western Ghats are a poorly worked out group. Biota of this area is the product of drastic climatic, ecological and biogeographical history. A few studies are conducted to reveal the faunal affinity of the Western Ghats with other regions of the world. Unfortunately there are no studies focused on spiders. In this study, we attempted to expose the faunal affinities of this very important invertebrate group distributed along the Western Ghats based on their taxonomic distribution throughout the world. This study reveals that a total of 270 species of spiders belonging to 138 genera of 39 families are reported from the Western Ghats so far. The faunistic analysis at generic level revealed that a total of 6 genera endemic to this area. Among the total 138 genera, 5 showing affinity to African fauna and 17 showing affinity to Southeast Asian fauna. Twenty genera are common to Africa, India and Southeast Asian regions and 90 genera are cosmopolitan in distribution. These results substantiate the geographical history of both the Western Ghats and India, because India was the part of African continent for about 160 million years ago. It detached from there are moved towards north and finally collide with Eurasia about 60 million years ago. Between these period India was an isolated island for about 100 million of years. This isolation may be leads to the creation of its distinct spider fauna. After the collision with Eurasia, Indian fauna underwent drastic changes due to the faunal migration between Southeast Asian region and India. There are different hypotheses explaining this migration of different animal groups. Actually the Western Ghats is the product of regional uplift during Deccan volcanic episode held about 120 million years ago. So the presence of African lineage in the Western Ghats indicates that there was no actual mass extinction of spiders during volcanic episode. If we consider this, the spider fauna in the Western Ghats can be divided into an ancient African lineage, late Southeast Asian immigrant and endemic. If there was mass extinction, the present day African lineage in the Western Ghats is the result of recent immigration. If we consider so, the spiders of the Western Ghats can be divided into Southeast Asian immigrant, recent African immigrant and endemic. Further studies based on molecular phylogeny can reveal the truth.

Studies on the diversity of wandering spiders in Wayanad Wildlife Sanctuary, south Western Ghats, India, with special emphasis on mygalomorphs

E. Sunish, A.V. Sudhikumar, M. J. Mathew & P.A.Sebastian

Spiders represent a diverse and functionally important group of arthropods. They are frequently the dominant predators in arthropod communities. The assessment of their status can provide much information useful in monitoring the integrity of biotic communities. In order to determine the araneofauna, a preliminary study of nomadic ground as well as foliage dwelling spiders was made at the Wayanad Wild Life sanctuary, North Kerala, India for a period of one year. Spiders were collected from four sites by hand picking, pitfall traps, sweeping, beating and sieving. A total of 893 individuals belonging to 66 species belonging to 42 genera and 18 families were collected during the study. They were widely distributed in all samples, as their frequency of occurrence was high. The mean relative densities of spiders, however, was low, ranging from less than 6% in rainy seasons to about 15% in summer. There was a seasonal fluctuation of relative densities indicating that the population of carnivores may increase relatively faster than that of the preys from rainy seasons to summer. Actual numbers of spiders trapped seasonally ranged from 160 individuals at all sites in late winter to about 320 in early summer. The mean number of species per season per site ranged from 8 in cold season to nearly 18 in early summer. The most dominantly present family was Salticidae (21%) whereas the least encountered one was Sparassidae (2%). The most encountered spider families in the order of dominance was Lycosidae (16%), Oxyopidae (14%), Thomisidae (11%) and Linyphiidae (9%). The primitive mygalomorphs represented 12 species of 7 genera (20%). The analysis of collected spiders on the basis of foraging mode revealed 8 types of feeding guilds viz., ground hunters (40%), foliage hunters (22%), stalkers (11%) and ambushers (27%). The collection includes 6 species of spiders being reported for the first time from Kerala. Analysis of the collected spiders also revealed a high degree of endemism shown by the spiders in Western Ghats. This study was carried out with the view to bring forth the status of spiders in Western Ghats and amend the spider fauna of this region into the conservation radar screen.

Jumping spiders (Araneae: Salticidae) in Afrotropical canopies

G.N. Azarkina, D. De Bakker & R. Jocqué

Canopy jumping spiders were collected with the pyrethrum knockdown method at 15 localities in fairly different habitats ranging from lowland forest (Ghana, Congo) over montane forest (Kenya, Rwanda, Tanzania) to wooded savannah (Ivory Coast, Tanzania, Cameroon, South Africa). In four localities, three of which were savannah, the shrub layer was sampled by beating and sweeping.

The collections contain 262 species of which an estimated 60% was estimated to be new to science. Salticids range among the most abundant spiders in the canopy but tend to be relatively more important in wooded savannah than in dense forest.

A cluster analysis reveals that the salticid fauna from savannah trees is clearly different from that of all forest types. It is surprising that the shrub and canopy layer faunas cluster together for each locality indicating that this family, in contrast with other families like oonopids and linyphilds, does not present a highly specialized canopy assemblage.

Spider coenoses in strict forest reserves in Hesse (Germany)

T. Blick

The spider fauna of eight strict forest reserves in Hesse (situated centrally in Germany) has been investigated intensively since 1990. At present there are 31 strict forest reserves in Hesse with an average size of 40 ha. Strict forest reserves are areas where all forestry operations were stopped (since about 1988) allowing undisturbed development. The aim is "Primeval forests of tomorrow".

The spiders of four reserves, all at a height of 300 to 500 m a.s.l., were identified so far by Andreas Malten and the present author. Most reserves have adjacent normally treated forest patches for comparison to show the influence of forestry on the succession and the fauna. The common beech (*Fagus sylvatica*) dominates the majority of the strict forest reserves and the four analysed sites.

A total of 278 spider species have been found in the reserves until now, 40% of the spider species known from Hesse. 162 to 202 spider species were recorded in each reserve (30,000 to 49,000 spiders, incl. juveniles) using a broad set of methods over two whole years. Most important for the spiders are: pitfall traps and different types of stem eclectors. Spiders are one of the seven standard groups which are analysed completely to species level in each reserve – others are Lumbricidae, Heteroptera, Coleoptera, Hymenoptera-Aculeata, Macrolepidoptera and Aves. Additional groups are monitored if possible ("all taxa biodiversity inventory approach").

The spider fauna has been analysed in different aspects: (A) frequency of occurrence in Germany, (B) distribution type (parts of Europe to Holarctic), (C) habitat types, and others like preference of strata, height (a.s.l.), phenology, size groups and the status of endangerment in Germany. (A) several rare species were recorded (including new records for Hesse), and interestingly (B) a set of species with very restricted areas in Europe was seen to occur. The data show that (C) the forest spider fauna in Germany is deficiently known and that the diversity of spiders (as well as that of the other groups) even in normally treated forests is unexpectedly high.

Research is conducted in co-operation with and financially supported by Landesbetrieb Hessen-Forst.

The effects of urbanization on spider communities

D. De Bakker; H. Dekoninck & E. Gaublomme

We analyzed spider assemblages in a range of different forest fragments along an urbanization gradient in Brussels, Belgium. From March till November 2002, 13 forest plots in 10 forest patches, ranging in size from 5 to over 4000 ha were sampled for their spider fauna by means of pitfall trapping. These were placed along a transect from the edge to a distance of 100m inside the forest. Effects of urbanization, forest size and forest edge are investigated on total species number, abundance and habitat preference groups (known ecological preferences of the species). A total of more than 16'000 specimens of more than 160 species were caught. Clusteranalysis and ordination on the most abundant species revealed that spider communities per site did not differ too much along the gradient. This would mean that spider communities caught on the edge of the forest differed the most from the others in the gradient and were mainly composed of pioneer species. Next to this difference, the second most important characteristic that separates spider communities in this dataset is humidity.

Theridion banaticus (Araneae: Theridiidae) a new spider from southern Carpathians

I. Duma

A new species of *Theridion* belonging to *petraeum* group is described and illustrated. The species is very similar to *Theridion petraeum* (L. Koch, 1872) and *Theridion uhligi* Martin, 1974. Theridion banaticus is found in low altitude mountains (south-western Carpathians) a zone that can be placed between grassy lowlands inhabited by *Theridion uhligi* and alpine zone inhabited by *Theridion petraeum*.

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- [2] Deltshev C. D., (1992) A critical review of family Theridiidae (Araneae) in Bulgaria, Acta Zoologica Bulgarica, 43: 13-22
- [3] Duma I. (2008) *Theridion uhligi* Martin, 1974 (Araneae: Theridiidae) new to Romania, Entomologica Romanica 13: 297-299
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Disclaimer: The species *Theridion banaticus* will be described as a new species elsewhere in a scientific journal. The author explicitly states that the name *Theridion banaticus* as it appears in this abstract is herewith disclaimed for nomenclatural purposes until the date of appearance of the original description.

Beta diversity explains the latitudinal gradient of species richness in European spiders

W. Entling, M.H. Schmidt, S. Kumschick, S. Bacher, R. Brandl, W. Nentwig

In this study we estimated the influence of latitude and its connected environmental factors on regional and local spider diversity using two independent datasets. Regional diversity was derived from species occurring in European countries and large islands. To measure local diversity, spider communities were sampled in 17 locations between Sweden, Spain and Greece. In a second step we estimated beta diversity among countries and islands and among the communities for three latitudinal bands.

While regional species richness declined with latitude, there was no such relationship within local communities. Instead, beta-diversity was higher in the Mediterranean than in central and northern Europe both among countries and large islands and among locations.

Thus, latitudinal gradients of species richness in European spiders were strongly scaledependent. Obviously, the increase of species richness on the regional scale is not caused by an increase of alpha-diversity but by an increase of beta-diversity with decreasing latitude. As most large-scale diversity research is based on interpolated or coarse-resolution data and not on community data, beta diversity as a reason for increased species richness at low latitudes could be more frequent than previously thought..

Ecology and distribution of the genus *Troglohyphantes* Joseph, 1881 in the western Italian Alps

M. Isaia, E. Lana & P. Pantini

In Italy, the linyphiid spider genus *Troglohyphantes* is represented by 36 species distributed all over the Italian Alpine range. the known distribution is often confined to very restricted areas and several species are recorded from just one or a few localities. Knowledge of the genus has grown considerably in the last twenty years, especially in the Central and Eastern Italian Alps, but fro the Western part of the Alpine range data are lacking. For several years we have been collecting data to study the distribution, thte ecology and the phylogenetic development of *Troglohyphantes* in the Western Alps. In this paper we present the first preliminary contribution to the knowledge of this genus in Piemonte and Valle d'Aosta, including data on taxononomy, ecology, habitat and data on altitude and temperatures of finding localities gathered from direct observation or GIS processing.

Biodiversity of spiders on flooded and non-flooded meadows in the Lonjsko Polje Nature Park, Croatia

L.Katusic & S.Kemfelja

Lonjsko polje represents one of the largest and the best preserved flooded areas in Europe. Periodical flooding of this area occurs mostly during spring and autumn, and water remains here for more then 100 days. These hydrological conditions provide high habitat diversity and represent interesting objects of research.

Field research for this paper was performed from April to November 2004 on two locations; one flooded and other non-flooded. The purpose was to determine differences in species composition, biodiversity and in seasonal dynamics of spider on researched areas, as well as to determine the influence of periodical flooding on spider communities. During the research, 85 species of spider belonging to 13 families were captured. Using the main method, pitfall traps, 6124 individuals belonging to 74 species were captured. On non-flooded meadow 62 species were found, opposed to 46 found on flooded meadow. Index of biodiversity shows that the non-flooded meadow has considerably higher species richness than flooded. The examination of seasonal spider population dynamics has shown that there is no considerable difference between study areas. Eighteen new species of Croatian spider fauna was recorded.



Variation of the Shannon-Wiener Index during research period

Araneofauna of the nature park Ucka

E. Kolundzic, M. Zec, M. Majer & J. Bujan

This research of the spider (order Araneae) fauna of the Učka Nature park was conducted during 10 days, from July 22nd to July 31st, and it's the first systematic research of the araneofauna on that area. Nature Park Ucka is unique for its great diversity of habitats and species. Samples were collected actively (by hand, pooter, catcher - sweep net) and passively (pitfall traps), and a total of 630 individual samples from 63 localities was collected. 598 samples were identified to genus level. A total of 93 species belonging to 21 families was identified. 15 species belonging to 3 genus are new records for Croatian araneofauna. Collection and determination of all materials was done by biology students of the Biology Department at the Faculty of Sciences in Zagreb.



Agelenidae in the web



Araneus angulatus feeding

[1]Roberts M J (1995) Spiders of Britain and Northern Europe. Collins Field Guide, Bath

[2]Heimer S, Nentwig W (1991) Spinnen Mitteleuropas. Paul Parey, Berlin

[3]http://www.araneae.unibe.ch

[4]http://www.pp-ucka.hr

[5]http://www.faunaeur.org

Araneofauna of the Mediterranean island Vis

M. Majer, M. Zec, I. Kelava & E. Lugić

Spiders (Araneae) are a poorly explored order in Croatia. Considering that there is no complete list of spider species there is a need for making one. Systematic listing started in protected areas (national and nature parks), and in time extended to other areas, like possible centres of endemism. Vis is the most remoted island from the Croatian mainland in the Adriatic sea. The research of araneofauna of the island Vis was conducted from the 30th of September until 10th of October 2005, covering the whole area of the island. The samples were collected in different habitats, thus resulting in great variety of species. During the research classic methods were used, like sweeping net, pooter or exhauster, arial, ground, and the method of pit-fall traps [1]. Samples were conservated in 70% ethanol and determinated in laboratory using the light microscope. The collecting and determination of the material [2],[3] has been carried out by the biology students of the Department of Biology, Faculty of Science in Zagreb.

This research represents the first systhematical investigation of the island araneofauna in Croatia, and the represents considerable contribution to the checklist of Croatian spiders.



Our favorite method: Collecting samples with the sweeping net



Argiope lobata, inhabitant of the island

[1] Roberts M J (1995) Spiders of Britain and Northern Europe. Collins Field Guide, Bath
[2]Heimer S, Nentwig W (1991) Spinnen Mitteleuropas. Paul Parey, Berlin
[3]http://www.araneae.unibe.ch

Diversity of the spiders of the Wrangel Island, NE Russia

Y.M. Marusik & O.A. Khrulyova

The Wrangel Island is a remote, relatively small island with the highest elevation of 1000 m. A unique feature of this arctic island is a very limited extend of the Pleistocene glaciations combined with the lowered sea level during the Last Glacial Maximum, making the Wrangel Island a part of the Bering land bridge. This enabled enrichment of the fauna and flora by very different elements originating from the boreal, forest-tundra, tundra and even steppic. This has resulted in a species composition on the Wrangel Island being different from all other Arctic islands. According to the published surveys and most recent taxonomic papers, the fauna of the island encompasses 42 species belonging to 7 families. New material and a re-examination of the old collection have revealed 9 additional species. Among arctic islands, the Wrangel Island has the second richest araneofauna after Greenland (76 species). It has a unique composition of species and families due to the highest value of endemic species (over 15%), the highest in the Arctic diversity of the Dictynidae (3 species), the occurrence of a jumping spider (*Chalcoscirtus* sp.) and the presence of *Hilaira gertschi*, which is absent from the neighbouring Chukotka Peninsula.

The epigeic spider fauna (Arachnida: Araneae) of dry meadows in the Untere Lobau (Vienna, Austria)

N. Milasowszky, M. Hepner, C. Hörweg & D. Rotter

The effect of scrub invasion on epigeic spiders in dry meadows, the so called "Heißländen", in the National Park Donau-Auen in Vienna was investigated. "Heißländen" are xeric alluvial biotopes characterised by gravel ground and dry grassland vegetation. The study was carried out at 50 randomly selected plots in the area of "Untere Lobau" in Vienna. Epigeic spiders were sampled by means of pitfall traps during three periods lasting two weeks each (29 April to 13 May, 25 June to 9 July and 6 to 20 September 1999). At each plot scrub coverage was estimated within a radius of 8 m around the plot centre. The principal threat to the dry meadows is likely to be from encroachment of scrub and the development of rank vegetation that may result from fertiliser application and/or a lack of grazing. In this study we tested the effect of scrub invasion on the total spider species richness, as well as on different subsets, i.e. forest, forest steppe, grassland, dry grassland and ubiquist spiders. We aimed to determine the amount of scrub coverage that might be beneficial or detrimental for spiders with high conservation value. We expect that the results can be used for further management projects in the National Park Donau-Auen.

Graecophalangium marenzelleri comb. nov. a new systematic position for *Egaenus marenzelleri* Nosek, 1905 (Opiliones, Phalangiidae)

P.G. Mitov

The genus *Graecophalangium* was established by Roewer in 1923. Currently it includes 5 species (*Graecophalangium militare* (C.L.Koch, 1839), *G. atticum* Roewer 1923, *G. cretaeum* Martens, 1966, *G. punicum* Starega, 1973, *G. drenskii* Mitov, 1995), distributed on the territory of the Balkan Peninsula and the Near East. During the revision of the Turkish opilionid materials, deposited in the Arachnid Collection of the Natural History Museum Vienna, it became clear, that *Egaenus marenzelleri*, described by Nosek in 1905, is related to the genus *Graecophalangium* Roewer, 1923. This results in the new combination *Graecophalangium marenzelleri* (Nosek, 1905). A redescription of *Graecophalangium marenzelleri* (Nosek, 1905). Comb. nov. was made, including the male external and genital morphology.

Spider fauna of oceanic islands of Japan

H. Ono

Specimens of spiders from Ogasawara Islands (= Bonin Islands), Japan, preserved in the arachnid collection of Department of Zoology, National Museum of Nature and Science, Tokyo were taxonomically studied. A list of 72 species was made on the basis of the study and of the records from preceding literatures. Three Hawaiian oonopids, Ischnothyreus omus Suman, 1965, Gamasomorpha lalana Suman, 1965, Oonopinus humus Suman, 1965, and an anapid, Pseudanapis aloha Forster, 1959, widespread from Pacific islands and Australia are newly recorded from Japan. A new species of the genus Acantheis of the family Ctenidae was found and its description was prepared. Ogasawara Islands, including Iwojima, a hard-fought area between Japan and United States in the Second World War, are situated in the northwestern Pacific (23-28N/141-143E) ca.1000 km apart from the middle of Honshu, the nearest land, and perform a typical oceanic fauna. The spiders of the islands are composed of 25% endemics, 37.5% widely distributed species and 37.5% artificially imported ones. Of the 45 species excluding unnatural ones 14 species seems to be originated from Japanese lands, 12 are immigrants from southern and eastern Pacific islands and 19 are regarded as the Southeast Asian origin. The fauna of islands is discussed on the basis of the zoogeographical composition of species and an analysis of ecological factors in dispersing as well as some assessment of artificial effects

Spiders (Araneae) of a young dune island at the German North Sea coast

S. Schwarz & O.-D. Finch

The faunistical investigation of terrestrial habitats on islands of the East Frisean Island chain has a long tradition. Arachnological work on the islands was first intensified during the 1980s by Walter Schultz and it still proceeds (e.g. [1]). An actual compilation of species richness data of a large variety of taxa [2] included also spiders (Finch 2008 in [2]) and revealed that a total of 260 spiders species is present on the 11 older and younger East Frisean Islands.

Actually we are interested in changes in species richness and community composition of spiders on the young dune island of Mellum within a long term ecological research project that was started in 1985. The island in its present form exists now for about 100 years. First representative data of its colonization by spiders are from 1985/86 [3]. These now can be compared with results of trapping programmes during the year 1995 and during 1998, respectively (our data and data by [4]). Against the theoretical background of island biogeography our analyses are focussed on time and scale depending processes structuring the spider communities in different habitats of the small island that is still unpopulated by man. Additionally, potential climate change effects on the spider communities will be regarded in more detail.

- [1] Finch, O.-D., H. Krummen, F. Plaisier & W. Schultz (2007): Zonation of spiders (Araneae) and carabid beetles (Coleoptera: Carabidae) in island salt marshes at the North Sea coast. – Wetlands Ecology and Management 15: 207-228.
- [2] Niedringhaus, R., V. Haeseler & P. Janiesch (Hrsg.) (2008): Die Flora und Fauna der Ostfriesischen Inseln Artenverzeichnisse und Auswertungen zur Biodiversität. – Schriftenreihe Nationalpark Niedersächsisches Wattenmeer 11: 1-470.
- [3] Schultz, W. (1988): Besiedlung junger Düneninseln der südlichen Nordsee durch Spinnen (Araneida) und Weberknechte (Opilionida). Drosera '88: 47-68.
- [4] Dormann , W. (2000): Reaktionen terrestrischer Salzwiesen-Zoozönosen auf Temperaturerhöhungen und verstärktes Flutgeschehen infolge globaler Klimaänderungen. Projektbericht Univ. Bremen.

Alien spider introductions to Europe supported by global trade

M. Kobelt & W. Nentwig

Global trade is permanently ongoing and increases its volume every year. In this study, the occurrence of 87 unintentionally introduced spider species alien to Europe is analysed. The analysis includes (1) the introduction potential of six different origin areas of the world according to trade volume, area size, and geographical distance; (2) the body size of native and alien species; and (3) occurrence in or at buildings (synanthropic) or in natural habitats. We found the eastern Palearctic as the most influencing origin area with 44 introduced spider species to Europe. The eastern Palearctic and the Indomalayan provided a significantly higher number of introductions than expected, whereas the Nearctic, Neotropical, and Afrotropical provided a significantly lower number of introduced species than expected. This can be explained with their lower trade volume, smaller area, larger geographical distance to Europe, and stronger climate differences to Europe. Comparing the body size of introduced and native European spider species of the same family, we found for Theridiidae significantly larger alien spiders and for all other tested families a trend to a larger body size of alien species compared to the native spiders. The family affiliation of alien spiders is the most important factor for synanthropic occurrence in Europe. On the base of a very conservative estimation of spider species introductions to Europe combined with possible effects of climate change, we predict for the near future a permanent increase in the number of alien spider species in Europe.

Developing a predictive system utilising spiders for assessment of habitat quality

M. Nolan

A databasing system allowing prediction of spider species associated with habitats was previously introduced as being in the early stages of development with respect to the Irish spider fauna¹. This project was funded again by the National Parks and Wildlife Service of Ireland through 2007, and another round of funding was confirmed in June 2008. This will allow for the composition of an account of all spider species found in Ireland and for coding of a considerable proportion of these into the system. A range of issues which necessitated consideration during the construction of the database are discussed: composition of species accounts and what information to include; categories to be included in the traits file; the problem of scoring affiliations between species and habitats. It is hoped to field test the system in 2009 and an appropriate sampling methodology is proposed and discussed with respect to how best to gain a representative sample of the predicted species. Recent progress in Irish spider studies is briefly discussed.

 Nolan, M. (2008) An 'Expert System' approach to digitising ecological information on spiders for habitat assessment. Revista Ibérica de Aracnología 15: 137 – 141.

Effects of tradional coppicing and game keeping in European lowland forests on epigeic spiders

R. Tropek, L. Spitzer, M. Konvicka & J. Benes

Evidences from birds, butterflies and plants support the hypothesis that deciduous woodlands of lowland temperate Europe would be sparser than both non-intervention reserves and commercially grown high forests prevailing in present [1,2,3]. The demise of techniques such as coppicing and forest pasture is causing a closure of formerly sparse woods across Central Europe. Effects of this transition on epigeic arthropods are little known.

We used pitfall traps to sample spiders in the Milovicky wood, Czech Republic, a former coppice now partly used as intensive deer park and partly still coppiced. A two factorial design allowed simultaneous assessment of forest openness and game density effects. Spiders preferred open stands and avoided high game density. Ordinations showed that spiders of conservation concern were associated with open stands. These results are consistent with patterns in other epigeic groups surveyed in parallel: carabids, milipedes, centipedes and woodlice [4].

The results support the necessity of restoring traditional management methods to maintain woodland diversity, at least in selected protected areas. The recently prevailing non-intervention management in most of protected woodlands in Europe may soon prove as a gigantic failure. They also show that high ungulate densities in game parks are intolerable for conserving woodland epigeic invertebrates.



CCA ordination of composition of spiders from the Milovicky wood - models with GAME and OPENNESS as explanatory variables (~ GAME + OPENNESS). Positions of all species are shown, different symbols stand for relic (filled circles), adaptive (filled triangles) and eurytopic (X-crosses) species [5]. Abbreviations of species names are given for relic species only: ATYPIC - Atypus piceus (Sulzer, 1776); CERMAJ -Ceratinella major Kulczyński, 1894; DRAVIL -Drassyllus villicus (Thorell, 1875); MEGPSE -Megalepthyphantes pseudocollinus Saaristo, 1997; OZYBLA - Ozyptila blackwalli Simon, 1875; OZYBRE - Ozyptila brevipes (Hahn, 1826); OZYSCA - Ozyptila scabricula (Westring, 1851); SCOCEL - Scotina celans (Blackwall, 1841); TRIAFF – Trichoncus affinis Kulczyński, 1894; XYSLIN - Xysticus lineatus (Westring, 1851); XYSROB - Xysticus robustus (Hahn, 1832).

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Effects of vegetation, microclimate and space on spider assemblage in Terai Conservation Area, India

U. Hore & V.P. Uniyal

The role of vegetation, microclimate and spatial factors on the spider assemblages in Terai ecosystem were investigated. This ecosystem is characterized by alluvial floodplains of tall grassland interspersed with woodland, swamps and riparian patches. High water table, annual flooding, and managed grassland burning maintains its dynamic complexity. A mosaic of five vegetation types was sampled for spiders by using pitfall traps and other semi-quantitative collection methods. A total of 3666 adult spiders representing 22 families, 60 genera and 160 species were documented. Correlations were investigated between the dissimilarity matrices representing the spider composition with matrices of vegetation and microclimate variables. Geographic distance between sampling locations was found to have weak, yet statistically significant influence on spider composition. The effects of microclimate and vegetation structure (matrix) were controlled independently using partial Mantel test. Henceforth, significant association was found between species composition and vegetation structure, but not with microclimate across habitat at regional level.

Colonization of a newly created dune grassland by spiders

E.Karakoç, L.Baert, J.-P.Maelfait

At the turn of the century a major restoration project was realised on the right bank of the estuarine part of the river Yser (Belgian coast). The first two phases consisted of the demolition of the buildings and roads of the former naval basis and the removal of the jetties and the quays of the former military harbour and slipway. The excavated sandy soil from the quays was used to build dune like hills above the pits left by the removal of the buildings and a dune like dike along the tidal mud flat created after the removal of the harbour and the slipway. These works ended in 2001 and immediately afterwards a multidisciplinary monitoring was started.

In this paper we report the results of six years of monitoring of the dune like dike on which a dune grassland gradually developed. We assess the spider assemblages having colonised this newly created habitat in comparison with the assemblages occurring in adjoining old dune habitats, which were sampled in the same way (pitfall traps) during the same period (2002-2007). The two old dune habitats were a well stabilised dune grassland and the seaward side of a foredune.

We shortly describe the life cycle timing of most abundant species. We can distinguish several phenological patterns (e.g. summer active species like *Haplodrassus dalmatensis*, winter active species like *Centromerita concinna*). By comparing the species composition of the newly created dune grassland with that of the old dune habitats we can asses which type of species could already colonize that new habitat.

Multi-species inference of environmental conditions for the conservation of riparian spiders

K. Lambeets, D. Bonte & J.-P. Maelfait

River banks are naturally disturbed habitats, in which local flood events and landscape structure are expected to govern riparian assemblages. Not solely effects of flooding *per se*, but also related changes in vegetation structure will affect species' distribution. By elucidating the relationships between species' occurrence and environmental conditions, insight into conservation strategies to preserve riparian species is gained. By means of variable reduction and multiple regression analysis, environmental constraints on the incidence and density of stenotopic riparian spiders were clarified.

Riparian spiders are expected to go extinct by increased flooding, but benefited densities of hygrophilic, dispersive species. Increased vegetation complexity had a positive effect on the latter. Local topography and landscape composition affected riparian lycosids in opposite ways, indicating the importance of a less hostile lateral transition and suitable hibernation sites nearby. Increased channel connectivity favoured incidence of a linyphild and benefited density of a rare lycosid.

Our analyses show the importance of an evidence-based approach of river management. River restoration should generate the required variation in environmental conditions (dynamic processes) on the river bank and landscape level to preserve vulnerable riparian spiders. Hence, accounting for responses of multiple species provides a more complete framework to guide future conservation strategies.

Wolf spider-coenoses of alpine rivers: habitat preference, recolonisation of renaturated areas and conservation-strategies (Araneae: Lycosidae)

Ch. Komposch

At present alpine rivers are of great interest to the water and energy industry as well as nature conservation institutions. Consequently, there is a high potential for conflicts between producing "eco-energy" and preserving the very last near-natural stretches and their stenotopic threatened biocoenoses respectively.

Spiders, spring-tails, carabid and staphylinid beetles represent the four main arthropod taxa of gravel banks of alpine rivers. The composition of wolf-spider-coenoses is used as a sensitive descriptive parameter to reveal and evaluate the ecological status and nature conservation value of riverside areas.

Available data extracted from EU-LIFE-Nature-projects of the last 10 years are used as baseline indicators for this study on Austrian river systems. Rivers investigated are the Upper Drau and Vellach in Carinthia, the Mur, Enns and Sulm in Styria; these are compared with Steinberger's data from the Lech in Northern Tyrol.

The reference stretches show highly diverse lycosid-coenoses with an evenly distribution of their up to 7 ripicolous species (e.g. *Arctosa cinerea, Pardosa morosa, P. wagleri, P. torrentum, Pirata knorri*). Restored stretches in quite early stages of succession are colonized on average by 3 (1 to 5) ripicolous wolf spider species; surprisingly, and despite of their geographical proximity, the assemblies studied differ highly from each other.

The ratio of big spider (Lycosidae) versus small spider abundances (Linyphiidae) shows a clear dominance of the former in near-natural riversides and demonstrates the extreme position in the hydropeaking-influenced range with prevailing linyphiid spiders.



Figure 1: Pristine conditions of alpine rivers: the Vellach river in Carinthia, Austria. Figure 2: Distribution pattern of ripicolous wolf spider coenoses in Eastern Alpine riverside areas: regulated stretch (Drau, Dellach), hydro-peaking influenced restored stretch (Drau,

Spittal), near-natural restored stretch (Drau, Dellach) and reference (Vellach).

Grazing, mowing or burning? What is the "comment" of the spiders on this?

Cs. Szinetár

Within the frames of the Life Nature Project (Habitat Management on the Pannonian Grasslands in Hungary, LIFE 05NAT/HU/000117 project), we started the arachnological study in spring of 2007 in the Belsobarand loess-valley, which is one of the most valuable loess ridges in Hungary. We examine the effects of the following implemented management actions through the changes in the spider assemlages.

I. close out of grazing and control (massively overgrazed grassland (sheep)

II. burning (early spring) and control unmanaged (sparse grazing at most)

III. hand-mowing and control unmanaged (sparse grazing at most)

Collection of spiders has been done two times, during one-month periods, by Barber-trapping on the managed and control areas. Trapping results have shown several significant differences between the untreated (control) and treated habitat patches. The highest spider density and species number was observed in the case of hand-mowing. We have found the lowest volue of the species and specimen number in the overgrazed grassland patches. Grazing and mowing makes the area equally more homogeneous, the traps are becoming strongly uniformized. In the case of management by burning and the spots studied as the control of the same, the diversity of the burned areas were significantly over the control area on the short term.

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