PROGRAM & ABSTRACTS

4-8 SEPTEMBER 2011

BEN-GURION UNIVERSITY OF THE NEGEV

BLAUSTEIN INSTITUTES FOR DESERT RESEARCH

SEDE BOQER CAMPUS, ISRAEL

Welcome to the **26th European Congress of Arachnology**. The Congress is hosted by the Jacob Blaustein Institutes for Desert Research, on the Sede Boqer Campus of Ben-Gurion University of the Negev at Midreshet Ben-Gurion.

We hope you enjoy the Congress!

The organizers

GENERAL INFORMATION

MEETING VENUE

Lectures will be held in the George Evens Family Auditorium (# **19** on Campus map)
Posters will be presented in the lobby of the Institute for Agriculture and Biotechnology of Drylands (# **25** on Campus map). Coffee/tea breaks will be in the Vickar Information Center (# **13** on Campus map)

ORAL PRESENTATIONS

PowerPoint files should be submitted on a flash-disk (USB) the day before the presentation (by 8:00 a.m. on the first day of the Congress). One of the organizers will download the file onto a computer either at the Registration Desk or in the Lecture Hall.

POSTERS

Posters will be on display throughout the meeting. There will be two poster sessions (Monday 5 September and Wednesday 7 September). Presenters are asked to be at their posters during the designated session (see **Program**).

EXCURSIONS

There are three excursions offered on Tuesday 6 September. Details of the trips and the list of participants in each excursion will be posted on the board near the registration desk. We have tried to accommodate the request of each participant, but changes may have been made. If you wish to sign up for an excursion or to change to a different one, please see the person responsible for Excursions at the Registration Desk.

MEALS

For those who registered for meals, lunch on Sunday, Monday, Wednesday and Thursday, and dinner on Thursday, will be in the Field School Dining Room (# **23** on the Midreshet Ben Gurion map). You may register for a lunch up to 6 p.m. on the day before. Other options are in the small shopping center (# **18** on the Midreshet Ben Gurion map) and the "Isobar" pub (open evenings, # **22** on the Midreshet Ben Gurion map).

STUDENT AWARDS

Awards for oral and poster student presentations (sponsored by Arachnologische Gesellschaft, Cambridge University Press, Oxford University Press and Yale University Press) will be presented at the end of the Congress. **Please inform the Registration Desk team if you would like your presentation considered for an award.**

INFORMATION REGARDING SPECIMEN COLLECTING

The conference site is near several nature reserves, some of which may be visited during or after the Congress. Below we provide **essential information concerning collecting in nature reserves and the removal of specimens from Israel**.

Please note that desert natural habitats are fragile. When collecting, attempts should be made to avoid disturbing the habitat, e.g., rocks and removed soil should be returned to the original position and plants should not be damaged. Note also that removal of any annual flowers and geophytes is forbidden by law.

In Israel, permits are required in order to collect specimens in nature reserves and to remove material from the country. The Congress organizers and the Israel National Parks Authority scientists share a common interest in increasing our knowledge of the local arachnid fauna and thus, we recognize the importance of collecting, identifying and documenting this fauna. To this end, we will request the appropriate permits from the authorities for Congress participants who wish to collect inside Nature Reserves and National Parks in Israel. The permit is subject to the following requirements:

1. If you intend to collect during the Congress excursion, and have not already submitted a request, please fill in your name and information in the form available at the Registration Desk
2. The collecting permit is for arachnids only.
3. Collecting by hand only is permitted (no traps). No more than 10 specimens of each species.
4. Within nature reserves, walking is permitted on marked trails and during daytime ONLY.
5. The collecting permit is valid for Nature Reserves and National Parks visited during the Congress excursion (a list will be provided at the Congress venue).
6. To collect in other Nature Reserves or National Parks, outside the Congress excursion a personal permit is needed. The Congress organizers will arrange these permits for you. Please inform us if you intend to collect specimens outside the organized Congress activities. A list of locations where you plan to collect must be provided to the Congress organizers during the Congress, in order to ensure the permit. (This may be done in consultation with Congress organizers).
7. You are required to provide a list of the approximate numbers of specimens of each arachnid order removed from each collecting location **before leaving Israel**. This list should be given to the organizers at the Congress or sent to: eca26@bgu.ac.il.
8. If new species are described, holotypes should be deposited at the arachnid collection of the Hebrew University of Jerusalem (c/o Dr. Ariel Chipman, Curator of Invertebrates, Natural History Collections, Hebrew University of Jerusalem, Jerusalem, 91904 Israel (chipman@cc.huji.ac.il). We would be

grateful if duplicate specimens of both sexes of the new species and of species that are recorded for the first time in Israel are donated to the arachnid collection of the Hebrew University of Jerusalem.

9. Reports or publications that include material collected under this permit should include a statement in the Acknowledgements indicating that the "collections were made with permission of the Israel Nature and National Parks Authority, permit # XXX". (The permit number will be supplied at the Congress.) We would appreciate your sending a copy to the Curator of Invertebrates in the Natural History Collections of the Hebrew University of Jerusalem (see above address).

On behalf of the Organizing Committee, I hope that you have productive collecting and we look forward to seeing the results of your efforts.
Yael Lubin

Program Overview

Sunday 4 Sept		**Monday 5 Sept**		**Wednesday 7 Sept**		**Thursday 8 Sept**	
0800-0930 Registration		0845-0930	**Plenary: Tso**	0845-0930	**Plenary: Goodacre**	0845-0930	**Plenary: Andrade**
			Symposium: Prey-specialized spiders		***Symposium: Spiders in agroecosystems***		***Symposium: Behavioral ecology II***
0930-0945	Greetings	0930-0935	Introduction	0930-0935	Introduction	0930-0935	Introduction
0945-1030	**Plenary: Prendini**	0935-0955	Pekar	0935-0950	Samu	0935-0950	Albo
		0955-1015	Toft	0950-1005	Herrmann	0950-1005	Sandomirsky
	Other arachnids	-		1005-1020	Gajdos	1005-1020	Sentenská
1030-1045	Dunlop	*1015-1045*	*Break*	*1020-1045*	*Break*	*1020-1045*	*Break*
1045-1100	Bird	1045-1100	Liznarova	1045-1100	Gavish	1045-1100	Lin
1100-1115	Murienne	1100-1115	Rezac	1100-1115	Opatovsky	1100-1115	Zimmer
1115-1145	*Break*	1115-1130	Salomon-Botner	1115-1130	Hochman-Adler	1115-1130	Chiarle
		1130-1145	Holm	1130-1145	Mestre Arias	1130-1135	Summary
	Symposium: Arachnid systematics	1145-1150	Summary	1145-1200	Bucher		***Symposium: Social spiders***
1145-1150	Introduction		**Physiology & biochemistry**	1200-1205	Summary	1135-1140	Introduction
1150-1205	Kuntner	1150-1205	Kuhn-Nentwig		**Behavior & Life History**	1140-1155	Majer
1205-1220	Dimitrov	1205-1220	Kalra	1205-1220	Gregoric	1155-1210	Corcobado
1220-1235	Scharff	1220-1235	Kropf	1220-1235	Kralj-Fiser	1210-1225	Berger-Tal
1235-1400	*Lunch*	*1235-1400*	*Lunch*	*1235-1400*	*Lunch*	*1225-1400*	*Lunch*

Sunday 4 Sept, continued		**Monday 5 Sept, continued**		**Wednesday 7 Sept, continued**		**Thursday 8 Sept, continued**	
1400-1415	Decae		***Symposium: Behavioral ecology I***		**Ecology**	1400-1415	Smith
1415-1430	Mora	1400-1405	Introduction	1400-1415	Melichnova	1415-1430	Bechsgaard
1430-1445	Frick	1405-1420	Cheng	1415-1430	Huang	1430-1445	Su
1445-1500	Gavish-Regev	1420-1435	Walter	1430-1445	Liao, Hsien Chun	1445-1500	Grinsted
1500-1515	Opatova	1435-1450	Anotaux	1445-1500	Ysnel	1500-1515	Settepani
1515-1530	Agnarsson	1450-1505	Pasquet	1500-1515	Paschetta	1515-1520	Summary
-		1505-1520	Korenko	1515-1530	Leroy		
-		1520-1525	Summary				
1530-1600	*Break*	*1525-1600*	*Break*	*1530-1600*	*Break*	*1520-1600*	*Break*
1600-1615	Ribera		**Diversity & faunistics**	1600-1615	Parr		**Biogeography**
1615-1620	Summary	1600-1615	Marusik		Morphology	1600-1615	Komposch
	Taxonomy & methodology	1615-1630	Jaeger	1615-1630	Dolejs	1615-1630	Isaia
1620-1635	Marusik	1630-1645	van Helsdingen	1630-1645	Mathew	1630-1645	Blick
1635-1650	Sudhikumar	1645-1700	Omelko	1645-1700	Wunderlin	1645-1700	Baert
1650-1705	Sestakova	1700-1715	Piterkina	1700-1715	Schaider	1700-1800	**General meeting**
	Evolution	1715-1730	Polchaninova	1715-1730	Jocque	1800-1830	**Prize awards and final words**
1705-1720	Forman	1730-1830	**Poster session I**	1730-1830	**Poster session II**		
1720-1735	Kral						
1735-1830	**Arachnid photos & films**						
1830-	*Reception*	*1830-1930*	*Israeli meal*	*1900-*	*Congress dinner*	*1900-*	*Dinner*
		2000-	*Desert at night; Russian party*				

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PROGRAM OF THE 26th European Congress of Arachnology

Sunday 4 September

8:00-9:30	**Registration**
9:30-9:45	**Welcome address**
9:45-10:30	**Plenary**
	Assembling the scorpion tree of life: Towards a global revision of the order Scorpiones – Lorenzo Prendini
	Session: Other Arachnids
10:30-10:45	Acariform mites and camel spiders: more than just good friends? – Jason Dunlop
10:45-11:00	Solifugae: Exploring the systematics and biology of a little known order of Arachnids – Tharina Bird, Paula Cushing, Robert Wharton, Jack Brookhart, Warren Savary, Lorenzo Prendini
11:00-11:15	Integrating systematics and ecology: An example on Ricinulei biogeography – Jerome Murienne, Ligia Benavides, Gustavo Hormiga, Gonzalo Giribet
11:00-11:45	**Coffee break**
11:45-11:50	**Introduction - Symposium: Challenges for arachnid systematics in the 21st century**
11:50-12:05	New taxonomy: Go integrative, biological, cyber…or go reconsider – Matjaz Kuntner, Ingi Agnarsson
12:05-12:20	Of webs and wings: New insights on orbweaver evolution and its driving forces – Dimitar Dimitrov, Lara Lopardo, Gonzalo Giribet, Miquel Arnedo, Fernando Alvarez-Padilla, Gustavo Hormiga
12:20-12:35	Molecular phylogeny of orb weavers (Araneae, Araneidae) – Nikolaj Scharff, Todd Blackledge, Ingi Agnarsson, Jonathan Coddington, Tamas Szuts, Volker Framenau, Dimitar Dimitrov, John Wenzel
12:35-14:00	**Lunch**
14:00-14:15	Geographically defined species groups within the genus *Nemesia* (Araneae, Mygalomorphae, Nemesiidae) – Arthur Decae

14:15-14:30 Evolutionary significance of the reduction of the spinning apparatus in Mediterranean trapdoor spiders (Araneae, Nemesiidae) – Elisa Mora, Arthur Decae, Vera Opatova, Miquel Arnedo

14:30-14:45 Phylogeny of the ancient mynoglenines (Linyphiidae) – Holger Frick, Nikolaj Scharff

14:45-15:00 A deeper view on a basal clade of linyphiid spiders: Morphological phylogenetic analysis of the genus *Stemonyphantes* (Linyphiidae: Araneae) – Efrat Gavish-Regev, Gustavo Horminga, Nikolaj Scharff

15:00-15:15 Colonization pathways and phylogeography of the Canary Islands endemic trap-door spider *Titanidiops canariensis* (Araneae, Idiopidae) – Vera Opatova, Miquel Arnedo

15:15-15:30 Dispersal biogeography: The role of dispersal in the generation of biodiversity – Ingi Agnarsson, Matjaz Kuntner

15:30-16:00 **Coffee Break**

16:00-16:15 Deepening in the origin and the distribution of the family Leptonetidae from the Mediterranean basin – Carles Ribera, Enric Planas, Christo Deltshev

16:15-16:20 Symposium summary

Session: Taxonomy and Methodology

16:20-16:35 A brief chronological review of different spider classification schemes – Yuri Marusik

16:35-16:50 Comparative study on the effect of preservatives and extraction methods on the quality of spider DNA – Ambalaparambil Sudhikumar, Frederik Hendrickx

16:50-17:05 Resurrection of the genus *Atea* based on the trichobothriotaxy (Aranea, Araneidae) – Anna Sestakova, Miroslav Krumpal

Session: Evolution

17:05-17:20 Karyotype evolution and detection of 18S rRNA genes in the superfamily Eresoidea – Martin Forman, Jiri Kral, Petr Nguen

17:20-17:35 Origin of spider sex chromosomes: lessons from meiosis of Entelegynes and Mygalomorphs – Jiri Kral, Tereza Korinkova, Martin Forman

17:35-18:30 **Arachnid photos and films** (open to the public)

18:30 - **Reception**

Monday 5 September

8:45-9:30 **Plenary**

Studying spider-inset interactions from perspectives of insect visual physiology – I-Min Tso

9:30-9:35 **Introduction - Symposium: Prey-specialized spiders: ecological and evolutionary mechanisms**

9:35-9:55 Overview of prey-specialized spiders and their adaptations – Stano Pekar

9:55-10:15 Evolution of food specialization in spiders: how does it fit with theory? – Soeren Toft

10:15-10:45 **Coffee Break**

10:45-11:00 Predatory versatility enhances local trophic specialization in a cosmopolitan carnivorous predator – Eva Liznarova, Lenka Sentenska, Stano Pekar

11:00-11:15 Why several capturing tactics evolved in woodlice eating *Dydera* spiders? – Milan Rezac, Katerina Krejsova

11:15-11:30 Balancing nutrient intake and utilization during reproduction – Mor Salomon, David Mayntz, Yael Lubin

11:30-11:45 Dietary niche and prey preference of social and subsocial spiders of the genus *Stegodyphus* – Christina Holm, Trine Bilde

11:45-11:50 Symposium summary

Session: Physiology and Biochemistry

11:50-12:05 Venom composition and strategies in spiders – Lucia Kuhn-Nentwig, Reto Stoecklin, Wolfgang Nentwig

12:05-12:20 Metabolic fuel utilization in scorpions under desiccation stress – Bhawna Kalra, Eran Gefen

12:20-12:35 How do orb-weaving spiders (Araneae: Araneidae) avoid getting stuck in their capture spiral? Christian Kropf, Dina Bauer, Thomas Schlappi, Alain Jacob

12:35-14:00 **Lunch**

14:00-14:05 **Introduction – Symposium: Behavioral ecology – foraging and signals**

14:05-14:20 Blue is the new UV:Blue, not UV, is the prey attracting color in spider web decorations – Ren-Chung Cheng, Sean Blamires, I-Min Tso

14:20-14:35 Evolution of a signal: Silken web decorations in orb web spiders – Andre Walter, Mark Elgar

14:35-14:50 Ageing and foraging effort in an orb-weaving spider – Mylene Anotaux, Raymond Leborgne, Alain Pasquet

14:50-15:05 Loss of legs: Is it a handicap for an orb-weaving spider? Alain Pasquet, Mylene Anotaux, Raymond Leborgne

15:05-15:20 Three-dimensional web as defence for parasitoid larva – Stanislav Korenko, Marco Isaia, Stano Pekar

15:20-15:25 Symposium summary

15:25-16:00 **Coffee Break**

Session: Diversity and Faunistics

16:00-16:15 Diversity of spiders in Israel – Sergei Zonstein, Yuri Marusik

16:15-16:30 Spiders of Laos – A decade of research in a heavily bombed biodiversity hotspot – Peter Jager, Bounthob Praxaysombath

16:30-16:45 Fauna Europaea: Objectives, present situation, Furture – Peter van Helsdingen

16:45-17:00 Altitudinal and spatial distribution of the epigeic spiders (Arachnida; Aranei) in the mountain part of Maritime Province of Russia – Mikhail Omelko

17:00-17:15 Gnaphosid spiders living around the salt lake Elton among the semi-desert of Caspian Sea lowland (Russia) – Tatyana Piterkina

17:15-17:30 Spider communities in the steppe ecosystems of central Russia and Ukraine – Nina Polchaninova

17:30-18:30 **1st Poster Session**

18:30-19:30 **Israeli meal**

20:00 **Desert at night; Russian party**

Tuesday 6 September

Excursions

Wednesday 7 September

8:45-9:30 **Plenary**

What makes a spider fly? Studies of dispersal behavior in spiders from disturbed landscapes – Sara Goodacre

9:30-9:35 **Introduction – Symposium: Spiders in agroecoystems at landscape and local scales**

9:35-9:50 The effect of grazing intensity on the ecological character of pasture spider assemblages – Ferenc Samu, Csaba Szinetar

9:50-10:05 The effects of forest age in the surrounding landscape on spider communities in eucalyptus plantations in the northern Negev, Israel – John Herrmann, Martin Entling, Yael Lubin

10:05-10:20 Importance of historical structures of agricultural landscape for the epigeic spider communities diversity in the cadastre of Liptovska Teplicka (Slovakia) – Peter Gajdos, Lenka Dankaninova, David Stanislav

10:20-10:45 **Coffee Break**

10:45-11:00 Decoupling fragmentation from habitat loss: a SLOSS analysis of spider biodiversity in a patchy agro-ecosystem – Yoni Gavish, Yaron Ziv, Michael Rosenzweig

11:00-11:15 Pest consumption and niche separation of common immigrant and agrobiont spider species in semi-desert wheat fields – Itai Opatovsky, Phyllis Weintraub, Yael Lubin

11:15-11:30 Spillover of agriculturally subsidized arthropods to adjacent natural arid habitats: Effects on spider foraging behavior – Valeria Hochman-Adler, Yael Lubin, Moshe Coll

11:30-11:45 Maternal effects, immediate food stress and its impact on dispersal strategies: Experimental evidence from an agrobiont spider – Laia Mestre, Dries Bonte

11:45-12:00 Body condition of spiders in fragmented landscapes: Intraspecific competition vs. food limitation – Roman Bucher, Martin Entling

12:00-12:05 Symposium summary

Session: Behavior & Life History

12:05-12:20 Larger spiders use more silk: Patterns of material investment in *Zygiella* s.l. - Matjaz Gregoric, Todd Blackledge, Matjaz Kuntner

12:20-12:35 Behavioral plasticity in an urban spider species – Simona Kralj-Fiser, Jutta Schneider

12:35-14:00 **Lunch**

Session: Ecology

14:00-14:15 Spatial relationship between three dominant spider species and Collembola prey in an environmentally heterogeneous forest floor habitat – Elvira Melnichnova, Theo Blick, W. Dorow, V. Wolters, Klaus Birkhofer

14:15-14:30 Relationship between spider diversity and microhabitats in plantation forests receiving differential thinning treatments – Pao Shen Huang, I-Min Tso

14:30-14:45 Factors influencing spider diversity in a coastal windbreak forest in Taiwan – Hsien Chun Liao

14:45-15:00 Ecological determinants of spider assemblages in a tropical forest (French Guyana) - Frederic Ysnel, Boris Leroy, Cyril Courtial, Julien Petillon, Alain Canard

15:00-15:15 New approaches to community ecology: Application of taxonomic relatedness indexes to wetland spider assemblages and their use for biodiagnostic purposes – Mauro Paschetta, Marco Isaia

15:15-15:30 The future of threatened spiders in the face of climate change: insights with *Dolomedes plantarius* (Clerck) – Boris Leroy, Mauro Paschetta, Morgane Barbet-Massin, Nicolas Dubos, Alain Canard, Frederic Ysnel

15:30-16:00 **Coffee Break**

16:00-16:15 The ecology and seasonal abundance of the huntsman spider, *Heteropoda venatoria* in banana agro-ecosystems in Cameroon - Christopher Parr

Session: Morphology

16:15-16:30 Life cycle and spinning apparatus of wolf spiders (Araneae: Lycosidae) – Petr Dolejs, Jan Buchar, Jaroslav Smrz

16:30-16:45 Ultra structural comparison of spinneret morphology of orb weaving and funnel web building spiders of Western Ghats, India – Elisabeth Mathew, Ambalaparambil Sudhikumar, Pothalil Sebastian

16:45-17:00 Rapid color change in the linyphiid spider *Floronia bucculenta* (Araneae: Linyphiidae) – Judith Wunderlin, Christian Kropf

17:10-17:15 Turning over a new leaf in dyspnoid scent glands research (Opiliones) – Miriam Schaider, Guenther Raspotnig

17:15-17:30 Signals from the rear: Is a modified abdomen in the last recourse for highly specialized males? – Rudy Jocque

17:30-18:30 **2nd Poster Session**

19:00 **Congress Dinner**

Thursday 8 September

8:45-9:30 **Plenary**

Sexual selection and ecology shape plastic development and behavior of spiders – Maydianne Andrade

9:30-9:35 **Introduction – Symposium: Behavioral ecology – mating behavior**

9:35-9:50 Male condition and female preferences in a gift-giving spider – Maria Albo, Soeren Toft, Trine Bilde

9:50-10:05 Lolita's web: Juvenile female matings in the brown widow spider – Iara Sandomirsky, Ally Harari, Yael Lubin, Maydianne Andrade

10:05-10:20 Facotrs affecting frequency of reversed sexual cannibalism in *M. sociabilis* – Lenka Sentenska, Stano Pekar

10:20-10:45 **Coffee Break**

10:45-11:00 The role of conspicuous body coloration in courtship of nocturnal spiders – Tai-Shen Lin

11:00-11:15 Risks and consequences of inbreeding in the invasive spider species *Argiope bruennichi* – Stefanie Zimmer, Jutta Schneider

11:15-11:30 Dr. Jekyll and Mr. Hyde: On the real identity of *Pardosa vlijmi* and *P. proxima* (Aranea, Lycosidae) – Alberto Chiarle, Francesco Ballarin, Marco isaia, Torbjorn Kronestedt

11:30-11:35 Symposium summary

11:35-11:40 **Introduction - Symposium: Social spiders**

11:40-11:55 The biogeography of social spiders – Marija Majer, Jens-Christian Svenning, Trine Bilde

11:55-12:10 Sociality level explains dispersal ability in spiders – Guadalupe Corcobado, Miguel Rodriguez-Girones, Jordi Moya-Larano, Leticia Aviles

12:10-12:25 Outbreeding depression and lack of inbreeding costs in a social spider – Reut Berger-Tal, Trine Bilde, Yael Lubin

12:25-14:00 **Lunch**

14:00-14:15 Population structure and sex-specific dispersal in a cooperative, subsocial and solitary spider – Deborah Smith, Yong-Chao Su, Yael Lubin

14:15-14:30 Comparative transcriptomics of the spider genus *Stegodyphus* suggests genetic consequences of the transition to sociality – Jesper Bechsgaard, Tiina Mattila, Mikkel Schierup, Trine Bilde

14:30-14:45 Population genetic structure of kleptoparasitic spiders (Argyrodinae: Theridiidae) – A comparison between group-living and solitary species – Yong-Chao Su, Deborah Smith

14:45-15:00 Reproductive skew in social spiders – to reproduce or to help your sister – Lena Grinsted, Trine Bilde

15:00-15:15 Task differentiation in the social spider *Stedogyphus sarasinorum* – Virginia Settepani, Lena Grinsted, Trine Bilde

15:15-15:20 Symposium summary

15:20-16:00 **Coffee Break**

Session: Biogeography

16:00-16:15 The spider fauna (Araneae) of hay meadows and pastures – a faunistic comparison and nature conservation evaluation - Christian Komposch

16:15-16:30 Ecology and systematics of the genus *Troglohyphantes* (Araneae, Linyphiidae) in Italy: An overview on recent findings – Marco Isaia

16:30-16:45 Extra-alpine arachnid species in Central Europe with restricted distribution areas – Theo Blick

16:45-17:00 The spider communities of the Galapagos Islands: Final approach – Leon Baert, Jean-Pierre Maelfait

17:00-18:00 **General Meeting**

18:00-18:30 **Prize Awards and Final Words**

ABSTRACTS

SUNDAY, 4 SEPTEMBER

ASSEMBLING THE SCORPION TREE OF LIFE: TOWARDS A GLOBAL REVISION OF THE ORDER SCORPIONES

Lorenzo Prendini

Arachnids & Myriapods, Division of Invertebrate Zoology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024-5192, USA

The higher phylogeny and classification of scorpions is in a state of flux. In 1980, seven families were recognized and grouped into three superfamilies: Buthoidea, Chactoidea and Scorpionoidea. By 2000, 16–20 families were recognized, and placed in 4–6 superfamilies, or none at all. Few of these classifications were based on cladistic evidence, most on appeals to authority. Stockwell (1989) presented the first quantitative phylogenetic analysis of scorpion phylogeny and proposed a revised classification that was never published. Stockwell's (1989) unpublished morphological analysis used genera as terminal taxa for non-buthid scorpions and a single family terminal representing Buthidae. Three family-level phylogenetic analyses, also based on morphological data, appeared since. Prendini (2000) treated Scorpionoidea using exemplar species and revised the family-level classification of the superfamily. Soleglad & Sissom (2001) treated the chactoid family Euscorpiidae using genera as terminals. Soleglad & Fet (2003) treated all scorpion families, using genera as terminals, and proposed a radical reworking of the classification: four extant parvorders, six extant superfamilies and fourteen extant families were recognized. Prendini & Wheeler (2005) criticized the cladistic analyses of Soleglad & Fet (2003) on theoretical and empirical grounds, rejected their analytical results and revised classification, and reverted to a classification based on the most recent peer-reviewed treatments, pending the outcome of a rigorous phylogenetic analysis. This presentation provides preliminary results of a program to reconstruct the phylogeny and revise the higher classification of scorpions based on diverse sources of evidence (DNA sequence from six loci in the nuclear and mitochondrial genomes, and morphology) acquired from multiple exemplar species, currently representing all scorpion families and more than half of all scorpion genera.

ACARIFORM MITES AND CAMEL SPIDERS: MORE THAN JUST GOOD FRIENDS?

Jason A. Dunlop

Museum für Naturkunde, Leibniz Institute for Research on Evolution and Biodiversity at the Humboldt University Berlin, Invalidenstrasse 43, D-10115 Berlin, Germany

Camel spiders (Arachnida: Solifugae) are one of a number of arachnid groups whose prosomal dorsal shield (or carapace) is composed of three distinct elements: the pro-, meso- and metapeltidium. These are associated with prosomal appendages one to four, five and six respectively. What is less well known – although noted in the historical literature – is that the coxae borne on the 4th and 5th prosomal segments (i.e. walking legs 2 and 3) of camel spiders are also separated *ventrally* by a distinct membranous region, which is absent between the coxae of the other legs. I suggest that this essentially ventral division of the prosoma (specifically between coxae 2 and 3) is equivalent to, if not homologous with, the so-called sejugal furrow. This division constitutes a fundamental part of the body plan in acariform mites (Arachnida: Acariformes). If apomorphic, the sejugal furrow could represent a potential synapomorphy for (Solifugae + Acariformes); a relationship with increasing morphological and molecular support for which the clade name Poecilophysidea was recently proposed. Fossil data in particular challenges the more traditional Acaromorpha concept (i.e. Acari + Ricinulei) by offering the extinct arachnid order Trigonotarbida as an alternative sister-group for ricinuleids. However, in the Poecilophysidea scenario the position of the pseudoscorpions and the parasitiform mites remains unresolved.

SOLIFUGAE: EXPLORING THE SYSTEMATICS AND BIOLOGY OF A LITTLE KNOWN ORDER OF ARACHNIDS

Tharina L. Bird,[1,2] Paula E. Cushing,[3] Robert Wharton,[4] Jack Brookhart,[3] Warren Savary,[5] Lorenzo Prendini[6]

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Solifugae, the sixth most diverse order of arachnids, are dominant predators in arid ecosystems on most major terrestrial landmasses. Despite their diversity, worldwide distribution, ecological importance, and fascinating morphology, behavior and life history, research on these arachnids has advanced little in 50 years. Many aspects of solifuge biology remain unknown, their taxonomy is in disarray, and an average of only five publications on the order appears annually.

In 2007, Paula Cushing (Denver Museum of Nature & Science) and Lorenzo Prendini (American Museum of Natural History) were awarded a 5-year Biodiversity Surveys and Inventories grant from the U.S. National Science Foundation to study Solifugae. The objectives of this grant were to: 1) conduct a phylogenetic analysis and revise the suprageneric classification of the order based on morphological and DNA sequence data; 2) conduct several family-level taxonomic revisions within the order, also based on morphology and DNA; 3) survey, discover and describe species in the regions of highest solifuge diversity; 4) create a collaborative network of solifuge specialists; 5) train new specialists; and 6) develop a website with an online specimen database, bibliography and information about Solifugae and solifuge researchers.

During this presentation we will provide a report on the project including: a preliminary molecular phylogeny of the order supporting the monophyly of many currently recognized families; a discussion of morphological character systems identified as phylogenetically informative for Solifugae; an update on revisions of the North American Eremobatidae and the African Solpugidae; a summary of results from projects exploring the diversity, internal and external morphology, biology, and behavior of solifuges; and an overview of the web-resources developed at www.solpugid.com.

INTEGRATING SYSTEMATICS AND ECOLOGY: AN EXAMPLE ON RICINULEI BIOGEOGRAPHY

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Ricinulei, commonly known as 'hooded tick spiders', are among the most obscure and cryptic arachnid orders. These small (less than 10 mm) predatory arachnids inhabit exclusively dryland and tropical forests of West Africa and the Neotropical region. They are found in leaf litter and soil but also under rotten logs, in caves, in sandy soil or under flat stones in the drier environments. In total, 63 species are currently named, grouped in three genera, *Ricinoides* in Africa and *Cryptocellus* and *Pseudocellus* in the Americas. Because of their old age (the oldest fossil is 319 Ma old), their extreme endemism and low dispersal capabilities, ricinuleids are an excellent group to study the biogeography of West Africa and the Neotropics. We will show how Habitat Suitability Modeling techniques and molecular phylogenetics can be efficiently combined in an integrative framework to shade new light on their biogeographic patterns.

NEW TAXONOMY: GO INTEGRATIVE, BIOLOGICAL, CYBER… OR GO RECONSIDER

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Despite the bleak prospects of taxonomy, and the many hurdles taxonomists face in academia, the field has seen a revival in modern integrative and cyber efforts. Taxonomy remains a basis for all biology and the driving force in discovering and protecting rapidly diminishing biodiversity. Therefore, it should not allow itself to fall behind other biological fields both in the tools it uses and in the quality checks it undergoes. We argue that the future is in a modern taxonomy that unites biological disciplines, where species diagnoses, classification and nomenclature are based on more than merely "because I said so" arguments, where morphological and molecular evidence both speak, and where nomenclatural codes are modernized to allow for phylogenetic hypotheses. Such biology-based efforts are known as integrative taxonomy and its species treatments draw diagnoses from several data sources. Optimally, integrative taxonomy should seek outlets in cyber taxonomy where most results are published rapidly online. To this, we see one valid alternative, when species descriptions outside a revisionary context are urgent in that they complement and highlight new research findings. Even in such cases, all available data should be utilized to strengthen taxonomic acts. To assess the current state of empirical taxonomy, we here review the arachnological literature of the past decade focusing primarily on spider taxonomy, and divide the works into four categories, some of which can be complementary (integrative, cyber, biological, alpha). Our survey suggests that the trends have clearly progressed from largely alpha towards more modern taxonomy including 1) integrative studies, 2) biological taxonomy be it discovery or revisionary, and 3) cyber taxonomy. However, the literature is still dominated by antiquated, poor examples of taxonomy whose worrying long term impact is that these taxonomic acts linger in the literature forever. We pose the following recommendations. First, train the next generation of taxonomists to be competent in several fields, and thus integrative. Second, museum jobs need to refocus on taxonomic expertise, and emphasize integrative, biological, and cyber taxonomy. Third, we argue that the peer review process by practicing specialists remains the only valid quality control of taxonomic works, and hence, taxonomic acts published in secondary and grey, non-peer review, literature should not be accepted into taxonomic legacy. Let arachnology be the model where taxonomy from here on undergoes stringent peer review. This argument is especially important in securing cyber taxonomy prolific but meaningful future.

OF WEBS AND WINGS: NEW INSIGHTS ON ORBWEAVER EVOLUTION AND ITS DRIVING FORCES

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We present a revised hypothesis for the relationships of the families in the superfamily Araneoidea and the first dated spider phylogeny that includes substantial representation of orbweavers diversity. In the light of these new evidences, we revisit alternative hypothesis that aim to explain diversification in spiders. The present study is based on a combination of newly collected sequence data and information already available in public data bases for six loci for close to three hundred taxa. These data have been analyzed using parsimony (both under direct optimization and static homology) and model based phylogenetic methods. Additionally, we explore the contribution of various data partitions to the phylogenetic pattern. The addition of new key taxa and the availability of data for some poorly studied groups provide deeper insights on araneoid phylogeny and evolution.

MOLECULAR PHYLOGENY OF ORB WEAVERS (ARANEAE, ARANEIDAE)

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Spiders of the family Araneidae are among the best known groups of spiders and they figure prominently in popular works, general textbooks and natural history books. They are also among the largest spider families, with approximately 3000 described species in 168 genera. The family has been the target of much phylogenetic and evolutionary research and speculation through times, but the first phylogenetic analysis based on a character matrix is only 14 years old. It was based on morphology and included 57 araneid genera, mainly from the northern hemisphere. We here present a new phylogenetic analysis of the family based on the mitochondrial genes CO1 and 16S and the nuclear genes 18S, 28S and Histone H3 and including 84 araneid and 30 outgroup genera. We present the different results obtained based on various data partitions as well as analytical methods and discuss the results in light of the previous suggested phylogeny for the family as well as the implication for classification and circumscription of the family.

GEOGRAPHICALLY DEFINED SPECIES GROUPS WITHIN THE GENUS *NEMESIA* (ARANEAE, MYGALOMORPHAE, NEMESIIDAE)

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The trapdoor spider genus *Nemesia* Audouin 1826 (50 species and 4 sub-species) is the only mygalomorph spider genus with a Mediterranean-wide distribution. *Nemesia* is found from the Iberian Peninsula to the Nile Delta and from Marrakesh to Istanbul. *Nemesia* also occurs in not strictly Mediterranean countries such as Portugal, Hungary, Bulgaria and Romania, countries that are adjacent to or geographically continuous with countries directly bordering the Mediterranean. Within this broad Mediterranean region *Nemesia* species occur in a range of different habitat types: coastal dunes, dry scrublands, plantations, suburban wastelands, road- and creek-banks, dry and humid forests etc.. Furthermore, *Nemesia* populations may be found from sea-level up to and over 2000 meters altitude both on the mainland and on virtually all Mediterranean islands. *Nemesia* is not found however anywhere outside this continuous geographical zone. The taxonomically and ecologically diverse and abundant occurrence of *Nemesia* in the Mediterranean suggests an evolutionary history of the genus that is intimately linked with palaeogeographical and/or paleoclimatological changes in the Mediterranean Region itself. This suggestion gains support from the observation that most *Nemesia* species seem to be local endemics. Knowledge of diversity and distribution of extant *Nemesia* species however is currently incomplete and in a state of confusion. To solve this problem new investigation with the aid of modern Phylogenetic and Phylogeographic tools is necessary. The study here presented is aimed at providing an improved basis for such future research by presenting a cladistic, morphology based, classification of geographically definable super-specific or sub-generic species groups existing within *Nemesia*.

EVOLUTIONARY SIGNIFICANCE OF THE REDUCTION OF THE SPINNING APPARATUS IN MEDITERRANEAN TRAPDOOR SPIDERS (ARANEAE, NEMESIIDAE)

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After two centuries following their first descriptions, the Mediterranean mygalomorph fauna remains poorly understood. Poor availability of specimens for study, lack of revisionary work, absence of unambiguous criteria for species diagnosis due to morphological conservatism, yet rampant polymorphism, among other factors, have hampered systematic and evolutionary studies of the group.

The trap-door family Nemesiidae has a worldwide distribution and ranks second among the largest mygalomorph families. Four Nemesiidae genera have been recorded in the Mediterranean basin: the genus *Raveniola* has a mainly Asian distribution and reaches the Mediterranean only in the eastern parts of Anatolia, the genus *Iberesia* is common in the Iberian Peninsula and the Balearics, *Brachythele* is widely spread in the Adriatic and Aegean regions and extends its distribution into Anatolia and Cyprus, *Nemesia* finally is distributed throughout most of the Mediterranean between the Atlantic coast and its type-locality near Alexandria in Egypt. *Nemesia* is by far the most species-rich mygalomorph genus in the Mediterranean (>50 species), and numerous species await formal description. High-species richness, narrow endemism and poor dispersal capabilities make Nemesiidae an excellent model for investigating the role of geological and climatic events in the diversification of Mediterranean fauna. To date, however, the poor taxonomic knowledge of the group has prevented their use as model organisms.

Different levels of reduction of the spinning apparatus in Nemesiidae have been described in the literature, and have been used by some authors as taxonomic criterion for establishing species groups or genera. The genus *Iberesia*, for instance, was recently proposed to group three southern Iberian species that lacked the posterior median spinnerets (PMS). Similarly, the shape of the PMS has been used to further divide *Nemesia* into two groups.

In the present study we aim to characterize the different levels of spinneret reduction and to test its evolutionary significance by inferring a phylogeny of a large array of Mediterranean Nemesiidae. We have performed molecular analyses of 2 nuclear and 3 mitochondrial genes, including both ribosomal and protein coding genes, using different inference methods, support measures and topological test.

Our results suggest that the complete lost of the PMS happened just once, but that other differences in size and shape of the spinnerets have evolved in parallel, calling into question some of the species groups proposed in the literature.

PHYLOGENY OF THE ANCIENT MYNOGLENINES (LINYPHIIDAE)

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The family Linyphiidae includes 4401 species in 586 genera and is traditionally divided into four subfamilies (Linyphiinae, Erigoninae, Stemonyphantinae and Mynogleninae). Only two of these subfamilies are robustly supported by modern phylogenetic analysis based on morphology and molecules. These are the large subfamily Erigoninae and the small southern hemisphere subfamily Mynogleninae. We here investigate the phylogenetic structure of Mynogleninae. It includes 125 extant species in 18 genera that are all characterized by relatively simple copulatory organs compared to the other linyphiid subfamilies. The monophyly of Mynogleninae is well supported by a unique type of glands and sulci on the clypeus, just below the anterior median eyes in both males and females. Its members share a very interesting disjunctive distribution pattern, with representatives in Africa, Australia (Tasmania) and New Zealand. This distribution pattern suggests that this could be a very ancient group of spiders that may have existed on the southern super continent Gondwana, prior to its break-up in the Mesozoic some 167 Mio. years ago. However, the evolutionary history of the subfamily is so far entirely unknown.

We reconstructed the phylogeny of 37 mynoglenine species, representing 15 out of 17 described genera, based on 202 morphological characters. We will discuss the phylogenetic implications in terms of the morphology, distribution and diversity, and used the phylogeny to test the monophyly of the described genera.

A DEEPER VIEW ON A BASAL CLADE OF LINYPHIID SPIDERS: MORPHOLOGICAL PHYLOGENETIC ANALYSIS OF THE GENUS *STEMONYPHANTES* (LINYPHIIDAE: ARANEAE)

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Linyphiidae is the second richest family-level lineage of spiders, currently with 4,378 species in 586 genera. These sheet-web weavers have a worldwide distribution, but are most diverse in the northern temperate regions. In a phylogenetic study using morphological and molecular data, Arnedo et al. (2009) found only two linyphiid sub-families to be monophyletic; i.e., Erigoninae and Mynogleninae. However the monophyly and validity of the proposed subfamily Stemonyphantinae, has not been tested thoroughly yet in a phylogenetic context. *Stemonyphantes* Menge, 1866, includes 17 described species found in temperate regions of the northern hemisphere. This is the only genus in the subfamily Stemonyphantinae, and it has been hypothesized to be the sister lineage of the remaining Linyphiidae. Using both molecular and morphological data, Arnedo et al. (2009) found *Stemonyphantes* in an unresolved trichotomy with Pimoidae and the remaining Linyphiidae, while the morphological partition found *Stemonyphantes* to be the sister group to all other linyphiids.

We investigated the phylogenetic placement of *Stemonyphantes* within 'linyphioids' (Linyphiidae + Pimoidae) by adding four *Stemonyphantes* representative species to the morphological data matrix of Arnedo et al. (2009), and by testing various hypotheses of palp sclerites homology. We specifically tested the homology of tegular and embolic apophyses of the four *Stemonyphantes* species: *Stemonyphantes lineatus* (Linnaeus, 1758), *S. conspersus* (L. Koch, 1879), *S. altaicus* Tanasevitch, 2000, and *S. agnatus* Tanasevitch, 1990. Those species represent the variation of palp sclerite morphology in the genus *Stemonyphantes*. Our morphological phylogenetic analysis recover *Stemonyphantes* as the sister group to all other linyphiids. In addition we tested *Stemonyphantes* monophyly and internal relationships, and the validity of the subfamily Stemonyphantinae with a new morphological matrix including 16 of the 17 *Stemonyphantes* described species in the ingroup and 16 species in the outgroup, representing the linyphiid sub-families Erigoninae, Mynogleninae, 'Micronetinae' and Linyphiinae, as well as representatives from the families Pimoidae and Araneidae. This analysis recovers *Stemonyphantes* as monophyletic and sister to all other linyphiids. In this talk we will discuss in detail the morphological and phylogenetic aspects of this basal clade of linyphiids.

COLONIZATION PATHWAYS AND PHYLOGEOGRAPHY OF THE CANARY ISLANDS ENDEMIC TRAP-DOOR SPIDER *TITANIDIOPS CANARIENSIS* (ARANEAE, IDIOPIDAE)

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Mygalomorph spiders are notoriously absent from oceanic islands, owing to their poor dispersal capabilities and close association to ground habitats**.** The genus *Titanidiops*, however, has managed to colonize the Canary Islands, becoming the only known endemic mygalomorph in the whole Macaronesian archipelagos. The genus belongs to the family Idiopidae, which is predominantly distributed over Australia, South Africa and South America with few representatives in South East Asia. *Titanidiops* currently comprises 3 species with disjunct distributions in the Canary Islands, northwestern Morocco and eastern Africa. The species *Titanidiops canariensis*, endemic to Fuerteventura and Lanzarote Islands, is a medium-size, trap-door spider, usually found in vertical slopes and at the base of large rocks, where it digs deep burrows below ground. Due to its secluded nesting and foraging habits, few specimens are available in collections, and very little has been known on its taxonomy, distribution and biology.

In the present study, we aim to investigate the colonization pathways and population history of *T. canariensis* by using a multilocus approach that combines DNA sequence information of 5 genes: the nuclear protein coding gene EF1gamma, and the mitochondrial protein coding genes cytochrome oxidase I, the NADH dehydrogenase subunit I, and the ribosomal 16S, and tRNA leucine. Overall, we have analysed more than one hundred specimens freshly collected in the Canary Islands and Morocco.

Our results point towards a single colonization of the Canaries by *T. canariensis*, presumably from northwestern Morocco. Fuerteventura was probably the first island to be settled, but there is also evidence of a back and forth colonization of Fuerteventura from Lanzarote. *T. canariensis* shows a strong phylogeographic structure, as anticipated due to its low vagility, that has been most likely further shaped by the long, and dynamic volcanic history of these islands. Additionally, deep phylogeographic breaks can also be recognized in the Moroccan populations.

DISPERSAL BIOGEOGRAPHY: THE ROLE OF DISPERSAL IN THE GENERATION OF BIODIVERSITY

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Oceanic islands are convenient models for studying dispersal and understanding how dispersal ability relates to speciation. We discuss recent studies of three nephilid lineages in the Indian Ocean (*Clitaetra*, *Nephilengys*, *Nephila*), representing poor, intermediate, and excellent dispersers, respectively. Based on these lineages, and empirical examples from other clades, we present a simple conceptual model of dispersal biogeography predicting that species richness of lineages across archipelagos should peak at intermediate dispersal ability. We also discuss likely skew towards high richness of intermediate-poor dispersers on Wallacean (fragment) islands such as the Greater Antilles in the Caribbean, and a skew towards high richness of intermediate-excellent dispersers on Darwinian ('de novo') islands, such as Hawaii. We conclude that although the processes underlying contemporary patterns of diversity on islands are many and complex, some broad patterns can be predicted by very simple models.

DEEPENING IN THE ORIGIN AND THE DISTRIBUTION OF THE FAMILY LEPTONETIDAE FROM THE MEDITERRANEAN BASIN

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Leptonetids are common inhabitants of caves from Mediterranean basin. In general its taxonomy is well established at the genus level, although some problems at the specific level exist. In this talk we present the first assessment of its evolutionary relationships based on molecular phylogeny (Cox1, H3, 16S & 28S), including representatives of all the known genera from the Mediterranean. The biogeographic patterns of this family are provided and a paleogeografic view is discussed.

A BRIEF CHRONOLOGICAL REVIEW OF DIFFERENT SPIDER CLASSIFICATION SCHEMES

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History of the classification of spiders can be conventionally divided into four periods according to chronology and methodology. These periods are partially or strongly overlapping: 1) "ecological", 1678-1886; 2) morphological, 1864-2009, 3) synthetic (morphology & evolution), 1967 to present, and 4) cladistic, 1976 to present.

First classification was suggested by M. Lister (1678) in time before the zoological systematics in modern sense was established. Several different characters, chiefly ecological (wandering or web-builders, type of the webs, or way of hunting or moving) were used together with few morphological (position of legs, length of legs, number of eyes, etc.). Characters were used chaotically, and taxa of the same rank were based on absolutely different characters. By the time more and more morphological characters were involved (number of spiracles, presence or absence of cribellum, number of rows of eyes, etc). The second period is tied with E. Simon, who presented his first classification when he was 16 years old (Simon, 1864). His classification was based on entirely different principle. He divided spiders according to their body plan (habitus). During his lifetime he suggested four systems (classifications). The last one (Simon, 1914) was very logical and taxa of each rank were defined on the same principles (type of chelicerae, presence or absence of cribellum, number of claws). This classification with some changes and "improvements" exists until now.

The third period is connected with P.T. Lehtinen, who published famous monographic paper in 1967. He was the first who tied morphology and evolution. Lehtinen showed that plesiomorphic characters such as presence of cribellum, or three claws, can not be used for grouping, as well as "apomorphic" characters such as lack of cribellum and two claws, which evolved independently in different lineages.

The forth period I associate with N.I. Platnick who published in 1976 and 1977 two works with cladistic analysis. Since that cladistic approach became highly popular, especially among American colleagues.

COMPARATIVE STUDY ON THE EFFECT OF PRESERVATIVES AND EXTRACTION METHODS ON THE QUALITY OF SPIDER DNA

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Owing to recent innovation in molecular biological techniques, nucleic acid data are becoming more and more important in ecology, systematics, evolutionary biology and conservation biology. Moreover, DNA sequence comparison is a powerful tool to study genetic relatedness of species, which can be used to estimate branching order of phylogenetic trees as well as evolutionary distance between both extinct and extant taxa. To prepare an accurate phylogenetic tree it is necessary to use a preservative which causes less degradation of DNA.

It is possible to obtain DNA from dried insects, but this is not an option for arachnids, which require wet preservation to facilitate identification using structures that shrivel when dried. In this context, the effect of three preservatives (acetone, ethanol (70%) and formalin (4%)) on DNA of the spider *Pisaura mirabilis* were tested and compared with fresh specimens in this study. For all treatments, spiders were placed directly in 1.5 ml preservative, kept in room temperature for 3 months and DNA was extracted from the leg of the preserved spider by four different DNA extraction methods (DNeasy method, Quick Extraction method, Master Pure method and CTAB method). PCR quality of the extracted DNA was tested with agarose gel electrophoresis.

This study revealed that the quality of the extracted DNA varies and the variation seems related to the mode of preservation and extraction method. From the results it is evident that formalin, which is a routine preservative, has poor capacity to retain the integrity of DNA. Further, ethanol preservation degrades DNA to some extent but gives separation of the strands in extraction. Acetone did not affect the quality of DNA and the yield was comparable to that of fresh specimen. DNA shearing and inter-strand cross linking which occurred both in formalin and ethanol preserved specimens did not occur in acetone.

By comparing the results, it can be concluded that acetone is superior to ethanol and formalin in preservation because it yields high quality DNA which can be compared to fresh samples in all the extraction methods tested. Formalin reacts with DNA through interaction with hydrogen bonds, fixation and denaturation of DNA proteins, cross linking between proteins and DNA and methylation of the nucleic acid. Acetone was found to be robust against water contamination than ethanol. Considering that most biological materials contain high amounts of water, acetone may be more recommended as preservative than ethanol which is widely used for the purpose.

RESURRECTION OF THE GENUS *ATEA* BASED ON THE TRICHOBOTHRIOTAXY (ARANEA, ARANEIDAE)

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Although the genus *Araneus* consists of approximately 630 species, it seems that on the basis of several distinct morphologic characters many species could be better placed in several different genera. Our arguments are presented for splitting *Araneus* Clerck, 1757 by resurrecting *Atea* C. L. Koch, 1837 defined by *Atea sturmi* (Hahn, 1831). Species which are supposed to be classified within this genus proposed to be reinstated herein possess distinct characters, e.g. shape of the prosoma (especially a head region) and the opisthosoma, type of the leg spines, modified tibia of the first pair of legs in males, different type of epigynum and male bulbus. Our study adds another, very specific reason for making this separation – the trichobothriotaxy – which supports the reinstatement of this genus. The position and number of the trichobothria are useful for taxonomy and also for phylogenetic studies. In this case the trichobothriotaxy of a tibia provides some useful characters to distinguish *Atea* from *Araneus*. The range of a number of the trichobothria in *Araneus* is 11 – 18, with marked variability in their number and position. They are formed into two lines with the trichobothrial basal clusters. On the contrary, *Atea* have fewer of the trichobothria (7 – 9), with low variability, in two straight lines without the basal clusters. Comparison of lateral and median rows of the trichobothria between *Araneus* and *Atea* shows that the maximum number of the trichobotria in each line in *Atea* is still lower as their minimum number in *Araneus*. It is worth mentioning that the same difference in a quantity and position of the trichobothria is observable also in juveniles of both genera, although they do not have the full developed trichobothriotaxy as its development depends on the age of individuals. Except *Atea sturmi* we consider also *Araneus triguttatus* (Fabricius, 1793) to be a member of the genus *Atea*, which has already been previously classified as such. Still, the genus *Atea* may contain additional species described as *Araneus*, however, further research is required before transfers can be made.

KARYOTYPE EVOLUTION AND DETECTION OF 18S RRNA GENES IN THE SUPERFAMILY ERESOIDEA

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Superfamily Eresoidea (comprising families Eresidae, Hersiliidae and Oecobiidae) is supposed to form the most basal branch of enetelegyne spiders. Karyotypes of most entelegynes are formed exclusively by acrocentric chromosomes and contain the X_1X_20 sex chromosome system. The male karyotype of 2n = 42, X_1X_20 (or 43, $X_1X_2X_30$) was most probably ancestral in entelegynes. Basic trend of enetelegyne karyotype evolution is towards reduction of diploid numbers. To elucidate karyotype evolution of Eresoidea, we have determined their karyotype, sex chromosome system, and location of 18S rRNA genes. Genes have been visualized by fluorescence in situ hybridisation (FISH). Methods of molecular cytogenetics including FISH have been rarely used to analyse spider chromosomes. Chromosomes of all analyzed species have acrocenric morphology. Within the family Eresidae, karyotypes of some southern African species (genera *Dresserus* and *Gandanameno*; 2n♂=38-40, X_1X_20) and *Stegodyphus lineatus* (2n♂=43, $X_1X_2X_30$) are closest to the ancestral enetelegyne set. The other *Stegodyphus* species possess lower male 2n (24-30) and X_1X_20 system. Genera *Eresus* and *Adonea* form a separate branch within the family showing derived karyotypes. One (*Dresserus* sp., *Gandanameno* sp.) or two (*Stegodyphus dufouri*, *S. lineatus*) chromosome pairs contain rRNA genes. The male karyotype of 35, $X_1X_2X_30$ is probably an ancestral in hersiliids. This set is more frequent than any other karyotypes being found in disparate genera (*Hersilia*, *Hersiliola*, *Tyrotama*). Diploid numbers has been reduced in genera: *Tama, Hersilia*, *Hersiliola*, and New World hersiliids. This reduction occurred independently at least two times in genera *Hersilia* and *Hersiliola*. The lowest 2n was found in *Hersiliola turcica* (2n♂=28, X_1X_20), which exhibits also the highest number of rDNA clusters within Eresoidea; they are localized on five chromosome pairs. Concerning oecobiids, two karyotype lineages can be distinguished. Diploid numbers of the genus *Uroctea* (2n♂=37-42) are close or equal to the ancestral entelegyne karyotype. In contrast to this, *Oecobius* shows reduced diploid numbers (2n♂=19-27). Oecobiids display considerable diversity of sex chromosomes. Males possess from one to three X chromosomes. Suprisingly, rRNA genes of one *Uroctea* species were found exclusively on the X chromosome. Superfamily Eresoidea shows great diversity in diploid counts and numbers of rRNA genes. Interestingly, ancestral karyotypes of all three families were found in southern Africa. Therefore, this region could be cradle of Eresoidea and could play a key role in evolution of entelegyne spiders. This research was supported by projects: GAAV (No. IAA601110808), SVV (No. 263206), MSMT (No. 0021620828) and Dryland Research SSA (No. 026064).

ORIGIN OF SPIDER SEX CHROMOSOMES: LESSONS FROM MEIOSIS OF ENTELEGYNES AND MYGALOMORPHS

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Spiders exhibit unusual multiple X chromosomes, whose origin has not been satisfactorily explained. Most species possess a system with X_1X_2 males and $X_1X_1X_2X_2$ females. This type of sex chromosome determination was termed X_1X_20 system. Based on an achiasmate pairing during male meiosis, chromosomes X_1 and X_2 are considered nonhomologous. Most hypotheses suggest origin of X_1X_20 determination from an X0 system. Some authors stress fission of a metacentric chromosome X into two acrocentric chromosomes. Alternatively, other authors suggest duplication of a single X chromosome and subsequent differentiation of the newly formed X chromosome. To elucidate the origin of spider sex chromosomes, their meiotic behaviour was traced using conventional preparations, C-banding, and electron microscopy in two major clades, the entelegynes and the mygalomorphs. Our data support the predominance of X_1X_20 systems in entelegynes, while rare $X_1X_2X_3X_40$ systems were revealed in the tuberculote mygalomorphs. Spider meiotic sex chromosomes showed unique features, namely association with a chromosome pair in males and inactivation in females. Analysis of these traits supports the hypothesis that the multiple X chromosomes of spiders have originated by duplications. Based on unusual pairing between the pair and X chromosomes, we hypothesize that the pair is formed by original spider sex chromosomes, producing X chromosomes by non-disjunctions. In contrast to the homogametic sex of other animals, the homologous sex chromosomes of spider females were already paired at premeiotic interphase and were inactivated until prophase I. Furthermore, the sex chromosome pairs exhibited an end-to-end association during these stages. We suggest that the specific behaviour of the female sex chromosomes have evolved to avoid the negative effects of duplicated X chromosomes on female meiosis. The chromosome ends that ensure the association of sex chromosome pairs may contain information for discriminating between homologous and homeologous X chromosomes and thus act to promote homologous pairing. Such genetic systems have already been found in polyploid plants. The meiotic behaviour of four X chromosome pairs in mygalomorph females, namely, the formation of two associations, each composed of two pairs with similar structure, suggests that the mygalomorph $X_1X_2X_3X_40$ system originated by the duplication of the X_1X_20 system via non-disjunctions or polyploidisation.

MONDAY, 5 SEPTEMBER

STUDYING SPIDER-INSECT INTERACTIONS FROM PERSPECTIVES OF INSECT VISUAL PHYSIOLOGY

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When animals forage their behaviors are often constrained by various abiotic and biotic factors. However, for animals with foraging activity tightly linked to morphology, they can not make quick behavioral adjustments when encountering opposing pressures. In this talk I will review studies investigating how various factors shape the body color signal design of orb web spiders. The conspicuous body coloration of certain orb web spiders has long been demonstrated to be visually attractive to insects. However, studies using advanced field monitoring techniques revealed that spiders exhibiting such traits were also vulnerable to attacks from diurnal predators. On the other hand, while many brightly-colored orb web spiders are traditionally regarded as "diurnal predators", many of them actually also hunt for prey during the night. Recent studies employing infrared monitoring techniques demonstrated that the conspicuous body coloration of several orb web spiders was also attractive to nocturnal prey. Moreover, these spiders actually obtain more prey biomass intake from nocturnal hunting. Even in strictly nocturnal species they also exhibit conspicuous spots as visual lures to attract prey. While the coloration pattern of diurnal orb web spiders represents a suboptimal design reflecting a tradeoff between opposing pressures of prey attraction and predation risk, that of nocturnal orb spiders seems to represent a very effective design in attracting prey under dim light condition. Therefore, factors shaping the design of color signals in orb spiders are far more complicated that previously known and visual properties of nocturnal insects may play a major role.

OVERVIEW OF PREY-SPECIALIZED SPIDERS AND THEIR ADAPTATIONS

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In this overview I focus on selected prey-specialized spiders and their adaptations. Using two criteria, the diet breadth (narrow to wide) and presence of adaptations (stereotyped to versatile) related to prey utilization, four trophic categories were distinguished in spiders. Euryphagous generalists include species with broad diet that lack specific adaptations. This category includes most spider species. Stenophagous generalists, such as *Oecobius* or *Steatoda*, have narrow diet breadth due to ecological circumstances but lack stereotyped capture adaptations. This is the case with local specialists. Euryphagous specialists, such as *Portia* or *Dysdera*, posses wider diet breadth but show several versatile adaptations. As a result they prefer certain prey but are also able to utilize alternative prey. Stenophagous specialists, such as *Zodarion* or *Mastophora*, has narrow prey range and their stereotyped adaptations limit utilization of alternative prey.

Euryphagous and stenophagous specialists were found to feed on Araneae, Crustacea, Isoptera, Lepidoptera, Diptera and Formicidae. There is scarce evidence of stenophagy on other prey types, namely springtails, cockroaches, homopterans and beetles. Firm evidence for any of these prey-specialization remains to be gathered in future.

Altogether evidence of prey-specific adaptations is fragmentary in these spiders. Araneophagous spiders, found in several web-building and cursorial families, are mainly euryphagous specialists possessing morphological, behavioral and physiological adaptations. Crustaceophagous spiders are both euryphagous generalists and specialists from few cursorial families with morphological adpatations for prey capture. Termitophagous spiders are stenophagous specialists found mainly in species with cursorial habit. Only behavioral adaptations were reported for theses species. Lepidopterophagous species are stenophagous specialists belonging to web-building species. Behavioral adaptations include capture strategies based on increase of silk strength and adhesion (bolas) or altered web design (ladder web). Dipterophagous species are found in few web-building families. Behavioral adaptations include attraction of flies. Myrmecophagous spiders are found in a number of families, particularly of cursorial habit. Behavioral and physiological adaptations enhancing prey search were found in these species.

EVOLUTION OF FOOD SPECIALIZATION IN SPIDERS: HOW DOES IT FIT WITH THEORY?

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Only a minority of spider species has taxonomically restricted diets (stenophagy), but adaptations to specific prey types exist in species with broad as well as intermediate and narrow diet widths. Several evolutionary hypotheses have been forwarded to explain the occurrence of narrow diets and adaptations to focal food types in animal consumers. Most of these were originally developed for herbivores. The talk will discuss the main hypotheses and relate them to present knowledge of prey specialization in spiders.

For some hypotheses, the selective pressures mainly stem from the interaction between the predator and the prey (Optimal Foraging Hypothesis, Physiological Efficiency Hypothesis), whereas others include interactions with other members of the biological community (Enemy-free Space Hypothesis, Competition Hypothesis). However, in the natural situation there is probably no strict distinction between these hypotheses, either because they operate concurrently or because they are intertwined; e.g. interspecific competition may act through OFH by making a prey previously out of the optimal prey set of a predator become part of it.

A stable and abundant access to a specific prey is considered a prerequisite for evolution of prey specialization. Spiders seem to fit this only partly. For myrmecophages, termitophages and crustaceophages the focal prey will often fulfill both criteria, but for araneophages, dipterophages and lepidopterophages populations of focal prey only stability may generally exist. OFH and PEH represent the behavioural and physiological aspects of diet composition. They are supported as explanations for stenophagy if mixed diets, or diets consisting of non-focal prey, do not improve or even reduce the predator's performance. They are supported by data from both strict stenophages (*Zodarion*) and from less stenophagous specialists (*Portia*, *Dysdera*). However, there is not always congruence between behavioural and physiological findings. The CH is a theoretical possibility but there is no experimental evidence that competition has influenced the evolution of diet width in spiders. ESH may explain the association of myrmecophiles with ants, but there is no evidence that it promoted myrmecophagy.

Different selection pressures may at the same time operate to restrict and widen the diet range. The existing spectrum of feeding strategies may be due to ecological circumstances that determine which of these evolutionary processes take prominence. Behavioural versatility in capture tactics may be associated with moderate diet restriction, probably widening the food niche within the focal prey taxon, whereas stereoptyped attack behaviour is characteristic of narrow stenophagy.

PREDATORY VERSATILITY ENHANCES LOCAL TROPHIC SPECIALISATION IN A COSMOPOLITAN CARNIVOROUS PREDATOR

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Local trophic specialisation has been very rarely investigated in carnivorous predators as most studies have centred on the analysis of prey in a single population. A few natural prey analyses done on spiders suggest stenophagy, but evidence is insufficient to disclose whether such a species is a fundamental or realised (local) specialist. Here we focus on a spider species that is cosmopolitan and anecdotal data from different parts of the world suggest it is a myrmecophagous specialist. We studied two distinct populations of *Oecobius navus*, one in Portugal and the other in Uruguay. We analysed the actual prey of both populations and found that the Portuguese population feeds mainly on dipterans, while the Uruguayan population feeds mainly on ants. Dipterans in Portugal and ants in Uruguay were the most abundant potential prey. In laboratory *O. navus* spiders were able to catch a wide variety of prey. The spiders used markedly different conditional prey capture strategies for dangerous prey (ants, spiders, true bugs) and for innocuous prey (moths, springtails, flies). The capture efficiency of the Portuguese population measured as components of the handling time was higher for flies, moths, springtails and termites, and lower for ants and true bugs. We failed to find behavioural adaptation for the prey capture that would increase capture efficacy with respect to the locally abundant prey. Thus we conclude that *O. navus* is an euryphagous predator locally specialised on a profitable prey. The local specialisation is enhanced by predatory versatility.

WHY SEVERAL CAPTURING TACTICS EVOLVED IN WOODLICE EATING *DYSDERA* SPIDERS?

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Dysdera (Araneae: Dysderidae) are the only spiders known to be diet specialised on woodlice. To overcome the armour of woodlice and their behaviours protecting the soft ventral side *Dysdera* use several grasping tactics. Moreover, the chelicerae of these spiders modified to enhance the efficiency of these tactics. The species with elongated chelicerae turn the prosoma sideways, enabling the spider to insert one chelicera underneath the woodlouse and the other over the dorsal side of the woodlouse. The species with frontally concave chelicerae place the chelicerae under the woodlouse and insert the fangs into its soft ventral side. The concave shape helps to get beneath the woodlouse. The species with flattened chelicerae slide the fang under the sclerite of the woodlouse's armour. The fangs are able to penetrate between sclerites only because they are both flat and dorsoventrally relatively elastic. There are three hypotheses, why more grasping tactics for capturing woodlice evolved in *Dysdera*: 1. Particular tactics are adaptations for capturing woodlice with different defence strategies. 2. They are adaptations for capturing woodlice of different size. 3. Some tactics are evolutionarily younger inventions allowing for more efficient capturing woodlice, but, at the same time, disabling capturing alternative prey. In order to test these hypotheses we studied predatory behaviour, impact of various diets on fitness, impact of venom on woodlice, and prey preference in four *Dysdera* species representing different chelicerae modifications.

BALANCING NUTRIENT INTAKE AND UTILIZATION DURING REPRODUCTION

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Animals require specific balance of nutrients and energy to develop, survive and reproduce optimally. These requirements change with the developmental stage or the reproductive status of the animal. Animals forage in a nutritionally heterogeneous environment, where most insect species are considered imbalanced food, containing a ratio of nutrients not optimal for the predator. We examined the regulation of nutrient intake and the utilization of these nutrients (i.e. conversion to body tissue) by females of the subsocial spider *Stegodyphus lineatu*s (Eresidae). After maturation and oviposition, females of this species provide maternal care to the young in the form of regurgitation feeding and matriphagy (consumption of the mother). We hypothesized that the nutritional requirements of females and the utilization of these nutrients would differ among the reproductive stages. Therefore, we asked: (1) what is the difference in nutrient intake among females in different reproductive stages? (2) How do females utilize ingested nutrients and (3) how do nutrient intake and utilization affect their performance?

We fed females in different life stages with crickets differing in nutrient composition (protein rich, lipid rich or intermediate) and measured various life-history traits in relation to the nutrient intake and growth of the females. Our results show that females do not extract nutrients in the same ratio as in the prey, but appear to extract nutrients selectively. Nutrient intake varied with reproductive stage; both females regulated protein intake more strongly than lipids with pre-maternal care females having a higher intake of lipids than pre-maturation females. The latter also showed lower utilization efficiency of proteins and lipids than pre-maternal care females. Pre-maturation females used ingested lipids as energy to redress prior energy deficiencies, while proteins were used for body growth and stored above a certain intake. This shows a change in nutrient requirement between the reproductive stages. Both reproductive stages showed high performance on a protein-rich diet, supporting the need for strong regulation of this nutrient. Pre-maturation females matured at a larger body size, while pre-maternal care females produced more young on a protein- enriched diet. This study is the first to show the ability of a sit-and-wait spider to regulate its nutritional intake when consuming imbalanced prey in the wild and utilize the ingested nutrients in a pattern that is in accordance with probable future challenges.

DIETARY NICHE AND PREY PREFERENCE OF SOCIAL AND SUBSOCIAL SPIDERS OF THE GENUS *STEGODYPHUS*

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Social spiders are faced with the challenge of increasing foraging success to fulfil the needs of the group and counter the cost of prey sharing. Hence social spiders are expected to subdue increasingly larger prey to acquire sufficient energy for all consumers, however there is an increased danger of engaging with large prey. To overcome these costs, cooperative foraging should allow for widening of the dietary niche by increasing prey capture rate or prey size range - thereby optimizing foraging for the whole group. It has been proposed that social spiders reside in areas where larger prey are relatively more abundant, suggesting that cooperation in prey capture allows for expansion of the foraging niche to exploit prey of a larger size.

The aim of my study was to explore whether a similar expansion of the dietary niche may apply for a social spider of the *Stegodyphus* genus. By studying a social (*S. dumicola*) and subsocial (*S. lineatus*) species in their native habitat I examined prey availability and prey size preference as factors that may affect their foraging and in particular increase the dietary niche of the social species. Differences between the level of sociality in the way the spiders exploit prey will provide insights into how cooperative societies increase foraging success to reduce resource competition. I found that social spiders have a broader dietary niche compared to the subsocial congener. This suggests that social spiders are able to exploit more of the available prey in habitat by cooperative prey capture. The data also suggest preference among both spider species for certain insect orders over others. I will discuss the foraging strategy of *Stegodyphus* relative to species of social *Anelosimus*.

VENOM COMPOSITION AND STRATEGIES IN SPIDERS

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An analysis of all spider components from all spider species investigated so far yielded 1618 records for venom compounds from 174 species belonging to 32 families. These compounds can be attributed to six groups: low molecular mass compounds, acylpolyamines, linear peptides, cysteine-knotted mini-proteins, neurotoxic proteins and enzymes. (1) Low molecular mass compounds such as organic acids, amino acids, polyamines and many neurotransmitters are usually a side-product of venom research but accumulated to 259 data sets for 85 species from 26 families with an average of 3 compounds known for a given species. We assume that all spider venoms contain such compounds and that they play a much more important role as previously assumed. (2) Acylpolyamines exert a remarkable diversity within Araneidae and Nephilidae (amino acids containing acylpolyamines) and several other unrelated families (non-amino acid containing acylpolyamines). They block cationic-selective ion channels. (3) Linear peptides are present as small cationic peptides (only for *Phoneutria* known so far) or as small and large α-helical cationic peptides (in Lycosidae, Oxyopidae, Ctenidae, and Zodariidae) and they destroy cell membranes. (4) Cysteine-knotted mini-proteins are the best investigated group of spider venom compounds and 965 different compounds are known from the venom of 60 species belonging to 20 families. They consist of 6 to 14 cysteines and exert a typical complex pattern of disulphide bridges. These compounds mainly act on membrane proteins of neuronal and muscular cells by modulating ion channels such as calcium, sodium and potassium channels. (5) The largest compounds in spider venom are proteins with a molecular mass of 110 - 140 kDa and they have only been found in Theridiidae. These proteins insert into a lipid membrane of nerve cells, form a pore and cause an exhaustive neurotransmitter release which finally leads to muscular paralysis. (6) A variety of enzymes (e.g. hyaluronidase) is present in most spider venoms. By destroying the barrier of extracellular matrix and cell membranes they support the activity of other toxic compounds which can faster reach their targets. Only one spider family (Sicariidae) primarily relies on the activity of a very specific enzyme (phospholipase D). We discuss evolutionary and phylogenetic aspects of the development and distribution of spider venom compounds among spider taxa and discuss major research gaps. Several venom strategies have been developed within spiders and obviously all are successful.

METABOLIC FUEL UTILIZATION IN SCORPIONS UNDER DESICCATION STRESS

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Scorpions in general are often considered as desiccation-resistant organisms as their wide geographic distribution includes extremely dry habitats. However, considerable interspecific variation in scorpions' performance under stressful conditions includes habitat-type effects as well as phylogenetic and sex-specific components. The scorpion hepatopancreas serves as an essential storage compartment considering the often unpredicted availability of prey. Stored protein, lipids and carbohydrates, as well as water are released from the hepatopancreas in order to maintain the organism's metabolic requirements and hydration state when access to prey is limited. During desiccating stress water is mobilized from the hepatopancreas to replenish the haemolymph in order to retain hydration and osmotic stability. Carbohydrate catabolism is advantageous under these conditions as it results in high metabolic water production rate, as well as the release of glycogen bound water. We therefore hypothesized that scorpions switch to exclusive catabolism of carbohydrates during desiccation stress, and that the timing of this shift in metabolic fuel utilization correlates with the species' resistance to desiccation. Scorpions were acclimated to laboratory conditions for two weeks during which they were fed with two crickets per week. The scorpions were then kept at 30±0.1^{o}C for 48h without feeding, and O_2 consumption and CO_2 emission rates were measured following additional 0 (control), 1, 2, 3 and 4 weeks of desiccation at the experimental temperature. Respiratory gas exchange rates enable calculation of the respiratory quotient ($RQ=VCO_2/VO_2$) indicative of the metabolic fuels being oxidized, typically ranging from 0.7 to 1.0 (for exclusive catabolism of protein and carbohydrates, respectively). Additionally, the hepatopancreas was dissected out following respirometry for enzymatic assays of carbohydrate, triglyceride and protein content. All studied species exhibited a decrease in gas exchange rates under stressful conditions, thus minimizing respiratory water losses. Hepatopancreas water stores of the mesic *Scorpio maurus fuscus* (Scorpionidae) depleted quickly, consistent with an early switch to exclusive carbohydrate catabolism (from RQ ~ 0.9 to 1.0). These responses were delayed in the desert-dwelling subspecies *S. m. palmatus*. Interestingly, the desiccation-resistant *Leiurus quinquestriatus* (Buthidae) used a mixture to triglyceride, protein and carbohydrates (RQ~0.9) as an energy source, consistent with the constant hepatopancreas water content, even after four weeks of desiccation. These results indicate preferential carbohydrate catabolism in scorpions during hydration stress. The timing of shift in metabolic fuel utilization reflects the respective species' ability to withstand water loss to the environment, and may be triggered by alterations to hemolymph volume and/or osmolarity.

HOW DO ORB-WEAVING SPIDERS (ARANEAE: ARANEIDAE) AVOID GETTING STUCK IN THEIR CAPTURE SPIRAL?

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In 1905, the French naturalist Jean Henry Fabre concluded from anecdotal observation that orb-weaving spiders protect themselves from getting stuck in their own capture thread by a fatty surface coating. However, this hypothesis has never been thoroughly tested. We investigated the force necessary to detach a self-mutilated spider's leg from the capture spiral of its own web by indirect measurement. Two groups of legs each of the species *Araneus diadematus* Clerck and *Larinioides sclopetarius* (Clerck) were tested: One was washed with an organic solvent (CS_2), the other one with distilled water (H_2O). In addition, untreated legs of *L. sclopetarius* were tested. In both species, we found highly significant differences between the water-treated and the CS_2-treated legs, i.e. the former stuck significantly weaker than the latter. There was no significant difference between the untreated and the water-treated legs. These results provide indirect evidence for a protective organic surface coating of araneid spiders and so support Fabre's hypothesis.

BLUE IS THE NEW UV: BLUE, NOT UV, IS THE PREY ATTRACTING COLOR IN SPIDER WEB DECORATIONS

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Color plays an important role in the life of animals. Animals use color for foraging, predator avoidance, courtship, guided localization and individual identification. Recently, research had focused on the spectral sensitivity of animals and the importance of color in animal communication. Nonetheless, how animals use and perceive color is still not clear. Spiders of the genus *Argiope* often build conspicuous silk structures on their webs, called decoration, to increase their prey capture rate. Many biologists suggest that UV reflecting property of decorations attract insects. However, no experiments have been conducted to systematically test whether the other spectral properties of decorations (e. g. reflectance in the blue or green) attract insects. We manipulated the spectral properties of dummy (colored paper) decorations in the field to investigate how attractive the various spectra are to insects. Base on the bee's visual system, we selected and spectrally tested different colored paper to create the following experimental treatments: UV+, Blue+, Blue-, Green+ and Green- and a control. We found the Blue+ attracted significantly more insects (principally Hymenopterans) than any other treatment. Green- and Blue- attracted the fewest insects. Contrary to existing theory, the UV+ and Green+ did not attract any more insects than the control. We thus showed that reflection in the blue waveband is responsible for attracting insects to *Argiope* decorations. This phenomenon may be related to an innate preference for blue flowers by pollinating Hymenopterans.

EVOLUTION OF A SIGNAL: SILKEN WEB DECORATIONS IN ORB WEB SPIDERS

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Animal signals may derive from an elaboration of previous forms or may be an innovation. Unravelling the evolution of the latter is challenging because the signalling effect may have evolved from a non-signalling biological trait. Silken web decorations of the orb web spider genus *Argiope* have become a model system to investigate innovative signals. For over 100 years, biologists have struggled to explain why spiders adorn their webs with additional silk structures, paradoxically producing a conspicuous signal on a construction whose function is to entangle unsuspecting prey. Numerous hypotheses have been proposed to explain the adaptive significance of web decorations. However, the suggested functions may well illustrate the maintenance of this behaviour but still lack a plausible explanation for its evolutionary origin. We here highlight the difficulties in discriminating between the evolution and maintenance of the web decorating behaviour. Drawing on recent research that focuses on physiological processes, we provide a novel model of the evolutionary progression of web decorating behaviour.

AGEING AND FORAGING EFFORT IN AN ORB-WEAVING SPIDER

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The abilities of the animal to take off its resources are essential to allow the maintenance of biological functions. Ageing is known to induce profound effects on physiology but no study, to our knowledge, had shown that this process might affect the behaviours concerned in foraging efficiency. In orb-weaving spiders, prey capture efficiency depends on the capacities of the web to intercept and retain the prey and also on the behaviour of the spider after the prey interception. In this study, we used an orb-weaving spider *Zygiella x-notata* (Clerck) as a model to investigate the consequences of ageing on the behaviours used to subdue a prey and on their efficiency. Comparisons were made between young and old adult females.

Parameters taken into account were: success of capture, behaviours expressed for subduing prey (displacements, bites, wrapping, prey transport) and durations of these behaviours (total duration from the first movement to the come back to the retreat with the prey, total duration of activity, duration of contact with the prey, duration of bites, wrapping and prey transport).

Data were analysed through correlations between the age and the predatory performances of the spiders. Results are discussed in terms of reduction in performance related to the age under the assumptions of various physiological degradations.

LOSS OF LEGS: IS IT A HANDICAP FOR AN ORB-WEAVING SPIDER?

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Leg loss is a common phenomenon in spiders, and according to the species 5% to 40% of the adults can present at least one missing leg. There is no possibility of regeneration after adult moult and the animal must manage with its missing appendages until its death. With the loss of one or more legs, females orb-weaving spiders can be penalized twice: firstly because the legs are necessary for web construction and, secondly, the legs are essential for the control of the prey after its interception by the web. During development, spiders may be also penalized because regeneration has energetic costs that take away resources for survival, growth and reproduction. All these consequences should influence negatively the development of the spider and thus its fitness.

We investigated the impact of leg loss in the orb-weaving spider, *Zygiella x-notata* (Clerck) by studying its frequency in a natural population and web building and prey capture behaviours in laboratory. In field populations, 9,5% to 13% of the adult females presented the loss of one or more legs; the majority of individuals had lost only one leg (in 48% of cases, a first one). Leg loss seems to affect all the adult spiders, as there is no difference of mass between intact spiders and those with missing leg. Data obtained with laboratory-reared spiders, showed that the loss of legs due to the moult is rare (less than 1%). Considering changes in web design, spiders with missing legs decreased their silk investment, increased the distance between spiral turns but did not change the capture surface of the web. Under our laboratory experimental conditions, spiders with one or two lost legs did not present any difference in prey capture efficiency. In laboratory conditions, spiders with lost leg (s) did not show any difference neither in egg sac production nor in longevity (adult lifespan) compared to intact spiders.

THREE-DIMENSIONAL WEB AS DEFENCE FOR PARASITOID LARVA

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Polysphinctine wasps belong to the most specialized koinobiont ectoparasitoids. Three polysphinctine wasps were observed to attack the arboreal spider species in a fruit orchard (Caraglio, Italy). The wasp *Zatypota percontatoria* (Müller) (N = 55) attacked exclusively theridiid spiders, *Zatypota anomale* (Holmgren) (N = 56) attacked exclusively dictynid spiders and *Polysphincta tuberosa* (Gravenhorst) (N = 10) attacked exclusively araneid spiders. Larvae of these parasitoids should be able to manipulate behavior of the spider hosts to achieve protection during pupation shortly before killing the host. The resulting webs serve as a protection against predators and environment for the pupa. We compared the web architecture of unparasitised and parasitised spiders. Unparasitised spiders built classical webs: theridiids (N = 10) and dictynids (N = 10) built three dimensional (3D) web, araneids built two dimensional (2D) web (N = 10). The parasitised spiders also built classical webs while the parasitoid was in larval stage. Webs of manipulated spiders were all 3D even in case of araneid spiders. The 3D architecture produced by parasitised spiders was similar all investigated host, but was achieved by a different level of manipulation. Manipulated theridiids improved 3D web by production of a protective cupola-like structure or by higher density of threads. Manipulated dictynidae did not change web architecture of their web. We assume that cribellate 3D web of dictyniid spiders provides sufficient protection for the parasitoid pupa, therefore induction of changes in host spinning activity are not necessary. Manipulated araneids changed the web completely from 2D to 3D. We assume that 3D web architecture is generally used as effective protection by polysphinctine wasp larva.

DIVERSITY OF SPIDERS IN ISRAEL

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Although spiders in Israel were subjects for numerous taxonomic, ecological and ethological papers and since Hasselquist (1757) over 120 papers dealing with taxonomy and fauna of spiders in Israel have been published, the country lacks any type of check-list of the whole order.

Conventionally history of arachnological research in Israel can be divided into three periods: 1) from 1757 to 1871, 2) from 1872 to 1965 and 3) from 1966. During the first period only four papers dealing with spiders from Israel have been published (Hasselquist 1757, Audouin 1825, 1827, Simon, 1868) and few species were reported or described.

The second period started from the pioneer publication by O.P.-Cambridge (1872) dealing with spiders of "Palestine" (territories now belonging to Israel and Lebanon). All material treated in 1872 publications was collected by O.P.-Cambridge in 1865 by himself. During the second period about 20 papers have been published oh spiders of Israel. Most important contributors in respect of published papers and species reported and/or described were O.P.-Cambridge (1872, 1876), Kulczyński (1908, 1909) and Strand (1913, 1914, 1915). All data about species diversity gathered during this period were summarized by Bodenhimer (1935, 1937).

The third period can be counted from first modern publication by H.W. Levi (1966) and following numerous works by G. Levy (1973-2009). Levy initiated regular studies of spiders fauna of Israel and revised majority of families occurring Israel. Altogether he described over 140 species, 136 of which remain valid.

According to the literature some 610 species belonging to 47 families are reported from Israel. Of them more than two dozens are doubtful and more than one dozen of species are known by their brief original descriptions and containing no figures. The most species rich families in Israel are Gnaphosidae (126), Salticidae (111) and Theridiidae (62). Other families contain less than 50 species. Among species rich families Lycosidae, Linyphiidae and Dysderidae are worst studied. Real species and family diversity in Israel to our mind are much higher. Brief joint collecting trip of two authors in January 2011 reveals at least two families and over 20 species new to the country.

SPIDERS OF LAOS – A DECADE OF RESEARCH IN A HEAVILY BOMBED BIODIVERSITY HOTSPOT

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Laos is situated within the Indoburmese Hotspot and covers 1000 km from 13°N to 22°N. Its area is two-third of that of Germany with 6.3 million inhabitans (5% of German population). It is rich in habitats like forests, limestone mountains with caves, wetlands etc. Despite its assumed natural diversity it was neglected in terms of scientific investigations. This can be attributed to its political history: founded in the 14th century and prospering 400 years it became later a political ball of Siam, China, France and the USA. In the secret war (1964–1973) it was made the most ever heavily bombed country in the world. Clearing cluster bombs, land mines and other unexploded ordnance (UXO) will take 350 years!

No checklist for spiders of Laos existed and an entry was neither listed in Bonnet's catalog nor in the world spider catalog of Platnick before 2001. The search for *Heteropoda maxima*, a huntsman spider with a leg span of up to 30 cm in males, started the activity of the authors in Laos. In the past nine years eight expeditions were conducted to survey the spider diversity in Laos. Material collected was included in fifteen publications since 2001, resulting in a preliminary checklist with 150 species. This is only double the number of what has been known 1757 from Sweden! More than one third (58 species) has been described in the past 10 years. Many more sampling and more revisions performed by specialists are necessary to reach the goal of a complete check list of spiders for Laos.

FAUNA EUROPAEA: OBJECTIVES, PRESENT SITUATION, FUTURE

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Fauna Europaea started in 2001 and was meant as a tool for zoogeographical registration within Europe. Funding by Brussels made this European project possible. The money was meant exclusively for setting up the database, organize the specialists, and construct the website. There were hopes and expectations for funding regular updates, but this has never materialized. Enthusiasm of the taxonomic group coordinators has made limited updates possible. The future of the system depends on priorities established in political and scientific bodies. Possibilities for the future will be outlined. Suggestions from users are welcome.

ALTITUDINAL AND SPATIAL DISTRIBUTION OF THE EPIGEIC SPIDERS (ARACHNIDA; ARANEI) IN THE MOUNTAINOUS PART OF MARITIME PROVINCE OF RUSSIA

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The material presented here was collected in 2003, 2004 and 2008 on two largest mountains of Maritime Province – Oblachnaya and Sestra Mts. Both of them are located in the south part of Sikhote-Alin ridge. In general 1113 specimens were collected using pitfall traps and by hands. Ground dwelling spiders of each altitudinal belt were studied. 5-10 of the pitfall traps were set in every studied habitat including uppermost stony screes.

Fauna of epigeic spiders of these mountains includes more than 40 species from 11 families. About 70% species found belong to families Lycosidae, Gnaphosidae and Thomisidae. Other families include 1-4 species. The most various spiders' fauna occurs in mixed forests of lower part of mountains. High mountain spruce and birch forests are inhabited by the least number of species.

The most number of ground dwelling spiders occurs in open habitats, only few species restricted to litter under closed canopy. Some spiders from mountain tundra belt are strictly associated with a particular habitat.

The fauna of mountain tundra belt is very peculiar. Two endemic species of wolf-spiders (*Sibiricosa mandhurica* and *Acantholycosa azarkinae*) which have never been registered in other parts of Sikhote-Alin ridge are described for both mountains. In my opinion existence of considerable number of endemic wolf-spiders on other mountains is quite probable. Besides of these endemics several arctic-alpine (*Gnaphosa orites*) and boreo-montane (*Acantholycosa norvegica, Pardosa eiseni*) species occur in this belt.

I calculated changes of species' diversity connected with ascent for every 100 meters above sea level. A summary cladogram was made on basis of analyze of matrices species' altitudinal distribution.

GNAPHOSID SPIDERS LIVING AROUND THE SALT LAKE ELTON AMONG THE SEMI-DESERT OF CASPIAN SEA LOWLAND (RUSSIA)

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Lake Elton is a closed salt lake 152 km^2 in area and 0.1-0.8 m in depth which is located in Volgograd Province, Russia, near the border with Kazakhstan (49°12,47'N 46°39,75'E). Being one of the most saline lakes in the world it has salinity from 200 to 500 g/l. Seven small salt rivers flow into the lake.

Ten habitats around the lake were chosen as model ones. They can be arranged on the gradient in the order of decreasing of their salinity: salt-marsh on bed-rock coast of Lake Elton - salt-marsh with *Salicornia prostrata* on the Khara-River – reedstands on the Khara-River – four variants of wormwood-gramineous desert steppe associations – two variants of grassland steppe associations - small forest in the ravines.

Material was collected using pitfall traps (10 traps per habitat) in 2006-2007 (coll. K.V. Makarov and A.V. Matalin). Material includes a total of 36 500 pitfall days. 3 907 gnaphosid spider specimens were captured and studied, with 2 302 of these spiders being mature. About 50 species are revealed.

Spiders of family Gnaphosidae dwell all study habitats. This is the predominant family in the zonal associations – steppe and desert habitats (the dynamic density up to 50-70 ind./100 pitfall*days and half of the total abundance of spiders) but its share is distinctively lower in the most extreme variants of habitats – salt-marshes and ravines. The particular characteristics of the studied araneocomplexes and their dynamics in time and space will be discussed.

SPIDER COMMUNITIES IN THE STEPPE ECOSYSTEMS OF CENTRAL RUSSIA AND UKRAINE

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European virgin steppes remained mainly in protected territories, and they can be regarded as false-island biota surrounded by agrolandscape. We investigated 25 localities in Central Russia and Ukraine, with 8 main types of steppe communities: three zonal – meadow steppe, forbgrass-*Festuca-Stipa* and *Festuca-Stipa* steppes; and five azonal – calcareous, petrophytous, psammophytous (northern and southern variants), saline, and seaside steppes. In total, the araneofauna is represented by 361 species from 27 families: Linyphiidae (17.7%), Gnaphosidae (16.6%), Salticidae (13%), Lycosidae (10%), Theridiidae (8.3%), Thomisidae (7.8%), and Araneidae (6.1%) are the most numerous. This range differs dramatically depending on the steppe type. Linyphiidae prevails only in the northernmost meadow steppes (21%); in forbgrass and petrophytous ones, it holds a dominant position (11.8-14.5%) after Gnaphosidae (17.2-20.8%) and Salticidae (12-14.7%), while in calcareous steppes, its rate falls to 3.8%. Gnaphosidae predominates in all the other steppe types together with Salticidae and/or Araneidae and Thomisidae. On number of individuals in grass layer, Araneidae dominates in all steppe communities (up to 42%) except *Festuca-Stipa* and southern sandy steppes where Oxyopidae (37%) and Salticidae (32%) are more abundant. For ground dwelling spiders, a Lycosidae-Gnaphosidae ratio is extremely significant: in meadow steppes, their rate makes up 0.75 to 0.05, respectively. Further to the South, they change roles – 0.35 to 0.32 in the *Festuca-Stipa* steppe, and 0.42 to 0.22 in the sandy one.

On species richness of spiders, steppe communities can be divided into two groups: the first one includes forbgrass (204 species), petrophytous (172), meadow (156), and calcareous (132) steppes. They are represented by 3-4 plots in the Forest-Steppe and in the Northern subzone of the steppe zone. The second group includes northern psammophytous (99), *Festuca-Stipa* (90), southern psammophytous (81), seaside (72) and saline (32 species) steppes. Except sandy steppes, each of them has only one location in the Southern steppe subzone. 15 spider species occur in all steppe types. 33 species are absent in the northernmost or in the southernmost steppes. 96 species were registered in 1-2 localities. Mainly they come into the steppe from adjacent habitats, and only 16 of them are the true steppe dwellers. The similarity of local steppe and forest araneofaunas accounts for 75% (QJaccard) in the North and gradually diminishes to 21% in the South.

WEDNESDAY, 7 SEPTEMBER

WHAT MAKES A SPIDER FLY? STUDIES OF DISPERSAL BEHAVIOUR IN SPIDERS FROM DISTURBED LANDSCAPES

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Dispersal plays a key role in shaping important biological and ecological processes such as the distribution of spatially-structured populations or the pace and scale of invasion. We have studied long distance, aerial dispersal in linyphiid spiders from heterogeneous environments where re-colonisation is likely to be an important factor in determining population persistence. We find that populations from these areas are infected with a range of maternally inherited endosymbiotic bacteria and that these bacteria appear to reduce the tendency for aerial dispersal in female spiders. The bacteria also appear to influence the sensitivity of spiders to commonly used insecticides, a factor that may be important in determining the likelihood of infections persisting in agricultural environments.

Dispersal facilitates the exchange of genes ('gene flow') between populations and counteracts the fixation of localised adaptations and the effects of random genetic drift within the wider meta-population. Decreased dispersal rate in response to bacterial infections is thus expected to increase the rate at which localised variants are fixed and also to cause local perturbations in the population sex ratio given that only female dispersal appears to be affected.

The potential of maternally acquired bacteria to limit gene flow and alter the population sex ratio directly through their effects on dispersal, rather than indirectly through mechanisms such as causing cytoplasmic incompatibility, or through killing of males, appears as yet to be unique to spiders. The possibility that the phenomenon occurs in other arthropod communities in response to similar infections should be explored.

THE EFFECT OF GRAZING INTENSITY ON THE ECOLOGICAL CHARACTER OF PASTURE SPIDER ASSEMBLAGES

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Pastures represent ecosystems that are intermediate between natural and agricultural systems. Depending on grazing intensity two hypotheses (not mutually exclusive) arise regarding spider assemblages. The Naturalness Hypothesis (NH) predicts that less grazed pastures will more resemble natural communities and will therefore harbour species with ecological characters of natural assemblages. The Intermediate Disturbance Hypothesis (IDH) predicts that moderate grazing may enrich arthropod communities in pastures, but makes no prediction about ecological characters. To uncover how grazing affects spider assemblages, we studied ungrazed, sparsely grazed and intensively grazed areas of a pasture in Hungary for 3 years by pitfall trapping and suction sampling. IDH was not supported, because either there was no significant difference among grazing levels (at ground level) or grazing monotonously negatively affected number of individuals and species (at higher strata). All statistical methods that took into account species identity indicated that there was virtually no difference between the spider assemblages of the sparsely- and ungrazed areas, but there was a marked difference between these and the intensively grazed area. Spider species in the intensive grazing had significantly lower affinity but wider tolerance for habitat naturalness, preferred more open habitats and their rarity status was lower. These character patterns supported NH. In the intensive grazing a number of disturbance tolerant species, amongst them agrobionts, were present, whereas the exclusion of rare or specialist species in the intensively grazed area occurred infrequently. The primary effect of intensive grazing was the opening of the spider assemblage to disturbance tolerant species, while species richness was likely maintained by neighbouring source populations. The overall effect of intensive grazing was a marked decrease in the naturalness status of the spider assemblage.

THE EFFECTS OF FOREST AGE IN THE SURROUNDING LANDSCAPE ON SPIDER COMMUNITIES IN EUCALYPTUS PLANTATIONS IN THE NORTHERN NEGEV, ISRAEL

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Plantation forests are an important part of the forest estate in many countries. This applies particularly to Israel where foresters planted almost 100 000 ha of former open land with often non-native tree species. Thereby, *Eucalyptus camaldulensis* is one of the most common tree species used as forest stands and groves. The oldest patches were planted almost 80 years ago and the species is still used into the present. Due to the different ages of the plantations, animal assemblages may vary strongly between planted forest patches. Thereby, older patches may serve as source habitats for adjacent younger forests. Arthropods are a vital component of these forests, functioning as decomposers and pollinators, herbivores, predators and prey. Spiders are often used in biodiversity assessment and are amongst the most abundant predacious arthropods in these arid and semi-arid environments. The conducted study aimed to examine spider diversity in *Eucalyptus camaldulensis* plantations of different ages and their relation to other forest patches in the surrounding landscape. Thereby, we hypothesized that spider diversity and abundance increases 1. with the age of the plantation 2. with the age of the adjacent forest patch due to immigration 3. with the mean age and amount of forest in the surrounding landscape. To investigate these hypotheses, we performed a GIS-based pre-selection of study sites that kept study site age and age of forest patches in the surrounding landscape as independent as possible. Thereby, 19 sites were selected varying in planting age from 1963 to 1999 and age of adjacent forest patches between 1952 and 1995. Spiders were sampled using pitfalls, beating tray sampling and cardboard hides to assure the highest sampled diversity.

IMPORTANCE OF HISTORICAL STRUCTURES OF AGRICULTURAL LANDSCAPE FOR THE EPIGEIC SPIDER COMMUNITIES DIVERSITY IN THE CADASTRE OF LIPTOVSKÁ TEPLIČKA (SLOVAKIA)

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Authors summarised the research results of epigeic spider fauna in the model area Liptovská Teplička that represents the traditionally used agricultural landscape with historical structures (HSAL). Because the majority of the habitats related to the HSAL were not affected by the process of agricultural collectivization and intensification, they represent islands of rich species animal communities including spider communities. Although these habitats are now becoming rare and thus highly valuable in Europe, they are not subject of interest of the society. Aim of the research was to evaluate importance of the HSAL from the aspect of spider diversity and nature conservation and to point to the necessity of their conservation. The spider communities were studied on 21 plots using pitfall traps in 2009 and 2010. Selected plots made part of HSAL characteristic for the montane meadow-pasture landscape around Liptovská Teplička (central Slovakia). From a structural perspective they represent a mosaic of small-scale meadows, pastures, arable fields and permanent agricultural cultivations. The authors considered their size, shape, orientation, distribution, utilization, agricultural forms of relief (balks), margins of cross-field tracks and other characteristics as well as regional or local differentiation that are results of interactions between natural conditions, geographical position, cultural-historical and economical development. During the research about 10.000 spider specimens belonging to 142 species were captured. Ecological relationships of spider species to individual historical structures were evaluated. Evaluated historical structures (HSAL) create very good living conditions for high biodiversity of the arachnofauna and for occurrence of many rare and threatened spider species. Of the identified species, 10 species are listed in the Red List of Spiders of Slovakia in different category of threat. High richness of the spider fauna and occurrence of the rare and threatened species for Slovakia indicate the high biotic value of the model areas in the agricultural landscape. Presented conclusions together with the results of further research concerning the HSAL will serve as a background for preparation of documentation or legislation aiming in protection of these biotopes. Without it there is a real risk that in the near future, due to abandonment of these structures followed by succession of forest and due to urban pressure, their habitats will suffer the decline or even irreversible loss of biodiversity.

DECOUPLING FRAGMENTATION FROM HABITAT LOSS: A SLOSS ANALYSIS OF SPIDER BIODIVERSITY IN A PATCHY AGRO-ECOSYSTEM

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Habitat loss reduces species diversity. But the effect of habitat fragmentation on the number of species is less clear because fragmentation generally accompanies loss of habitat. In this paper we compare four different published procedures that aim to decouple the effects of fragmentation and habitat loss. Two procedures are based on species area curves, one on Fisher's alpha index of diversity and the last on plots of cumulative species against cumulative area. We used these procedures to analyze spider species diversity in two landscapes in Israel. The dataset contains species whose lifecycle cannot be sustained in the surrounding matrix. When applied to these data, all four procedures suggested that spider diversity increases with an increase in fragmentation. This increase is probably not due to additive within-patch processes (edge effect and microhabitat heterogeneity) but to relatively small negative effects of fragmentation on extinction-colonization dynamics. We show that the fragmented landscape may prove to be the optimal conservation strategy for the long-term conservation of spider diversity in our study system. Finally, we discuss the pros and cons of the patch-oriented approach of the four procedures that we explored and compared to published landscape-oriented approaches.

PEST CONSUMPTION AND NICHE SEPARATION OF COMMON IMMIGRANT AND AGROBIONT SPIDER SPECIES IN SEMI-DESERT WHEAT FIELDS

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Natural enemy populations are important in suppressing outbreaks of pest populations. However, disturbances in agricultural fields due to crop managment do not allow maintenance of sustainable predator populations. Therefore, alternative habitats that provide reproduction sites, shelter and alternative prey, are important for natural enemies that immigrate into the agricultural fields during the crop season. In the desert agroecosystem of Israel there are large ecological differences between natural habitats and crop fields. As a result, the high-productivity agricultural fields attract predators from the surrounding natural desert environment during the crop season. The two most common web building spiders present in wheat fields during the cropping season are an agrobiont species, *Alioranus pastoralis* (Linyphiidae), and an immigrant species, *Enoplognatha* sp. (Theridiidae). These species share the same niche, and may be competing for the same resources. We found that the agrobiont species has a prey preference for Collembola, an abundant non-pest prey, , while the immigrant *Enoplognatha* consumed aphids (pest species). These results clearly demonstrate the potential role of immigrant spiders in biological control of pest species in winter wheat fields in Israel. However, why do immigrant species consume more of the pest than do the agrobionts? Two alternative hypotheses are interspecific competition and specific prey preferences. These questions were investigated using DNA based gut-content analysis and monitoring the spider and pest densities and web locations throughout the crop season.

SPILLOVER OF AGRICULTURALLY SUBSIDIZED ARTHROPODS TO ADJACENT NATURAL ARID HABITATS: EFFECTS ON SPIDER FORAGING BEHAVIOR

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Connectivity between habitats is sometimes manifested by the spillover of organisms that may subsidize consumers in the recipient habitat, with consequences for the entire food web. Agroecosystems are generally more productive than the surrounding matrix because of high human inputs. hen resources within crop fields decline, crop pests may move into surrounding habitats. The degree to which agricultural herbivores act as a subsidy to native predators will depend in part on their acceptance as prey by these predator species. Intensively farmed agricultural islands in the hyper-arid Arava Valley (southern Israel) provide a unique opportunity for this study; pest insects invade the desert habitat from source crop islands. Laboratory experiments in microcosm enclosures tested if agriculture prey were accepted by desert enemies. Desert spiders, *Thanatus vulgaris* (Philodromidae), were starved for 10 days before the experiment, then fed with 10 individuals of agriculture prey, either *Bemesia tabaci* whiteflies or *Frankliniella occidentalis* western flower thrips, the two main pests in this area. A third group of spiders was feed with 2 fruit flies *Drosophila melanogaster* as control. Observations were done about 1 hr and the experiment was repeated with the same prey type the following day. The initial and final weights of the spiders and feeding bout durations were measured. When feeding on thrips, spiders increased their body mass equally on the two consecutive days. Feeding bout durations on thrips were similar on both days, suggesting that the spiders were not satiated on the first day. With whiteflies, spiders fed as long on the second day as on the first and yet the average mass gain over the two days was negative, implying that whiteflies are not favored prey and may even inhibit assimilation. When feeding on fruit flies, spiders body mass increased more on day 1 than on day 2 and they significantly reduce their feeding time on day 2, suggesting satiation on day 1. We conclude that *T. vulgaris* may be able to utilize western flower thrips as an agriculturally subsidized prey, but may not be able to benefit from whitefly subsidies.

MATERNAL EFFECTS, IMMEDIATE FOOD STRESS AND ITS IMPACT ON DISPERSAL STRATEGIES: EXPERIMENTAL EVIDENCE FROM AN AGROBIONT SPIDER

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Dispersal is widely recognized to be conditional on a broad array of environmental conditions, both at ecological and evolutionary time scales. There is currently increasing evidence that parents influence offspring life history through transgenerational plasticity. When mothers mediate these parental effects, maternal effects may provide offspring with information about past environmental conditions. This subsequently enables them to combine current with parental habitat cues in determining their emigration and dispersal distance strategy. However, despite the importance of both distance and timing for population dynamics, empirical research on the role of maternal effects is largely lacking. We performed a factorial experiment on the dwarf spider *Erigone dentipalpis* (Wider, 1834) to test the influence of food supply across two generations on dispersal propensity in juveniles and adults, the latter being able to perform either short-distance (rappelling) or long-distance (ballooning) tactics. Direct but not maternal starvation decreased offspring body condition, and only starved spiders emigrated in the juvenile stage, walking short distances. Adult rappelling decreased in food-deprived males, indicating an asymmetry in sex-related costs of short-distance dispersal. In contrast, the propensity of ballooning was affected by the interplay between maternal and direct feeding regimes: sustained high levels of food availability across generations decreased ballooning, revealing that *E. dentipalpis* is very sensitive to variations in habitat quality. Our findings highlight that different evolutionary causes exist behind long-and short distance dispersal strategies arising from specific cost-benefit ratios, and emphasize the importance of maternal effects in our understanding of the dynamics of spatially structured populations.

BODY CONDITION OF SPIDERS IN FRAGMENTED LANDSCAPES: INTRASPECIFIC COMPETITION VS. FOOD LIMITATION

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Habitat fragmentation can reduce population density by disrupting migration or by reduced individual fitness, e.g. due to food shortage. We studied the relationship of spider body condition with habitat fragmentation, population density, and prey availability. We expected that prey availability and population density of spiders is enhanced in landscapes with high percentages of semi-natural habitat and in habitat patches that are connected to other semi-natural habitats. Body condition should be enhanced by high prey availability, but negatively affected by population density due to competition.

We sampled spiders on 30 groups of cherry trees that varied independently in the level of isolation from other woody habitats and in the percentage of woody habitat within 500 m radius. As a measure of body condition, we used residuals of the relationship between individual body mass/opisthosoma width and prosoma width of the two most common orb-weaving spider species *Nuctenea umbratica* and *Araniella opisthographa*.

Body condition of *A. opisthographa* was positively correlated with the abundance of flies that increased with the percentage of forest in the landscape. In contrast, body condition of *N. umbratica* was reduced by high population densities, presumably due to intraspecific competition. In addition, body condition and population density of *A. opisthographa* was lower at isolated sites.

Our study suggests that effects of landscape fragmentation on body condition vary strongly between spider species, depending on the relative role of food limitation and intraspecific competition. These species-specific relationships of body condition with habitat fragmentation can explain some of the usually very high variation in fragmentation effects on arthropod populations.

LARGER SPIDERS USE MORE SILK: PATTERNS OF MATERIAL INVESTMENT IN *ZYGIELLA* S.L.

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Web architecture varies greatly among spider groups and even within species. Spiders change web architecture throughout their ontogeny and accordingly increase the amount of invested silk. Larger spider species also evolved tougher silk that could function synergistically with architectural changes in determining how orb webs capture insect prey. Furthermore, individuals of some species alter the properties of their webs according to their size and feeding history, including the diameter, length and tension of threads. Because spider webs are static manifestations of foraging behavior, they likely reflect the tradeoff between the high material costs of producing silk and catching efficiency. To investigate such a tradeoff, we examine the material investment of silk in orb webs in relation to body size in five *Zygiella* s.l. species – *Leviellus thorelli*, *Parazygiella montana*, *Stroemiellus stroemi*, *Zygiella keyserlingi* and *Zygiella x-notata*. Although the results are not uniform among the investigated species, we show that within each species larger individuals generally build their webs using larger amounts of at least one of three types of spinning gland excretions: major ampullate silk used for radial threads, flagelliform silk used for the sticky spiral, and glue. We also explore how silk diameter, thread length, glue droplet number and volume, capture area, and other web features contribute to the observed patterns. Additionally, we investigate whether or not larger species respond similarly to variation in body size.

BEHAVIORAL PLASTICITY IN AN URBAN SPIDER SPECIES

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Individuals of the same sex and age within a given population commonly differ in their behaviour. Such differences, if consistent over time and across conditions are referred to as personality characteristics. Various behavioural types differ in their adaptiveness to environmental changes, e.g. urbanization and climate change. Some species thrive in urban environment, whereas others go extinct. Few researchers have investigated the potential impact of underlying personality on species invasiveness. Invasive species are thought to be dominant due to aggressiveness and boldness, which are advantageous in inter-species competitive conflicts, but are disadvantageous in within-species encounters, in particular for a species with high population densities. The bridge spider *Larinioides sclopetarius* is a successful colonizer over the Holarctic. Although they are ecologically and economically important in urban habitats, the biological bases for their success are understudied. We aimed to explain behavioural mechanisms affecting invasiveness by studying intraspecific behavioural variation, genetic background of their behavioural traits and fitness consequences in dense groups. *L. sclopetarius* showed consistent inter-individual differences in activity and exploration in a novel environment (NE), boldness and aggression levels towards the same sex conspecific. Females consistently differ in aggression levels towards mates and voracity towards prey. However, aggression towards same-sex conspecific was found to be the only significantly heritable behavioural trait, while boldness tended to be heritable ($p=0.08$). Despite high repeatability in the parent generation, these behaviours may be shaped by other factors than intrinsic personality. Activity and exploration (the latter, only for females) in NE correlated positively with body mass. Aggression did not relate to any other behaviour in the parent generation, whereas in female offspring voracity towards prey correlated to aggression towards the same sex conspecific and mates. These results suggest that behaviours in NE in this species are more flexible than behavioural traits in other investigated spider species, e.g. *Anelosimus studiosus* and *Agenelopsis aperta*. Also, differences in behavioural correlation between parent generation from urban habitats and offspring generation reared in the lab suggest high developmental plasticity in behavioural traits. We estimated fitness consequences of different behavioural types. To simulate success under high densities, groups consisting of 10 previously mated females (10 aggressive, 10 non-aggressive, mixed-50:50) were housed in terraria for three weeks under the same conditions. The three groups differed in the end body mass per individual and tended to differ in mortality rate, which were both the highest in the aggressive groups. Numbers and mass of cocoons were not significantly different between groups. These results suggest that low aggression level in high density urban population of *L. scopetarius* is beneficial for their survival, but this does not relate to higher reproductive success.

SPATIAL RELATIONSHIP BETWEEN THREE DOMINANT SPIDER SPECIES AND COLLEMBOLA PREY IN AN ENVIRONMENTALLY HETEROGENEOUS FOREST FLOOR HABITAT

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Disentangling the biotic and abiotic processes that are responsible for pattern formation between predators and their prey is crucial for improving our knowledge about food-web interactions. We studied the spatial patterns and relationships between three abundant spider species and Collembola prey in a forest floor food-web while accounting for environmental heterogeneity at the local scale. Spiders and epedaphic Collembola were sampled throughout the year in a spatially explicit design based on a regular grid of pitfall traps. Environmental heterogeneity at the forest floor was determined based on moss and litter cover and the number of dead wood items at each trap location. Techniques for point pattern analysis (L-function) were used to describe spatial relationships between individuals of the three most abundant spider species and Collembola under homogeneous and heterogeneous null models. Assuming habitat homogeneity two spider species *Inermocoelotes inermis* and *Walckenaeria cuspidata* were aggregated, whereas *Tapinocyba insecta* showed a random distribution. After accounting for habitat heterogeneity the L-function indicated that individuals of *I. inermis* were aggregated in areas with denser moss coverage. In contrast, *W. cuspidata* and *T. insecta* preferred litter and dead wood rich microhabitats. The analysis of predator-predator relationships suggested an independent spatial relationship between spider species if habitat heterogeneity was ignored, but association between species if models accounted for environmental heterogeneity. The distribution of Collembola was not related to environmental parameters and spider species and Collembola were independently distributed. Our study suggests weak competitive interactions between the analyzed spider species at the scale of 100 m and demonstrates the importance to account for environmental heterogeneity to avoid erroneous descriptions of patterns.

RELATIONSHIP BETWEEN SPIDER DIVERSITY AND MICROHABITATS IN PLANTATION FORESTS RECEIVING DIFFERENTIAL THINNING TREATMENTS

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Current plantation management policies have evolved into focusing on both conserving biodiversity and maximizing economic benefit. Before designing effective means for conserving biodiversity of plantation forests, we should understand the difference in species characteristics between natural and plantation forests subjecting to different degree of thinning. In many terrestrial ecosystems spiders are the most diverse and abundant arthropod predators. Spiders rely on a distinct complex of environmental factors and are sensitive to changes of the habitat due to forest succession, natural disturbances or forestry practice. Therefore, spiders are considered as a good indicator for comparing the biodiversity of various environments and for assessing the effect of disturbances. This study aims to investigate the diversity of spider to assess the influences of various degree of thinning by comparing the community structure and guild composition. I monitored and quantified spider diversity and microhabitat parameters in different plantation types with thinning treatments. And once each season I systematically collect spiders from each habitat. Collected spider specimens were sorted, identified, and data-based. Multivariate analyses were used to examine the relationships between microhabitat structure, microclimates and spider diversities. Results of analyses showed that two years after thinning spider family compositions of three plantation forest types differed significantly. Plantation forests receiving differential thinning treatments, including the un-thinned forests, had different spider family compositions in different year. Such results indicated that there were temporal variations in spider diversity. Two years after thinning, the understory vegetation densities in all three plantation forest types were higher than those recorded from the first year. Thinning treatment might have changed the structures of dense understory vegetation and consequently resulted in declines in species diversity, individual density and changes in composition. Moreover, the heterogeneity in understory vegetation recovery rate, and temporal variation of spider diversity, might further generated variations in spider diversity.

FACTORS INFLUENCING SPIDER DIVERSITY IN A COASTAL WINDBREAK FOREST IN TAIWAN

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Taiwan is a continental island with long coastal lines and large area of windbreak forests. Most of biodiversity researches conducted on coastal windbreak forests focus on flora or vertebrate fauna. Currently, factors determining the diversity of spiders in such type of habitats are still not clear. This study aims to realize the diversity of spiders in a coastal windbreak forest in Taiwan and to assess the environmental factors generating such diversity. The study was conducted between July 2009 to May 2010 and once every two months spiders were systematically collected by pitfall traps located in 34 sampling plots. During the collection trips various vegetation structural variables and microclimate factors were also measured. A total of 4049 spiders belonging to 21 families were collected. The abundance pattern of three dominant guilds (ground runner, foliage runner and space weaver) explained most of the spider diversity variation among sampling plots. Environmental factors best correlated with the observed spider diversity pattern were soil moisture and abundance of shrews and lizards. The correlation pattern between these variables and abundance of different spiders guilds varied. Such results indicate that environmental factors had differential influence on various spider guilds.

ECOLOGICAL DETERMINANTS OF SPIDER ASSEMBLAGES IN A TROPICAL FOREST (FRENCH GUYANA)

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The ecology of tropical spiders is poorly known because of the taxonomic and methodological constraints. In South America, most contributions focused on the systematic of spiders [see for example numerous works by Brescovit and colleagues] and their ecology in flood plains [work by the late Joachim Adis], mostly in the Amazonian forest. Our study focuses on spider assemblages of the Trinité reserve, French Guyana. This protected area is highly isolated within the Guyanese forest and contains a remarkable inselberg (isolated, often volcanic, rock hill surrounding the forest plain). In order to develop a long term monitoring protocol of spider biodiversity, two hypotheses were tested. Hypothesis 1: like other arthropod taxa, spiders daily migrate along vegetation strata. Hypothesis 2: sampling methods per se (here beating and sweep netting) are likely to interfere on the number of singletons, as it has been shown with sampling intensity. These hypotheses were tested in two sites of the reserve (on the inselberg and in the forest plain), during a 10-day field trip in 2010. Since they are ecologically isolated from their surroundings, inselbergs may function as islands, where processes of speciation are favoured. Based on taxonomic distinctness indices between sampling sites, assumptions are suggested regarding the observed levels of endemism of the inselberg.

NEW APPROACHES TO COMMUNITY ECOLOGY: APPLICATION OF TAXONOMIC RELATEDNESS INDEXES TO WETLAND SPIDER ASSEMBLAGES AND THEIR USE FOR BIODIAGNOSTIC PURPOSES

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The potentiality of spiders as bioindicators has been widely recognized, especially when describing and characterizing different habitats and different environmental conditions. Classical community indexes (i.e. Shannon diversity and Simpson dominance) are generally used to describe biological assemblages in order to infer ecological trends focusing, for example, on the effect induced by anthropic disturbance. Such indexes are generally based on species richness and abundance with a strong correlation with sample effort. Based on a different statistical approach, several new indexes that take in consideration the taxonomic relations between the species of a certain community have been proposed. High values of taxonomical relatedness indexes have been proved to reflect habitat functionality in marine ecosystems but they have rarely been used in terrestrial habitats. The complex taxonomic structure of spider communities, the stability of their systematic and their diversified ecological requirements makes them an ideal group to apply such indexes, especially in habitats were species richness is remarkably high, like wetlands.

In this paper we present the first application of taxonomical relatedness indexes to spider assemblages and a preliminary evaluation of their use to describe environmental stability. Our study took place in a Natural Reserve in NW-Italy where we sampled spiders in four different habitat typologies (a meadow, a bed of reeds, a riparian wood and an area invaded by allochtonous vegetation) using pitfall traps. NMDS plots were used to compare the different assemblages on the base of their similarity in species composition (abundance). For each of the 40 sampling sites, we calculated several community indexes like Shannon, Simpson, Pielou's evenness and several taxonomic relatedness indexes including taxonomic diversity, taxonomic distinctness and variation in taxonomic distinctness. Differences among habitats were tested with parametric and non-parametric tests (ANOVA and KW) and correlation among indexes were evaluated with Spearman's *r*. The same analysis was performed for Carabid beetles, in order to compare them with spiders. According to NMDS plots both spiders and carabids assemblages were clearly separated in relation to habitat type but, when considering community indexes, only for spiders significant differences among habitats were found. In particular, higher values of spider taxonomical distinctness were found in the more stable habitats (riparian wood and bed of reeds), attesting the good potentiality of such approach in evaluating habitat disturbance.

THE FUTURE OF THREATENED SPIDERS IN THE FACE OF CLIMATE CHANGE: INSIGHTS WITH *DOLOMEDES PLANTARIUS* (CLERCK)

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The potential impacts of global climate changes on future distributions of species have been increasingly studied in many vertebrate taxa as well as in some invertebrate taxa. Clear range shifts are expected to occur, with some species expected to increase their distribution range, and other expected to decrease. Spiders are strongly dependent on humidity and temperature and their range should therefore be influenced by climate change. However, potential impacts of climate change on spider species distributions have been poorly studied. As far as we know, the only attempt had been done on the endangered spider *Macrothele calpeiana* (Walckenaer). This species will be negatively affected because of restriction and fragmentation of its southern range. Here we analyse the potential impacts of climate change on another endangered species: *Dolomedes plantarius* (Clerck). *D. plantarius* is rated vulnerable (VU) in the IUCN red list and is one of the rare spider species comprised in the strategy of creation of protected areas in France which will be applied within the next few years. This emblematic species is widespread in northern Europe but very rare and current records report a fragmented distribution. We modelled the current and future distribution of *D. plantarius* to predict the potential impacts of climate change. Predictions were done using ensemble modelling on 7 state-of-the-art modelling techniques. Models were based on bioclimatic and landcover variables, and future projections are based on the latest IPCC climatic simulations. Models accuracy is first discussed. The observed potential impacts of climate change on *D. plantarius* distribution range are then discussed depending on the different climate change scenarios.

THE ECOLOGY AND SEASONAL ABUNDANCE OF THE HUNTSMAN SPIDER, *HETEROPODA VENATORIA* IN BANANA AGRO-ECOSYSTEMS IN CAMEROON

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The tropical vagrant huntsman spider, *Heteropoda venatoria* though not dangerous to humans, its frequent occurrence in bananas scares consumers of the fruit. To explain its frequent occurrence in marketed bananas, the spider habitats, temporal and spatial distribution and its population dynamics were studied through weekly observations and monitoring in a banana agro-ecosystem in Cameroon from April 2006 to March 2007. *H. venatoria* habitats in banana farms were beneath soil litter spots/mulches, under loose leaf sheaths (barks) of pseudostems and stumps, leaf petioles, between banana flower bracts and clusters clusters, within banana tree bags and between fingers of bunches. Spider densities in these habitats varied with plant phenology , seasons and cultural practices . The spiders inhabited the loose leaf sheaths around pseudostems and their stumps, the stout leaf petioles and the tube-like leaf sheaths of the pre-flowering plants during the dry seasons or dry spells of the rainy season. In contrast, during the rains or when the farms were under irrigation, the relatively more sheltered inner parts of flower bracts, spaces between the fruit clusters and those between the fingers on bunches of bunched plants were preferred. Overall, < 5% of spiders inhabited the litter which instead harboured high densities of their predators namely; frogs, toads, agama lizards and geckoes. Higher densities of *H. venatoria* were recorded in pseudostems and stumps around refuse areas with distinct population gradients in the order 0-10 m > 10-20 > 20-30 > 30-40 m away from the refuse. Densities of spiders in pseudostems were lower during the rainy than the dry season with the lowest density in August. The trends were similar in the litter spots. In contrast, spider densities in bunches were highest and lowest during the rainy and dry seasons, respectively.The ecological knowledge of huntsman spiders of the family Heteropodidae is very limited. This ecological information is vital in the sustainable management of the spider populations to exploit their beneficial effects.

LIFE CYCLE AND SPINNING APPARATUS OF WOLF SPIDERS (ARANEAE: LYCOSIDAE)

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Spinning apparatus of wolf spiders, contrary to that of araneoids, was poorly studied. The studies dealing with lycosid spinning apparatus used either histological (histology and histochemistry of spinning glands) or morphological (light microscopy or scanning electron microscopy [SEM] of spinnerets and spigots) approach. Most of these studies dealt with adult and subadult specimens only. Hence, a complex study, combining both histology of spinning glands and morphology of spinnerets in adults as well as in juveniles of all instars, is necessary.

The aim of this study is to describe changes of the spinning apparatus during the life cycle of four model wolf spiders. The species chosen were *Tricca lutetiana* (Simon, 1876) and *Arctosa alpigena lamperti* Dahl, 1908 as rare members of the subfamily Lycosinae, burrowing and vagrant respectively, and *Pardosa amentata* (Clerck, 1757) and *Xerolycosa nemoralis* (Westring, 1861) as common representatives of the subfamily Pardosinae and Evippinae respectively. At first, life cycles of these four species were reconstructed based on field collecting and laboratory rearing. Then, spinning apparatus of all available instars was inspected using standard histological techniques and SEM.

Males and females of *T. lutetiana* and *P. amentata* reached adulthood in the same instar whereas females of *A. a. lamperti* and *X. nemoralis* matured in later instars than males. Postembryos (in a cocoon) possessed only non-functional spigot primordia. The first instars (that left the cocoon) were equipped with the primary and secondary ampullate spigots both on anterior and middle spinnerets and few piriform and aciniform spigots. In the following instars, an ampullate tartipore appeared and the number of piriform and aciniform spigots increased gradually. In subadult males, the counts of spigots corresponded either to those of subadult females or to those of pre-subadult females, depending on whether the males mature at the same instar as females or not. In adult females, tubuliform glands appeared, whereas in males, secondary ampullate spigots reduced into non-functional nubbins.

Spinning apparatus of wolf spiders studied were inspected using a combination of more methods. Inspection of postembryonic spinnerets revealed that the spinning apparatus is fully functional since the first instar. In general, each species differed in number of spigots – *T. lutetiana* possessed the lowest number while *A. a. lamperti* the highest one. This variance reflected the difference in lifestyle between burrowing and vagrant species.

ULTRA STRUCTURAL COMPARISON OF SPINNERET MORPHOLOGY OF ORB WEAVING AND FUNNEL WEB BUILDING SPIDERS OF WESTERN GHATS, INDIA

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Structural details of spinnerets vary with family and are very closely related to the behaviour of the spider. Hence an ultra structural comparison of spinnerets is an effective method to study not only taxonomic differences, but also behavioural features. This is the pioneering study on spinneret morphology of any species in the whole of India. Western Ghats, one of the biodiversity hotspots, is home to a diverse assemblage of spiders. Four orb weavers viz. *Neoscona mukerjei, Cyrtophora citricola, Gasteracantha geminata* (Araneidae) and *Nephila pilipes* (Nephilidae), a funnel web builder *Hippasa pisaurina* (Lycosidae) and a sheet web builder *Stegodyphus sarasinorum* (Eresidae) were collected from the southern stretch of Western Ghats and their spinneret morphology examined and compared by Scanning Electron Microscopy (SEM).

Hippasa deviates from the typical non web building lycosids in that it is a funnel-building wolf spider and hence assumes greater significance. Also, till date, there is no documented study on the spinnerets of *Hippasa*. In this study a preliminary comparison of spinneret morphology of a typical orb weaver namely, *Neoscona mukerjei* and *Hippasa*, a funnel web builder, is attempted.

It was observed that the Posterior Lateral Spinneret (PLS) of female *Neoscona* is most complex bearing many aciniform spigots, two cylindrical spigots, two aggregate spigots and a flagelliform spigot sticking out between the tips of the aggregate spigots. Its Posterior Median Spinneret (PMS) holds a cylindrical spigot and an ampullate spigot apart from the numerous aciniform gland spigots. The Anterior Lateral Spinneret (ALS) has a prominent primary major ampullate spigot along with the major ampullate nubbin and many piriform spigots. This pattern conforms to that observed in other typical orb weavers.

As for Hippasa, the spigots are surrounded by feathery setae. Aciniform spigots look longer than in a typical lycosid, and this would be consistent with funnel web building since it is the aciniform spigots that are primarily used to make the funnel. This situation would be similar to what we see in funnel-building agelenids since they also have very long aciniform spigots. Minor ampullate spigot seems to be absent on PMS, but requires further examination for confirmation. Thus it becomes obvious that spigot morphology corresponds to the web-type of spider.

RAPID COLOR CHANGE IN THE LINYPHIID SPIDER *FLORONIA BUCCULENTA* (ARANEAE: LINYPHIIDAE)

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Floronia bucculenta can change the color of its opisthosoma very rapidly. When the spider drops from its web, it becomes darker – the pattern made out of white guanine fields largely disappears. However, the mechanism behind that is yet unknown. The goal of this study was to find out the morphological structures enabling the guanine spots to change place. Therefore, histological serial sections of the opisthosoma were studied. First results indicate that delicate muscle fibers apically surrounding the guanine cells cause an inwards translocation of guanine.

TURNING OVER A NEW LEAF IN DYSPNOID SCENT GLAND RESEARCH (OPILIONES)

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Large, prosomal exocrine glands – so called scent glands – are characteristic for all Opiliones. While Cyphophthalmi and Laniatores possess typical defensive glands from which they emit odorous secretion in case of disturbance, Palpatores - especially dyspnoid species - are reluctant to release secretion. Some groups, such as Trogulidae, do not emit secretion at all, even when they are heavily squeezed with a forceps. Nevertheless, Dyspnoi indeed possess large, well-developed scent glands with remarkable morphological constructions. In the present contribution, the current state of knowledge of dyspnoid scent gland morphology is reviewed, with focus on recently accumulated data from representatives of three families of the Troguloidea, namely the Dicranolasmatidae, Nemastomatidae and Trogulidae.

Contrary to the clearly exposed scent gland orifices of Cyphophthalmi, Laniatores and Palpatores-Eupnoi, the ozopores in many Dyspnoi are hidden, directed ventrally and surrounded by an external atrium – a kind of chamber covering the scent gland openings. This atrium is bordered by a dorsal integumental fold and ventrally by coxa I. Several distinct types of atria can be distinguished among representatives of the families mentioned above. The Trogulidae, for instance, possess an atrium that is additionally bordered by a lateral wall of cuticular papillae, thus leaving only a slit-shaped secondary opening that leads to the outside of the body. Atria of *Dicranolasma scabrum* (Dicranolasmatidae) exhibit a lateral row of modified cuticular papillae, whereas atria of species of the Nemastomatidae have no lateral border at all. Histological investigations on the scent glands of several dyspnoid species have already indicated the presence of solid or hardly soluble secretion. Actually, this is confirmed by chemical analyses of the scent gland secretions in a model nemastomatid species, *Paranemastoma quadripunctatum*. Further morphological studies on *P. quadripunctatum* and *P. bicuspidatum* revealed a complex mechanism of emission of secretion – suggesting the active absorption of enteric fluid into the reservoir of the scent gland so as to dilute and/or dissolve solid scent gland material.

Dyspnoi are mainly soil- or cave-dwelling species, heavily sclerotized, and, in case of Trogulidae and Dicranolasmatidae, also camouflaged by soil incrustation. Thus, the evolution of scent gland functions apart from typical chemical defense may have been favored, leading to glandular types and mechanisms of secretion discharge that clearly diverge from the typical allomonal glands in other Opiliones.

SIGNALS FROM THE REAR: IS A MODIFIED ABDOMEN THE LAST RECOURSE FOR HIGHLY SPECIALISED MALES?

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In the course revisions in several spider families, special attention was paid to different types of sexual dimorphism. Modifications of the abdomen in males are among the rarest cases in this context. The examples illustrate the extent of the variations of sexual dimorphism among spiders that rely on tactile signals exchanged during courtship and mating. Other cases of unusual sexual dimorphism, like the modifications of chelicerae, endites, labium or even the labrum provide more examples of the tactile 'mating module'.

The existence of stable somatic templates in combination with the endless variations in sexual dimorphism may throw a different light on the conservative explanations for the phenomenon. Mainly the fact that the variations show an extensive complexity range, indicates that male modifications might be markers for specialisations in resource exploitation.

The mechanism explains phenomena like species richness of families with good eye sight, complexity of genitalia in small species and differences in the range of genitalic complexity as a result of dispersion and vicariance among others.

THURSDAY, 8 SEPTEMBER

SEXUAL SELECTION AND ECOLOGY SHAPE PLASTIC DEVELOPMENT & BEHAVIOR OF SPIDERS

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Variation in local conditions can clearly affect the traits most likely to confer high reproductive success. Evolutionary responses to such variation may include changes in the distribution of heritable phenotypic traits, or the evolution of plasticity that allows accommodation to local conditions without changes in the distribution of heritable traits. I discuss developmental and behavioural plasticity under variable demography in the Australian redback spider (*Latrodectus hasselti*), and emphasize the importance of understanding (1) contextual determinants of reproductive fitness and (2) developmental trajectories when assessing selection. I show that monogynous male redback spiders face a number of competitive challenges when seeking mates, and density-related cues indicating the relative importance of these can shape developmental trajectories and affect male reproductive performance in different contexts. I show that demography is also related to the opportunity for redback males to mate with juvenile females—a facultative mating tactic that may permit polygynous mating by males that are otherwise specialist monogynists. I argue that species in which male mating opportunities are constrained may be particularly likely to show plasticity, and spiders are excellent models for examining links between demography, selection and plasticity.

MALE CONDITION AND FEMALE PREFERENCES IN A GIFT-GIVING SPIDER

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Individual reproductive success is highly affected by low feeding conditions and/or by unbalanced nutritional state. In male spiders, low body condition may limit their ability to court and copulate and consequently their access to females. In *Pisaura mirabilis* (Pisauridae), males offer to females a nuptial gift (a prey wrapped in silk) during courtship. Gift construction can involve high costs for males, and those in low condition are less likely to wrap the prey in silk or they do it for a shorter time. The gift may be a target of female choice and functions as a mating effort that increases male reproductive success. We predicted that a well wrapped gift, obtained from a male in good condition, would improve the mating success of a starved male. We investigated this hypothesis by exposing females to 1) satiated males with well wrapped gift, 2) starved males with badly wrapped gifts, and 3) starved males with well wrapped gifts. Our results show that a higher proportion of satiated males with well wrapped gift (100%) have success in mating compared to starved males with badly wrapped gifts (75%) and starved males with well wrapped gifts (70%). Similarly, mating duration was longer in satiated males (76.0 ± 36.1 min) than in starved males independently of gift quality (35.3 ± 38.5 min, with badly wrapped gifts and 36.1 ± 25.8 min, with well wrapped gift). Both groups of starved males obtained no offspring, while satiated males had an average of 13.8 spiderlings (± 15.2 SD) per egg-sac. The nuptial gift-giving trait is under strong sexual selection in *P. mirabilis* and even males in low feeding condition invest in gifts, court females and mate. The results indicate that male feeding condition is very important for mating success, while investment in the gift seems to not improve male fitness.

LOLITA'S WEB: JUVENILE FEMALE MATINGS IN THE BROWN WIDOW SPIDER

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Juvenile female matings is proposed as an alternative mating tactic for the brown widow spider *Latrodectus geometricus*. Anecdotal observations suggest that males of the brown widow spider sometimes mate with sub-adult (final instar) females in nature, opening through their exoskeleton to inseminate their newly-developed spermathecae. Here we document the occurrence of sub-adult matings, and examine whether this behavior develops as a male or a female tactic by analyzing how the reproductive success of each sex is affected. In laboratory trials we compared the outcome of pairings between adult males and adult or sub-adult females. Males paired with sub-adults mated with reduced investment in courtship relative to males mating with adults, had higher initial mating success and were more likely to be polygynous. Our data suggest that sub-adult female matings can evolve as an alternative male mating tactic. Sub-adult matings might also serve females as a mating insurance tactic under variable and unpredictable male densities.

FACTORS AFFECTING FREQUENCY OF REVERSED SEXUAL CANNIBALISM IN *M. SOCIABILIS*

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Reversed sexual cannibalism is a very rare phenomenon in animal kingdom. The aim of our study was to uncover factors, which affect occurence of this behaviour in the spider *Micaria sociabilis*. Several hypotheses derived from the classical form of the sexual cannibalism were tested – an economic model, a mate choice and an aggressive spillover theory. Hunger in males did not increase the frequency of cannibalism, nevertheless presumed decrease in prey diversity during the season appears to result in cannibalism. Male mate choice based on female body size or her mating state (virgin or mated) was not proved, however, high frequency of cannibalism during the overlap of two generations indicate male choice based on the age of the female. Male cannibalism was documented only in several males suggesting the effect of different individual aggression. The rate of cannibalism was positively correlated with male body size. Observed results suggest that reversed sexual cannibalism in *M. sociabilis* is influenced by ecological factors as well as inherent features of males and females.

THE ROLE OF CONSPICUOUS BODY COLORATION IN COURTSHIP OF NOCTURNAL SPIDERS

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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,* I first measured the spectra of the body coloration. I then manipulated the color signal of male spiders by using dummies constructed from papers with spectra similar to colors of real spiders. The control dummies had white bands while the experimental dummies did not and the responses of female *D. raptor* to them were monitored by infrared video cameras. The results showed that in the field the control dummies attracted significantly more female *D. raptor*. However, the exact roles played by this conspicuous signal in the courtship of these nocturnal spiders are still unclear. To answer this question, I will first collect mature male *D. raptor* from the field and measure their body size, weight, white stripe area and reflectance spectra to see whether individuals vary in these properties. Then I will collect juvenile male and female *D. raptor* from the field and raise them individually under the same feeding conditions. When they mature I will measure the body weight and take pictures of males and use Image J to quantify the area of white stripe. The reflectance spectra of the white bands will also be measured. The males will be divided into experimental (white stripes covered by brown paint) and control (brown paint on brown carapace) groups and females' responses to them will be determined. I will also perform multivariate analyses to realize what measured variables are most relevant with size/chromatic properties of white stripes and males' mating success.

RISKS AND CONSEQUENCES OF INBREEDING IN THE INVASIVE SPIDER SPECIES *ARGIOPE BRUENNICHI*

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Inbreeding may occur in the absence of pre-copulatory inbreeding avoidance, if siblings of both sexes tend to settle in close proximity and if a new population was founded by a few individuals. Inbreeding can lead to major losses in fitness which most often affects the female more than the male. This, however, is different in species in which both sexes mate with a maximum of two mates. In such mating systems, selection to avoid inbreeding should be particularly strong on both sexes. The sexually cannibalistic spider *Argiope bruennichi* migrated from their original Mediterranean habitat throughout Europe over the past 50 years and is a very successful coloniser. We hypothesised that these spiders encounter a high risk of inbreeding in recently founded populations and that they are either resistant to negative inbreeding effects or that they employ mechanisms to minimise detrimental effects of inbreeding.

We collected individuals from four geographically separated populations two of which were established and two were recently founded. In an experimental setup, we arranged matings between siblings, between non-siblings from the same population, and between non-siblings from different populations. Copulations were observed and hatching success was determined. The duration of copulation was shorter between siblings than between non-siblings, whereas sexual cannibalism did not differ between the treatments. Egg-sacs from siblings had the lowest and egg-sacs derived from between population crosses had the highest hatching success. Within population crosses were intermediate but hatching success was not affected by population history. We used microsatellite markers to compare genetic diversity between the four populations. Surprisingly, we found a high genetic variation within all, the two established and the two young, populations. We suggest that the high variation might be the result of a rapid and simultaneous migration from different regions that caused a high genetic diversity within recently founded populations.

DR. JEKYLL AND MR. HYDE: ON THE REAL IDENTITY OF *PARDOSA VLIJMI* AND *P. PROXIMA* (ARANEAE, LYCOSIDAE)

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Pardosa proxima is considered widespread in open habitats from the Mediterranean basin to Central Europe. Like other species belonging to genus *Pardosa*, the males produce complex courtship display that has several functions such as species-recognition, female choice and suppression of potential cannibalism. *P. proxima* courtship behaviour was firstly observed by Den Hollander & Dijkstra in 1974 and compared to the sister species *P. vlijmi*. The latter was sampled only in two localities of France, in syntopy with *P. proxima* and described as a new "ethospecies" due to the remarkable differences in courtship behaviour. No obvious morphological differences between the two species were observed by the authors giving rise to cases of possible misidentifications and confusing the known distribution of *P. proxima* and *P. vlijmi*. Recently we recorded *P. vlijmi* in Italy, recognized on the ethological basis. The comparison of these two closely related species offers interesting insights both regarding ethological and systematical aspects.

The reproductive signaling behaviour of the two sister species was studied by means of a modular approach. More specifically we investigated the connectedness among behavioural units and the intra- and inter-specific variability within behavioural units and within lower hierarchical components (sub-units). Although qualitatively different, the courtship behaviour of both species shows similar organization. We clearly recognized three different behavioural units in a linear succession corresponding to start, main and ending behaviours. Within the two courtships we can highlight strongly stereotyped sub-units and, on the other hand, highly variable sub-units (comparing specimen of the same species and, even more, among behavioural patterns of the same specimen). In respect to morphological aspects we investigated differences between male palps in terms of ratio between height and width of the palpal tibia, shape of the conductor, as well as hairness of the ventral side of the abdomen. The results are presented with scanning electron microscope (SEM) photos. On the basis of such findings, we analysed some other Italian material, including Tongiorgi's collection stored in Bergamo Museum, finding out that *P. vlijmi* appear to be quite common in Italy. The analysis of additional Greek material opens an interesting question about the identity of *P. proxima*, as Greece is its *terra typica*.

THE BIOGEOGRAPHY OF SOCIAL SPIDERS

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Permanent group living and cooperation in spiders has evolved independently at least 18 times scattered on the phylogenetic tree of spiders, but their distribution is restricted around the tropics. To see which environmental factors might have contributed to this macroecological pattern and facilitated evolution of social behaviour, we perform a global analysis of social species richness on a regional level. Social species were defined by: lack of premating dispersal, inbred population structure with female biased sex ratios, cooperation in brood care and feeding. We gathered the distribution data from two review papers on social syndromes in spiders and The Platnick 2011 world spider catalogue. Botanical countries of the world were held as reference units for presence or absence of social species. Environmental factors including annual mean temperature, minimum temperature of the coldest month, precipitation seasonality, annual global vegetation index (a measure of vegetation productivity) and topographic heterogeneity of the world were used as explanatory variables. We calculated the unit means for each of those variables, and included the area of each botanical country. Hurdle models were then performed on species richness and presence vs. absence of social spiders. Both presence-absence and species richness of social spiders increased with vegetation productivity (global vegetation index), and species richness correlated with low precipitation seasonality. This pattern fits with the hypothesis that prey availability plays a key role in explaining the distribution of social spiders in the tropics: insects are larger in biomass in areas of higher vegetation productivity and also larger in size in aseasonal environments where there is more time to grow. I will discuss the occurrence and diversity of social species in relation to climate stability, prey availability and niche differences.

SOCIALITY LEVEL EXPLAINS DISPERSAL ABILITY IN SPIDERS

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The costs and benefits of dispersal may vary under different ecological conditions. One such ecological condition is sociality, which once established could shape dispersal abilities. Spiders constitute an excellent system to study the link between sociality and dispersal behaviour because a broad range of sociality levels can be found among the species of a single genus. Until now research on the link between dispersal and sociality has been based on indirect approaches such as the study of age classes, population genetic structure or observational field studies. Here, we study the link between dispersal and sociality following a functional and mechanistic approach for the first time. In order to test if a progressive reduction of the ability to disperse has accompanied the evolution of sociality we performed experimental trials to measure the propensity and ability to bridge – a common aerial locomotion mode in spiders which probably has special relevance during pre-mating dispersal – in seven species of *Anelosimus* (Theridiidae) with different degrees of sociality. We found that the tendency to disperse by bridging, and, at least in males, the ability to disperse, significantly decreases as the level of sociality increases. Additionally, we detected a reduction of leg length relative to body size with increasing sociality and decreasing dispersal abilities in males, which may be mechanistically related to a reduced ability to bridge. We found that the tendency and ability to disperse by bridging decrease gradually across the sociality gradient without a pronounced threshold between the traditionally considered subsocial and social species. This result agrees with the idea that sociality in spiders, instead of being a discreetly categorical trait (social vs subsocial), is a continuous variable that groups together a broad list of life-history traits. Since sociality in spiders is a derived character, we propose that these dispersal constraints associated with the evolution of sociality could significantly increase the cost of dispersal, and subsequently contribute to the maintenance of sociality once it is achieved.

OUTBREEDING DEPRESSION AND LACK OF INBREEDING COSTS IN A SOCIAL SPIDER

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High rates of inbreeding are rare in social species, and most social insects, for example, are strictly outbreeding. Social spiders, however, maintain a highly inbred mating system. Indeed, an important step in the evolution of sociality in spiders, by the sub social route was the switch from an outbred to an inbred mating system that prevails in the social species. On the short term, inbred mating has high costs due to inbreeding depression and expression of deleterious alleles. On the long run, however, lack of pre-mating dispersal and inbreeding is expected to reduce genetic diversity, and the adaptive potential. We investigated the fitness costs associate with low genetic diversity and frequent inbreeding in the social spider *Stegodyphus dumicola* (Eresidae). *Stegodyphus dumicola* share a communal nest and cooperate throughout their lives. Once spiders have reached adulthood they also mate within the colony. Furthermore, little pre-mating dispersal and colony foundation by single mated females reduces gene flow and creates genetic viscosity in the population. Combination of low gene flow and small effective population size, due to inbreeding, can lead to adaption at the genes level, and reduce costs of inbreeding. Outbreed mating can results in disruptions of co-adapted gene complexes and fitness reduction, also known as outbreeding depression. We assessed the consequences of constant inbreeding, by allowing females to mate at three levels of genetic diversity: inbreeding, outbreeding within a population, and outbreeding between populations. Once females had mated we took 8 fitness measurements at different life stages of females and young. Reduced hatching success of females that mated between populations indicates on outbreeding depression. However, once hatched, individuals from all mating treatments survived and developed at the same rate, revealing high benefits of group living. We suggested that lack of inbreeding costs, but a high cost of outbreeding, maintain low genetic diversity in this species, and reduce selection to outbreed. These results suggest that inbreeding could reduce the adaptive potential powered by genetic diversity and *S. dumicola* has reduced capability to undergo adaptive radiation.

POPULATION STRUCTURE AND SEX-SPECIFIC DISPERSAL IN A COOPERATIVE, SUBSOCIAL AND SOLITARY SPIDER

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A species' population structure sheds light on dispersal, reproductive patterns and intra-group relatedness. However, direct comparisons of population structure among spider taxa and among types of social systems have been difficult due to the variety of genetic markers, primarily allozymes, DNA fingerprints, mtDNA sequences and microsatellites, employed by various authors. In this study we use TE-AFLP (three enzyme amplified fragment polymorphism) DNA fingerprinting to examine population structure and sex-specific dispersal (male dispersal vs. female dispersal) in three species of spiders - *Stegodyphus dumicola, S. lineatus* (Eresidae) and *Latrodectus pallidus* (Theridiidae).

Stegodyphus dumicola is a cooperatively social species that forms colonies of a few individuals to a few hundred individuals. Its congener, *S. lineatus*, is subsocial: immatures remain with the mother for short time post-hatching and initially disperse only short distances from the maternal web. Since all members of the Eresidae appear to exhibit at least subsocial behavior, we used the non-social white widow *L. pallidus* as an example of a species without maternal-offspring interactions.

Initial comparison of population structure with AMOVA (analysis of molecular variance) showed greatest population structuring in *S. dumicola*, and the least in *L. pallidus*. Spatial autocorrelation analyses showed the shortest dispersal distances in *S. dumicola*, and greatest in *L. pallidus*. More detailed analysis of sex-specific dispersal will be presented. These data are crucial for understanding the changes in dispersal and mating systems that occur in transitions from solitary to cooperative behavior.

COMPARATIVE TRANSCRIPTOMICS OF THE SPIDER GENUS *STEGODYPHUS* SUGGESTS GENETIC CONSEQUENCES OF THE TRANSITION TO SOCIALITY

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The spider genus *Stegodyphus* contains three independently derived social inbred species, and approximately 18 solitary outcrossing species, making this genus ideal for comparative studies of the evolution of sociality in spiders. To get insight in the genomic consequences of sociality, a genetic toolbox is needed. We have sequenced the transcriptomes of three *Stegodyphus* species, one being social and the two others solitary, and obtained a catalog of ~1800 alignments of ortholog loci. We characterize the transcriptomes, and do preliminary molecular analyses on more than 1300 alignments. We observe 5-10 times lower heterozygosity level in the social species compared the two solitary species. We find evidence of relaxed selection in the social species based on comparison of non-synonymous and synonymous polymorphisms. However, relaxed selection cannot be detected on the lineage leading to the social species based on dN/dS, GC-content and codon usage bias, suggesting that sociality evolved recently.

POPULATION GENETIC STRUCTURE OF KLEPTOPARASITIC SPIDERS (ARGYRODINAE: THERIDIIDAE)–A COMPARISON BETWEEN GROUP-LIVING AND SOLITARY SPECIES

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Most species of *Argyrodes* and *Faiditus* (Theridiidae: Argyrodinae) are solitary kleptoparasites in the webs of their host. However, some species live in groups in the webs of their larger hosts. These kleptoparasites approach the host and feed on large prey that their host is feeding upon. Experimental studies in our lab indicate that this is a form of cooperative behavior on the part of the kleptoparasite "gang-members," as kleptoparasites in groups are able to feed for a longer period of time than single kleptoparasites. This host-kleptoparasite system can be used to test various evolutionary hypotheses of cooperation, e.g., kin selection and reciprocity, in one system. In this study, we investigated whether members of kleptoparasitic gangs are cooperating preferentially with relatives. We carried out DNA finger-printing using the TE-AFLP method (three-enzyme amplified fragment length polymorphisms). We found that (1) in group-living species, the gang members are more closely related than groups of individuals drawn randomly from the local population; (2) in solitary species, there is no structure at all. These results, along with observations on reproductive behavior of the tested species, suggest that population genetic structuring in the group-living species is caused by limited dispersal of immatures. In solitary species, there is no genetic structure at a small geographic area, suggesting wide dispersal of immatures. These results suggest inclusive fitness benefits in the origin of cooperation among the gang members in group-living species.

REPRODUCTIVE SKEW IN SOCIAL SPIDERS - TO REPRODUCE OR TO HELP YOUR SISTER

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The colony structure of permanently social spiders differs from that of eusocial insects mainly in the lack of a clear division of labour. However, reproductive skew within social spider colonies implies that a large proportion of female colony members forgo own reproduction and invest all their resources in the offspring of their sisters. Furthermore, new evidence shows that individual colony members engage disproportionally in certain colony tasks, indicating that social spiders may have more subtle task differentiation after all. What causes this reproductive skew and behavioural differentiation in non-eusocial spider colonies? We will present a study investigating potential origins of labour differentiation by focusing on the underlying size variation in *Stegodyphus* colonies throughout the spiders' life cycle, from eggs to adults. Current literature suggests that individual body size reached at the reproductive season determines whether a female becomes a reproducer or a helper, and this size is determined stochastically due to resource competition within colonies. By obtaining individual sizes of spiders in colonies from a range of developmental stages, sizes, and food treatments, our study suggests that size variation within colonies exists, but is independent on either of these effects. Hence, reproductive skew, based on size variation within colonies, might not simply be an unselected consequence of resource competition, but rather be determined early on in the colony life cycle by mechanism such as maternal effects.

TASK DIFFERENTIATION IN THE SOCIAL SPIDER *STEGODYPHUS SARASINORUM*

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Spider sociality is markedly different from insect eusociality in the lack of reproductive division of labour and overlapping generations. Furthermore, there is no evidence of caste systems nor of task specialization in social spiders. Behavioural asymmetry, however, has been suggested in the social species *Anelosimus eximius* but not yet in any of the social *Stegodyphus* species. Our objective was to test whether the social *Stegodyphus* spiders exhibit the same tendency for behavioural asymmetry as observed in the *Anelosimus* spiders, as evidence of convergent evolution.

We marked individuals of the social spider *S. sarasinorum* and observed them in feeding experiments during three consecutive days. We recorded prey attack and web maintenance behaviour in order to investigate whether colony members engaged differentially in colony tasks. We examined whether the size of individuals could predict their tendency to engage in specific colony tasks.

We found that individuals engage in different tasks, and that individuals appear to consistently perform the same task, independent of their size. These new findings indicate that distantly related, independently evolved social spider species may have task differentiation afterall, in some cases not dependent on size nor hunger state.

THE SPIDER FAUNA (ARANEAE) OF HAY MEADOWS AND PASTURES – A FAUNISTIC COMPARISON AND NATURE CONSERVATION EVALUATION

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Extensive grasslands have covered large parts of the Central European landscape for several hundred years. Within the last decades these biotope types have nearly vanished and with them a highly adapted spider fauna. Habitat-analyses and red data lists show the biggest decrease of all habitat types in species-rich grasslands. Meadow-spiders mostly rank among the vulnerable, endangered and critically endangered species. The European Union aims to stop this negative trend, the loss of grasslands and biodiversity, and has created a special programme, called ÖPUL, for funding ecologically oriented farmers.

Our current investigations deal with these ÖPUL-funded meadows and pastures in Austria. Using the indicator group Araneae, the success of this grassland support programme will be evaluated. The main questions are: Show these ÖPUL-funded grasslands a higher species richness and are they more valuable from the nature conservation point of view than conventional farmed areas? Are there differences between mowing and grazing?

Faunistic-ecological studies were carried out in 39 different grassland types in South-Eastern Austria (Styria, Burgenland and Lower Austria). The epigeic spider fauna has been investigated by means of pitfall-traps and a G-Vac suction sampler during the vegetation period in 2008.

The spider fauna is represented by 136 epigeic species from 19 families. 85 % of the collected 12.100 specimens have been caught by pitfall-traps (barber-traps) and 15 % by the G-Vac suction sampler. The total number of expected epigeic species in these plots is 167. Dominant species are *Pardosa palustris* (50 %), *Pachygnatha degeeri* (11 %) and *Trochosa ruricola* (5 %). Remarkable is the new record for Austria for the three species *Robertus insignis* (O. P.-Cambridge), *Sibianor tantulus* (Simon) and *Ozyptila sanctuaria* (O. P.-Cambridge). An analysis of the spider coenoses of the different plots reveals the position in the different natural areas (Southeastern Alpine foothills, Central Alps and the Pannonian flat lands and hill countries) as the most striking factor.

A comparison of the spider fauna of hay meadows and pastures shows that the species diversity of both is quite similar, whereas the percentage of red data list species is significantly higher in hay meadows (36 %) than in pastures (14 %). Concerning the nature conservation value, nine of the Top-10 plots are hay meadows, while only one is a pasture. Moreover, within the Top-10 plots nine grasslands are inside the ÖPUL-programme. This observation demonstrates the importance of the funding programs for grasslands in Central Europe.

ECOLOGY AND SYSTEMATICS OF THE GENUS *TROGLOHYPHANTES* (ARANEAE, LINYPHIIDAE) IN ITALY: AN OVERVIEW ON RECENT FINDINGS

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Hypogean environments are naturally sheltered habitats, being the places were the climatic and meteorological history of the planet has had minor impacts. The presence of relictual fauna in a certain area is the result of an array of ecological, historical and geographical factors and can be used for the study of biogeography and speciation processes. At the same time, cave ecosystems may often harbour species of considerable scientific interest and may offer interesting opportunities for ecological studies. In respect to this, recent studies in caves of the Italian Alps revealed several interesting research issues, both from the zoological and ecological point of view. In view of recent results published by the author between 2006 and 2011, a general overview and several insights on spider genus *Troglohyphantes* (Araneae, Linyphiidae) will be presented. Concerning the zoological aspects, the current status of the Italian species, including a discussion on two newly described species, a new synonymy and the present known distribution of the Italia species, will be presented, including a short outline on the preliminary findings about the phylogeny of the genus based on molecular analyses. Concerning ecology, the ecological preference of several species of *Troglohyphantes* will be described, focusing on the influence of environmental factors such as altitude, climatic features, glacial history and cave features. By means of advanced statistical elaboration with General Linear Models and General Addictive Models, the correlation between the occurrence of *Troglohyphantes* species and cave temperature will be pointed out. In view of this relation and considering the ecological peculiarities of the cave environment, the potential use of *Troglohyphantes* for the monitoring of global warming will be emphasized.

EXTRA-ALPINE ARACHNID SPECIES IN CENTRAL EUROPE WITH RESTRICTED DISTRIBUTION AREAS

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No habitat type or biogeographical unit (on the level of the European Union) is restricted to a single European country. Only small northern parts of the Alps belong to Germany. The Atlantic and the Continental lowlands exist as a similar specification in the adjacent countries of Germany, as well as the lower mountain ranges from 300 to 1000 m a.s.l. Therefore, as arthropods cannot be restricted by political borders, we do not count truly endemic arachnid species in our country. This is also the case for most other groups of animals.

The German Federal Agency of Nature Protection (Bundesamt für Naturschutz) developed a method and categorisation for the species to evaluate the responsibility of a country for each individual species. This is an additional category in the Red Data Lists, but does not mean automatically that a species – for which a given country is especially responsible – must automatically be endangered in that same country.

For the arachnids the important parts of these criteria are:

1. Germany is to an especially high degree responsible for a species: (a) at least 3/4 of the area or of the known population or records of a species is situated in Germany; (b) between 1/3 and 3/4 of the area or of the known population or records of a species is situated in Germany, and Germany is in the centre of the species' area
2. Germany is to a high degree responsible for a species: (a) more than 1/3 of the area or of the known population or records of a species is situated in Germany; (b) between 1/10 and 1/3 of the area or of the known population or records of a species is situated in Germany and Germany is in the centre of the species' area
3. Germany is to an especially high degree responsible for isolated (disjunct) outpost populations: (a) of glacial relict species (arcto-alpine or boreo-alpine); (b) isolated from the main area by geographical barriers, which can not be transcended.

A complete list of the arachnid species (spiders, harvestmen, pseudoscorpions) for which Germany is responsible is in preparation. The contribution here focuses on species which live in forests in the lower mountain ranges in the Strict Forest Reserves in Hesse (Central Germany). The totals of the three arachnid orders in Germany are about 1100 species. There are 50 arachnid species in the category '!', 12 in the category '(!)', and 9 in the category '!!'. 323 spider species, 18 harvestmen and 12 pseudoscorpions have been recorded in the Strict Forest Reserves in Hesse until now. For 11 spider species and 3 harvestmen species, Germany is responsible: 12 from the category '!' and two (spider) species from the category '!!' (*Oreonetides quadridentatus*, *Panamomops affinis*, both Linyphiidae).

This method to categorize species is a valuable additional instrument to evaluate the recorded species in single sites or site groups, besides the red data lists, rarity, originality of the habitats, niche breadth, habitat fixation, etc.

THE SPIDER COMMUNITIES OF THE GALÁPAGOS ISLANDS: FINAL APPROACH

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A synthesis is given of 30 years of galapagoan spider fauna research. An historical overview of spider sampling in the archipelago is given. Extensive sampling campaigns for arthropods have been regularly carried out since 1975 till nowadays on all islands and volcanoes of the Galápagos archipelago by various teams: W.G. Reeder of the Texas Memorial Museum, Austin, U.S.A.: 1975-1980; a Belgian team (L. Baert, J._P. Maelfait, K. Desender and collaborators: 1982, 1986, 1988, 1991, 1996, 1997, 1998, 2000, 2002, 2009 & 2010), a Canadian team (S. Peck and collaborators: 1985, 1989, 1991, 1992 & 1996), an Austrian team (H. & I. Schatz: 1985, 1987 & 1988), a Spanish team (J. Hernández Pacheco and collaborators: 1990-1991, mainly cave fauna) and members of the Invertebrate section of the Charles Darwin Research Station (Y. Lubin: 1982-1983; S. Abedrabbo: 1985-1992; G. Estevez; L. Roque: 1997-2008; Henri Herrera: after 2008 and several CDRS-collaborators). All known available existing spider material preserved in various Museums (AMNH, BM, CAS, MCZ, ZMO, RBINS) and literature data has also extensively been studied.

This resulted in an analysis of 11.387 data originating from 688 sampling localities. 173 spider species are numbered: 148 of them could be identified or were described as new. The remaining 25 species could only be identified to morpho-species level and they might be new to science and thus endemic. Of the 148 identified species, 77 species seems to be endemic to the archipelago (nearly 44,5%), 43 species are native with a New World distribution, 12 are Cosmopolites, 12 are Pantropical species and 10 species have a world-wide distribution.
Various aspects of their distribution is analysed:

1° their relationship with the American mainland;

2° their distribution over the various islands and volcanoes of isla Isabela. Is there a difference in distribution along a North-South and/or a West–East axis according to prevailing sea and/or wind currents;

3° their distribution along the altitudinal gradient of the different islands and volcanoes of Isla Isabela;

4° their affinity to one of the vegetation zones (as spider communities) of those various islands and separated volcanoes.

Poster Session 1
Monday

(alphabetical order by first author surname)

EFFECT OF CLEAR-CUTTING AND GRAZING ON THE SPIDER DOMMUNITY OF A MEDITERRANEAN WOODLAND, RAMAT-HANADIV, MOUNT CARMEL

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Ramat Hanadiv Park, located at the southern tip of Mt. Carmel, Israel, is managed to maintain the typical biodiversity of this Mediterranean ecosystem. Ramat Hanadiv Park is a garrigue, dominated by shrubs. Open patches between the shrubs are covered by herbaceous vegetation, creating a mosaic of woody and open habitats. Management includes grazing and removal of shrubs to re-open the woody habitats. Yet the effects of these actions on biodiversity are poorly understood. We studied the effects of this management in a large-scale experiment, using spiders as a test group. Spiders are abundant, species-rich and readily identified. As arthropod predators with diverse hunting and habitat-use strategies, their diversity is a good indication of overall arthropod diversity.

We investigated effects of goat grazing and woody plant removal on spider assemblages using three different collection methods: pitfall traps and net sweeping in open and woody patches and shrub beating in woody patches. There were five experimental blocks, each with four 0.1ha plots. Each plot represented a treatment: 1) dominant shrub removal, 2) goat grazing, 3) grazing + shrub removal and 4) unmanipulated control. We compared spider abundance and family and species richness and composition in each treatment. We found that (1) total spider abundance significantly decreased with the disturbance treatments, (2) removal of woody vegetation is the main cause to decrease in spider abundance and family richness, (3) at the genus level, spider richness was negatively affected by both grazing and woody removal, (4) Areneidae and Salticidae families prefer the unmanipulated plots wile the removal plots are favored by the Gnaphosidae and Zodariidae families.

THE SCORPIONS (ARACHNIDA, SCORPIONES) COLLECTIONS HELD AT THE «MUSEO REGIONALE DI SCIENZE NATURALI» OF TURIN (ITALY)

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The historical collections of the Department of Man and Animal Biology of the University of Turin, former «Museo di Zoologia dell'Università di Torino» (MZUT) and now housed at the «Museo Regionale di Scienze Naturali» of Turin (MRSN), are among the oldest and most important one of Europe.

During the 19th century the collections reached the maximum increase thanks to the work of eminent naturalists and, in particular, zoologists. Among them is worth to mention Alfredo Borelli (1858-1943), zoologist and arachnologist, who travelled mainly to South America (Argentina, Paraguay and Bolivia) between 1893 and 1896. His large entomological collection is renowned, though he also collected important species of other invertebrate groups, especially scorpions.

The historical scorpions collection is quite large with more than 3,300 specimens, 800 tubes (containing more than one specimen) and about 300 species from all continents. The type material can be attributed to 21 species that comprise important samples such as *Babycurus zambonellii* Borelli, 1902, *Butheoloides silvestrii* (Borelli, 1913) comb. n., *Teuthraustes festae* (Borelli, 1899), *Rhopalurus rochae* Borelli, 1910 and *Paruroctonus silvestrii* (Borelli, 1909). Furthermore we rediscovered the syntypes of *Tityus argentinus* Borelli, 1899, which were recently cited as lost, and the female holotype of *Hemiscorpius tellinii* Borelli, 1904.

The most recent scorpions collection, which belongs to the «Museo Regionale di Scienze Naturali» of Turin (MRSN), consists of 122 specimens, 59 tubes and 27 species. Although the collection is not particularly large, the type material of two species is recorded: *Tityobuthus lucileae* Lourenco, 1996 and *Orobothriurus* sp. n., the latter currently under description by Dr. Jose Ochoa.

At present, the two collections, both preserved in alcohol and in good condition, are under study and reorganization. A huge amount of the material has been already determined, although there are still some samples to be sorted and examined.

SETAL AND SENSORY STRUCTURES ON THE PEDIPALPS OF SOLIFUGAE

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Solifuges, or camel spiders (order Solifugae) keep their pedipalps extended when moving through the environment and males use them during copulation. The pedipalps are covered with sensory setae and it is assumed that they are used for chemo- and mechanoreception. However, little work has been done to test this hypothesis. We used scanning electron microscopy (SEM) to examine the surface morphology of the pedipalps of solifuges representing the 12 families. Although similar sensory setae are found throughout the order, several unique setae are found only in particular families, suggesting that the patterns and structures of these setae may be phylogenetically informative.

THE GENUS *AKRAV* LEVY, 2007 (SCORPIONES: AKRAVIDAE) REVISITED

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Akrav israchanani, a relict chactoid scorpion from the famous Ayyalon Cave in Israel, is analyzed for the first time since its original description by Gershom Levy (2007). All scorpion specimens found in this cave (19 specimens) were dead, represented by exoskeletons (not exuvia), mostly highly fragmented but extremely well preserved, and without any evidence of fossilization. Time and cause of death are unknown. Diagnostic characters described by Levy are largely confirmed, and some are further clarified. An exhaustive set of microscopic images is published, encompassing data from all best preserved specimens. Previously unpublished morphological details are illustrated such as exact pattern of trichobothria, finger dentition, structure of pectinal organs, etc. Measurements of type series are provided. Presence of mites (Acari) in the Ayyalon Cave is not confirmed: the only specimen tentatively identified as a mite proved to be a late-stage scorpion embryo found inside one of the females; it is described and illustrated.

LOW RESPIRATORY WATER LOSS RATES IN DESERT-ADAPTED SCORPIONS

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Desiccation resistance in terrestrial arthropods involves one or more of the following strategies: high water storage capabilities, reduced loss rates and tolerance of low body water content. Scorpions exhibit some of the lowest recorded water loss rates compared with those of other terrestrial arthropods of similar body size. Body water is lost primarily through evaporative water loss (EWL), which includes cuticular and respiratory losses (CWL and RWL, respectively). Estimated CWL and RWL fractions currently available from the literature show considerable variation, at least partly as a result of differences in methodology. The present study reports RWL rates and their relative importance in scorpions from two families (Buthidae and Scorpionidae), including both xeric and mesic species. Two of the included Buthidae were surface-dwelling species and another inhabits empty burrows of other terrestrial arthropods. This enabled correlating RWL importance with scorpion phylogeny, habitat type and/or homing behavior. Flow-through respirometry was used to measure CO_2 and water vapor emission rates from individual scorpions during a 24h recording at 30^{o}C (22D:2L). Increases in EWL rates during bouts of activity were attributed to respiratory losses, and thus used together with elevated CO_2 output for calculation of RWL. Buthidae species exhibited significantly lower EWL rates compared with those of Scorpionidae, with no significant effects of habitat type and homing behavior. In contrast, resting RWL rates were not significantly affected by scorpion phylogeny, but rates for the xeric species (totaling ~10% of EWL rates at 30°C) were significantly lower compared with those of mesic species. These lower RWL values were correlated with significantly lower H_2O/CO_2 emission rates in xeric species. Lower RWL rates for xeric species in two scorpion families may indicate an adaptive significance despite the substantially higher relative importance of CWL to water budget of scorpions. Results in this study also highlight the importance of scorpion activity on its water budget. Calculation of RWL based on resting metabolic rates underestimates the importance of water losses through this route as increased metabolic rate during bouts of activity result in increased RWL. Furthermore, interspecific variation in activity patterns means that mean daily metabolic rates are more useful in predicting behavioral responses under desiccation stress.

DRASSODES (GNAPHOSIDAE) IN THE WESTERN PALAEARCTIC: LITTLE KNOW AND NEW SPECIES

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Among the family Gnaphosidae, *Drassodes* Westring 1851 is a very large genus, being the second most speciose after *Zelotes* Gistel 1848. In the most recent catalogue (Platnick 2011), more than 170 species and subspecies of *Drassodes* are recorded from around the world. As noted by Platnick & Shadab (1976), many species included in this genus are probably misplaced, especially those described under *Drassus* Walckenaer 1805, which were automatically transferred to *Drassodes* when *Drassus* was synonymized with *Gnaphosa* Latreille 1804 (Simon 1893).

According to the catalogue of Canard (2005) and taking into account the recent descriptions of new species, more than 60 species are now known from the western Palaearctic. Nevertheless, this does not represent the true situation, because around a third of these species do not truly belong to *Drassodes*.

During the course of a revision concerning the western Palaearctic species of the genus, the Mediterranean region was fond to have a high diversity of species, many of which are insufficiently known or have yet to be described. This poster presents some of these species, illustrating somatic and genitalic features allowing the recognition of potentially natural species groups.

SPIDERS OF SOCOTRA ISLAND

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Socotra Island is unique because of its incredible diversity of strange looking plants (*Dracaena cinnabari*, *Adenium socotranum*, *Editcolea grandis* etc.) and it is of the most protected regions of Yemen. All islands (Socotra, Darsa, Samha and Abd al-Kuri) are under protection of UNESCO and other organizations. There are a lot of diverse programs of investigations of fauna and flora but there is only a few data about spiders. First one were records of expedition of Balfour (1888) – described by Gerstäcker (1873) and Pocock (1899, 1903). Later, there was description of female of mygalomorphe spider *Moggridgea socotra* by Griswold (1987). Later there were lack of knowledge until work of van Harten who collected a lot of species and most of them were described later in Fauna of Saudi Arabia in cooperation with arachnologists (B. Knoflach, M. I. Saaristo, A. J. Santos, W. Wesolowska, M. Alderweireldt, C. A. Rheims, A. S. Dippenaar-Schoeman, Ch. Deeleman-Reinhold and M. Grasshoff). All this specialists mentioned from Socotra altogether more then 40 species of spiders.

Our investigation of the Socotra Island started in 2009. There we collected 3 times (June 2009, June 2010 and November 2010) and afraid due to political instability of Yemen we have no possibility to continue in year 2011. During this expeditions we collected over 1000 specimens of spiders of all families known from the island and three new (Filistatidae, Sicariidae and Eusparassidae – only one juvenile). We focused our particular interest on Salticidae. This is the best known family on the Socotra. There were reported 17 species, lot of them described based on one sex only. We collected nearly all undescribed sex from described species and several new species (2 minimally) which are under description process now. During our investigation we have found interesting behavior of endemic species *Afrobeata firma* which prefer hollow trunks o *Adenium socotranum* as a living space and that this species use land-snail shells for its reproduction. Other important founding was that most of from Socotra described species of genus *Heliophanus* are somehow connected to endemic species of ants and trees (*Boswelia*, *Commiphora* etc.).

Fauna of Socotra Island is relatively rich consider fact that this island is relatively dry. We are under process of description and we will be very glad for any cooperation. At this moment we can offer material of some families.

SPIDERS OF LAOS

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True Spiders (order Araneae) are eight-legged arthropods with venom glands and the ability to produce silk. Worldwide, 41,000 species are known, whereas Laos is under sampled with more than 100 species recorded in 2010. A much higher diversity would be expected, as is known from other Southeast Asian countries. With body lengths of 0.4 to 50 mm and a leg span of up to 300 mm Laotian spiders have a positive effect on agricultural fields as well as natural habitats. They feed on cockroaches and mosquitoes and represent an effective biological pest control. Thus, they are an important part of our natural environment and well worth protecting.

A MORPHOLOGIC REVISION OF THE LIVING MEMBERS OF ENIGMATIC SPIDER GENUS *MASTIGUSA* (ARANEAE: DICTYNIDAE)

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The enigmatic spider genus Mastigusa was established by Menge in 1854 to hold a strange spider species discovered in Baltic amber. Much later it was discovered that the genus still have living members that had been misplaced in other spider genera. The genus now holds 3 living members and 8 extinct members from amber. The living members are found in the Paleartic region, but distribution patterns are not well known. This has to do with the biology of the living species, which are mymecophilous and therefore live a large part of their lives in ant nests. Members of the genus are therefore rarely collected. The 3 living members of the genus are very similar and hard to tell apart and hence, there has been much confusion as to what species are present where, and as to how many species should be recognized. The genus is currently placed in the family Dictynidae, but has also been part of Agelenidae. We revised the genus based on morphology and, when possible, examined specimens from the whole distribution range. In total we examined 80 specimens (64 female and 16 male spiders) from 14 different countries in the Palaearctic region. The revision is based on somatic morphology (including morphometrics) and genital morphology (light microscopy and SEM). Morphometric characters (dependent variables) and environmental variables (independent, explanatory variables) were tested using multivariate analysis, in order to reveal specimens with similar morphometric characters and to suggest species boundaries. Scanning Electron Microscopy was used to study genitalic details and spinnerets. Our results suggest that there are fewer living species than previously anticipated and new observations done in nature and captivity reveals new knowledge about the genus.

PURIFICATION, CDNA STRUCTURE AND BIOLOGICAL SIGNIFICANCE OF A SINGLE IB DOMAIN (CSSIBD-1) PROTEIN IDENTIFIED IN THE HEMOCYTES OF THE SPIDER *CUPIENNIUS SALEI*

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Cupiennius salei single insulin-like growth factor-binding (IB) domain protein (CsSIBD-1), a peptide with high similarity to the superfamily of insulin-like growth factor-binding related proteins (IGFBP-rPs) was identified in the hemocytes of the spider *Cupiennius salei*. CsSIBD-1 was purified by RP-HPLC and the sequence determined by a combination of Edman degradation and 5'-3'RACE PCR. CsSIBD-1 (8767.08 Da) is composed of 78 amino acids, contains six intrachain disulphide bridges and carries a modified Thr residue at position 2. The spider transcript encodes only for the conserved N-terminal insulin binding domain of the IGFBP superfamily. CsSIBD-1 mRNA expression was detected in six tissues by real time-PCR, with the highest expression levels in hemocytes followed by the subesophageal nerve mass, muscle, hepatopancreas, ovaries and venom glands. Starvation does not influence the CsSIBD-1 content in hemocytes, but it is up-regulated in muscles and hepatopancreas within 14 days and in venom glands and ovaries within 22 days. After infection the CsSIBD-1 content in the hemocytes decreases and coincidentally the temporal CsSIBD-1 expression is down-regulated in all tissues with the exception of muscles. Two further members of the IGFBP superfamily, CsSIBD-2 and CsSIBD-rP1, were identified on cDNA level in spider hemocytes and venom glands. We conclude that CsSIBD-1 may play an important role in the immune and endocrine system of spiders.

FIRST STEPS TOWARDS A WORLD MONOGRAPH OF THE SPIDER FAMILY LEPTONETIDAE

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Recent revisionary work has dramatically improved our understanding of species level diversity in the Leptonetidae, particularly in East Asia and North America. However, most leptonetid genera remain poorly characterized and phylogenetic relationships within the family are unexplored. As the rate of species discovery accelerates, there is a need to better define leptonetid genera in order to provide a taxonomic foundation for future studies and produce a scaffold for evaluating biogeographic and evolutionary patterns. Here we present the first assessment of leptonetid relationships based on a combination of molecular and morphological data including exemplars for most described genera worldwide. Morphological characters supporting major clades are discussed and an overview of leptonetid biogeography is provided.

UNDESCRIBED SPECIES OF *ALOPECOSA* SIMON, 1885 (ARANEAE, LYCOSIDAE) FROM SOUTH UKRAINE

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The genus *Alopecosa* Simon, 1885, contains 160 species, mostly from the Palaearctic. 18 species are known from Ukraine, of them 16 are occurring in south Ukraine. They belong to five species groups, namely *fabrilis*, *pulverulenta*, *cursor*, *sulzeri* and *striatipes*. While studying lycosids from south Ukraine we found one undesribed species belonging to the *striatipes* species group. These group encompasses 7 species in Central Europe: *A. beckeri* (Thorell, 1875), *A. cronebergi* (Thorell, 1875), *A. edax* (Thorell, 1875), *A. solitaria* (Herman, 1876), *A. mariae* (Dahl, 1908), *A. schmidti* (Hahn, 1835), *A. striatipes* (C. L. Koch, 1839) and *A. taeniopus* (Kulczynski, 1895). All these species occur in Ukraine also, except *A. edax*.

Species of *striatipes* group differs by: 1) shape of tegular apophysis; 2) shape of embolic division; 3) shape of epigynal margins and 4) number of anterior epigynal pockets (one or two). General appearance: habitus and pattern of abdomen and carapace can be used as additional characters for species separation.

The undescribed species is most similar to *A. beckeri* and *A. taeniopus*. Females of this species differ by having two anterior epigynal pockets, other species have only one anterior epigynal pocket. Males can be distinguished by the shape of tegular apophysis.

Adult specimens of new species were collected by hand picking and by pitfall traps during November – December in steppe, semi-desert steppe and in saline lands in Zaporizhzhya and Kherson Areas and in the Crimean Peninsula. We suppose that undescribed species ranging across northern coastal plains of the Sea of Azov.

ARANEAE - SPIDERS OF EUROPE

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Since November 2010 the former internet portal on Spiders of Central Europe has been relaunched as Spiders of Europe. It contains now more than 4000 spider species which are presented with more than 19000 figures and more than 800 references. Dichotomic keys and a new multi-patterns linyphiid key allow the identification of most species. For each species, a distribution map is provided, a graphic presentation of phenology, and a link to the relevant data in Platnick's catalogue. A Wiki function allows users to submit corrections and additions of data similar to Wikipedia but an expert group reviews these comments prior to publication. Further new parts of this portal will concern a large photo collection and special pages devoted to the biodiversity of European spiders and the project on Barcoding of the Spiders of Europe. This portal is supported by more than 110 arachnologists and 20 institutions by granting us their copyrights for the reproduction of figures. Several institutions support araneae financially to guarantee the technical support of the website.

DIVERSITY OF THE SPIDER FAMILY *CYBAEIDAE* IN RUSSIA

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Cybaeidae is comparatively small family that contains 176 species from 10 genera by now. Most genera occur in Palaearctic except for *Symposia* and *Vagellia* known for tropics only. In former Soviet Union this family was known by two species of *Cybaeus* from Ukraine (*C. angustiarum* L.Koch, 1868) and Georgia (*C. abchasicus* Charitonov, 1947) for a long time. Record of Cybaeidae from Azerbaijan and Turkmenistan refer to *Paracedicus* Fet, 1993 (*P. ephthalitus* (Fet, 1993), *P. feti* Marusik & Guseinov, 2003, *P. gennadii* (Fet, 1993). In our opinion this genus has a little number characters common with *Cybaeus* so we treat it as a member of Desidae. More than half species of Cybaeidae occur in East Palaearctic in Japan. 82 species of this family have been reported there to date and 80 of them are endemics of Japan islands. First *Cybaeus* in Russia has been reported in 1991 by Marusik & Logunov, who described three species *C. bam, C. basarukini* and *C. kunashirensis* from Sakhalin Area. Lately two more species have been added to fauna of Russia, and both were from the Russian Far East: *C. confrantis* Oliger, 1994 (Maritime Province) and *C. striatipes* Bösenberg & Strand, 1906. 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. confrantis* and therefore we undertook this survey. As a result nine new species of this genus were founded there in total.

SPIDERS (ARANEAE) OF THE SEASIDE SALINE MARSHES OF THE LEFT-BANK UKRAINE

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Seaside saline marshes have patched location along the whole stretch of the Black and Azov Sea coast. 141 spider species from 20 families were registered in six sites in Kherson and Donetsk Areas. Local species richness varies form 45 to 68 species. Seven most abundant families make up 67% of the fauna: Gnaphosidae – 21%, Linyphiidae – 18%, Lycosidae – 11%, Thomisidae – 9%, Salticidae – 7%, Araneidae – 6%. Faunal similarity between the halophilous araneocomplexes of the two areas is low (Q Sorensen=0.31) that reflects mosaic character of this community. There were only seven common active soil dwellers found: *Arctosa leopardus* (Sund.), *Pardosa agrestis* (Westr.), *P. italica* Tong., *P. luctinosa* Sim., *Trochosa ruricola* (De Geer), *Gnaphosa leporina* (L.K.), *Micaria albovittata* (Lucas), *M. rossica* Thor., *Trachyzelotes cumensis* (Ponomarev), *T. malkini* (Platnik et Murphy); and four grass dwellers: *Philodromus fallax* Sund., *Tibellus macellus* Sim., *Ebrechtella tricuspidata* (Fabr.), *Runcinia grammica* (C.L.K.). Among them, only *P. luctinosa* is a true halophilous species. The others inhabit in Southern Ukraine various grasslands, grooves or shoes of water basins. Saline marshes are typical habitats of *Latrodectus tredecimguttatus* (Rossi). In certain years, its density reaches 60 nests/100m^2.

Dynamic density of soil dwelling spiders fluctuates dramatically in different years, from 12 to 206 specimens/100 trap-days. Lycosidae accounts for 53% of collected spiders, with Gnaphosidae following it (34%). A low rate of Linyphiidae (5%) is also a typical feature of halophilous spider community. There are no common dominants for five investigated plots. In Donetsk Area, three eudominants (*Pardosa luctinosa* 34% *Gnaphosa cumensis* 22%, *Arctosa leopardus* 14%) and three subdominants (*Trochosa ruricola*, *Trachyzelotes cumensis*, *T. lyonneti* (Audouin)) were found. In Kherson Area, the dominant complex changes significantly and has a marked local specificity. In a southeast plot, the complex consists of *Pardosa luctinosa* - 16.3%, *P. pontica* (Thor.) - 12.5%, and *Trachyzelotes malkini* - 10%. In a northwest plot, only *P. pontica* predominates (up to 62% in certin years) and sometimes *Arctosa leopardus* (12%). Further to the West, *Pardosa vittata* (Keys) and *Evippa apsheronica* (Marusk et all) appear as concominant dominants.

THE FAMILY IURIDAE (SCORPIONES: IURIDA) IN ANATOLIA

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Our research team in 2008-2010 studied 354 scorpion specimens belonging to the relict family Iuridae (genera *Calchas* and *Iurus*) from Anatolia (Turkey). The published results (Soleglad et al., 2009; Fet et al., 2009; Kovařík et al., 2010) indicated an unexpected morphological diversity (in particular, presence of several types of neobothriotacy in *Iurus*) leading to taxonomic revision and description of four new species: *Calchas gruberi*, *C. birulai*, *Iurus kadleci*, and *I. kinzelbachii*. In addition, *Iurus kraepelini* was restored from synonymy; *Iurus asiaticus* was elevated from subspecies status and restricted to eastern Anatolia; and *Calchas nordmanni* was restricted to northeastern Anatolia. Seven endemic species of Iuridae (four species of *Iurus* and three of *Calchas*) are currently reported from Anatolia; their allopatric distribution reflects complex biogeographic history of the region.

SPIDERS OF ALBANIA - FIRST CHECKLIST WITH NEW COUNTRY RECORDS

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The present study provides the first Albanian check list of spiders. It comprises recently published data, a review of museum collections and material from a PhD study. Spiders are insufficiently studied in the Albanian territory. Since 1884 several papers on Albanian spiders have been published. Deltshev et al. (2011), for instance recorded 197 new records. Altogether, 335 species are listed today for Albania, which in comparison with other Mediterranean countries seems to be just a fractional amount of the present biodiversity. 17 new country records belonging to 10 families are revealed from a critical taxonomic review of the Roewer collection in the Senckenberg Research Institute, Frankfurt, Germany. Further 53 new species from 17 families, using pit fall traps, from a PhD study in Tirana district during 2010–2011, increased the number of spiders in Albanian territory. Nine species yielded from this study may be new to science. So far, 414 spider species are known for Albania.

DO ORB WEB SPIDERS NEED TO DRINK? (ARANEAE; ARANEIDAE)

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Water is essential for survival in terrestrial animals. Balancing the water budget can be achieved by either avoiding water loss or gaining water. The major pathway to gain water is food intake. However, many animals also drink free water to compensate for losses and thus drinking may complement feeding. In arthropods, spiders and can gain substantial amounts of water through enzymatically liquefying their prey. However, in some species this may not be enough to cover all water needs. We here test whether drinking is essential for orb web spiders of the genus *Argiope*. We subjected females of *A. trifasciata*, a species occupying dry habitats, to different levels of feeding (flies vs. crickets) and water supply (no water vs. daily spraying) prior to a drinking test. For comparison, we investigated the drinking behaviour in dependence of the water supply also in a tropical species, *A. aetherea*. Individuals of *A. trifasciata* were unable to increase their body mass when fed with flies but significantly increased their body weight under a cricket diet. However, regardless of the feeding regime spiders that experienced water shortage ingested significantly more water in the drinking test than spiders that received water every day. Moreover, we could reveal the same behavioural response in the tropical *A. aetherea*, despite the fact that this species should not be faced with water deprivation in the wild. Our results suggest that drinking is an essential part of the water balance in these orb weavers independent from the nutritional status. We suggest that the spiders may need to drink fresh water to process nutrients ingested along with the feeding.

THE EFFECT OF WIND ON STICKINESS AND AMINO ACID COMPOSITION OF SILKS PRODUCED BY *CYCLOSA MULMEINENSIS*

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Previous studies showed that orb-weaving spiders can adjust various properties of webs under different environmental conditions. In this study, I investigate whether dust spider *Cyclosa mulmeinensis* inhabiting windy habitats exhibits two ways to cope with strong winds. I will first test whether *C. mulmeinensis* can enhance the strength of radii silk by increasing the concentration of alanine and glycine in radii silks. Secondly, I will evaluate whether *C. mulmeinensis* compensates a reduced orb web area by increasing stickiness of catching spirals. To answer these questions, I will subject *C. mulmeinensis* to wind-disturbance and control treatments and measure stickiness of catching spirals and amino acid composition of major ampullate silks. I predict that spider under wind disturbance condition will exhibit more alanine and glycine in their MA silks, which in turn renders the silks better mechanical properties. Moreover, I predict that spiders under windy condition will built sticky spirals with larger and more sticky droplets. Hopefully, results of this study can demonstrate that the ability to genetically, physiologically and behavioral adjust various properties of the components of prey-catching trap explains why *C. mulmeinensis* can successfully inhabit windy areas.

SPIDER SPECIES COMPOSITION OF CHERNIVTSI CITY (UKRAINE) RECORDED DURING 1874-1986 IN COMPARISON WITH THE ACTUAL PERIOD

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Recent studies of the effect of urbanization on species composition show that urbanization can increase or decrease species richness, depending on taxonomic group, spatial scale of analysis, and intensity of urbanization (McKinney 2008). Changes of spider assemblages in urban habitats were found (Shochat et al. 2004; Horvat et al. 2010; Varet et al. 2010) as well increasing of spider species quantity introduced to Europe (Kobelt & Nentwig 2008). Considering these the aim of our investigation was a retrospective analysis of spider fauna inhabiting the territory of Chernivtsi city during 1874-1986 and 2002-2011 according to the literary data and the results of our researches.

We collected material in Chernivtsi city using different methods in such habitats as sub-urban forest and meadow, city parks, lawns, buildings during 2002-2010. We used systematic names suggested by The world spider catalog, version 11.0. (Platnick 2010) both for our list as well as for the species recorded by our predecessors.

The first information on the spider fauna of the territories that now belong to Chernivtsi administrative boundaries is available in «Dodetek do fauny pajecząkow Galicyi» by Polish zoologist M. Nowicki (1874), who mentioned 26 species. Later araneofauna of Bukovina including Chernivtsi was studied by Romanian zoologist A. Roşca (Roşca, 1930-1938). He recorded 160 species from 24 families for Chernivtsi in the modern territorial sense. In the subsequent historical period araneofauna of Chernivtsi was not investigated (about seventy years). Information about only five species from greenhouses and other habitats of the city is available (Legotai 1964; Chumak & Pichka 1982; Chumak 1986).

Summarizing of literature data showed that in the second half of XIX-first half of XX centuries araneofauna of Chernivtsi counted at least 174 species. During our study we collected a total of 13 526 spiders representing 26 families, 207 species. Thus, for the analyzed period we noticed 16 % rise in spider species quantity. We didn't find 51 species, whereas we found 84 species which were not previously mentioned for Chernivtsi. The general list now includes 258 species from 30 families. We consider that the most important reasons that cause transformation of spider composition are combination of processes of introduction and studying of araneofauna.

THE FIRST OCCURRENCE OF *NEMESIA CELLICOLA* AUD. (ARANEAE, NEMESIIDAE) IN ISRAEL, WITH NOTES ON ITS TAXONOMY, DISTRIBUTION AND ECOLOGY

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Nemesia cellicola, the type congener, first described from environs of Alexandria, Egypt (Audouin, 1826), was later observed within the southern part of the continental Italy (Costa, 1838), as well as in Sicily (Frade & Bacelar, 1931), Sardinia (Caporiacco, 1936) and Tunisia (Pavesi, 1884). It should be noted inhabiting also Corsica, France (where it was registered under *Nemesia arenicola* Simon, 1892). Nevertheless, this wide-spread Mediterranean species has not been hitherto occurred in Israel.

Within the country *N. cellicola* was found in central and southern parts of the coastal plain (localities Or-Akiva and Nizzanim, respectively) and in the northern part of the Negev (Be'er Mashabim). The only published record showing occurrence of *Nemesia* sp. in the surroundings of Sede Boqer (Pluess & al., 2008), according to the collected material should be referred to another species, probably undescribed yet.

Unlike all other congeners predominantly inhabiting the more humid biotopes that could be found in the Mediterranean region (oak/pine forest, maquis, garriga), the pale-coloured representatives of *N. cellicola* can be occurred only in the sandy areas: from coastal dunes to true sand deserts. Thus, *N. cellicola* appears to be the most xerophilic member of the genus that theoretically could explain its unusual wide, in comparison with other congeners, trans-Mediterranean distribution.

In Israel wandering males of *N. cellicola* can be observed mostly within autumn months, that principally does not contradict to Buchli's (1961, 1962, 1968, 1970) observations of West-Mediterranean congeners. At that in *N. cellicola* the male wandering activity is shifted to a later date: October-November (instead of September-October by Buchli). Paradoxically, in Or-Akiva the wandering males of *N. cellicola* were obtained with pitfall traps in the beginning-middle of August that is, in fact, the peak heat in Israel.

Poster Session 2
Wednesday

(alphabetical order by first author surname)

FORAGING BEHAVIOR OF SPIDERS IN DRYLAND WHEAT AGRICULTURE

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Spiders are suggested to play an important role in pest control by suppressing insect pest populations in crops. Spiders were investigated to see if they can serve as natural enemies in pest suppression in wheat fields in the Negev. I observed the foraging behavior of three spider species, a wandering spider *Thanatus vulgaris* (Philodromidae) and two web building spiders *Bathyphantes extricatus* and *Alioranus pastoralis* (Linyphiidae), on different herbivore species found in the wheat, including aphids, which are pests and Colembolla, which are non-pest species. I investigated the effect of prey quality and availability of alternative prey on the foraging behavior of spiders that use different hunting strategies. Based on optimal foraging theory, collembola are expected to be preferred over aphids, because aphids are known to contain toxins. In addition, linyphiid - a crop resident species – is expected to handle aphids better than the other spider species which are of desert origin, due to familiarity with aphids. Spiders were collected from wheat fields in the western Negev and maintained in the lab. Collembola and aphid cultures were maintained in the lab. *Bathyphantes extricatus* rejected most aphids: only 17.5% were eaten, while 33.3% of the collembola were eaten. *Bathyphantes extricatus* fed longer on collembola than on aphids (70 min vs. 38 min on average, $p = 0.0546$) and gained weight by feeding on collembola, but lost weight on aphids. *Alioranus pastoralis* consumed both collembola and aphids in similar amounts: 38% and 34% of the individuals consumed, respectively. Feeding time on collembola and aphids was similar (50.4 min and 50.3 min, respectively). However, *A. pastoralis* gained weight feeding on collembola while they lost weight feeding on aphids. In summary, both species gain weight on collembola (non-pest herbivores) but not on aphids (pest herbivores). However, while *B. extricatus* rejected aphids, as expected from optimal diet theory, *A. pastoralis* did not, suggesting that there may be some benefit to feeding on aphids in this species.

POST MATING DISPERSAL IN THE SOCIAL SPIDER *STEGODYPHUS DUMICOLA*

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Dispersal in group living animals is the result of two forces- the benefits of staying vs. the costs of leaving. The benefits of staying include kin selection and direct benefits of group augmentation, and the costs of leaving involve energy spent in movement, low survival and low success of reproducing alone. Competition over resources can change the balance between these two forces. By increasing competition within the nest, the benefits of kin cooperation and benefits of cooperating in large group size are reduced, and dispersal is enhanced. Alternatively, through reducing competition, better body condition of individuals should reduce the costs of dispersal and of reproducing alone, and thus enhance dispersal. By manipulating competition over resources in colonies of the social spider *Stegodyphus dumicola* we explored the importance of each of these theories in maintaining group structure. Social spiders are philopatric and rarely disperse, benefitting from group augmentation via higher survival and capture of large prey. Spider colonies were manipulated by changing the foraging opportunities of individuals within a colony. In order to decrease competition we added food by throwing additional prey on the capture webs. To increase competition we reduced the chances of capturing prey by removing the capture web. We recorded the occurrence of dispersing females in the surroundings of each focal nest, and compared the timing of dispersal and the number of dispersing females with control nests. Female dispersal was increased and occurred earlier in both food-addition and web-removal nests. However survival and egg-sac production of dispersal females was higher in the food addition nests compared to the web-removal and control nests. To conclude, *S. dumicola* colonies maintain a group structure due to both the cost of leaving and benefits of cooperation. High competition causes increased dispersal by younger mated females in order to explore alternative foraging opportunities, and low competition increased dispersal by probably older gravid females that perceived a higher quality environment. Thus, foraging opportunities and competition for food has long term influence on gene flow and group dynamics.

NON-CONSUMPTIVE EFFECTS OF SPIDERS ON HERBIVORE AND CARNIVORE PREY

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In trophic interactions, predator effects on prey populations through consumption are often exceeded by non-consumptive effects that predators elicit on prey behavior. Spiders can elicit strong antipredator behavior in both insects and other spiders. However, antipredator behavior has only been investigated in a limited number of insect and spider species. In addition, the mechanisms involved in the detection of predation risk (i.e., predator presence) have rarely been explored in terrestrial systems. We will investigate the occurrence and strength of antipredator behavior across 18 spider and 18 insect species covering a wide taxonomic range. We are performing behavioral arena experiments in which individuals may choose between filter papers with and without spider cues. In addition, activity of potential prey (time spent immobile, distance moved and velocity etc.) in absence and presence of such cues will be analyzed using video records. The selection of study species will allow testing effects of life-history traits on the magnitude of antipredator behavior. Traits include hunting mode of the predator, relative body size of predator and prey, trophic level, niche width and dispersal ability of the prey. Our study will provide an overview of the commonness and importance of non-consumptive effects among terrestrial arthropods.

ABUSE OF ANT PHEROMONES FOR PREY SEARCH IN ANT-EATING SPIDERS

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Prey-specialized predators have often evolved adaptations that increase their prey searching efficiency. Some arthropod predators use chemical cues that indicate the presence of their prey. In particular, when the prey is a social insect, which uses a variety of chemical signals, there has been likely a strong selection towards abuse of intraspecific chemicals produced by prey. For example, some ant-eating spiders are known to locate their prey abusing alarm pheromones of ants.

Using a specialized ant-eating zodariid spider, *Zodarion rubidum*, we tested its ability to recognize chemical signals produced by ants. This species is known to prey on few ant species, but possesses capture and venom adaptations effective on Formicinae ants, in particular. We performed laboratory experiments using an olfactometer. We tested the response of *Z. rubidum* towards air from four different ant species: *Lasius platythorax* and *Formica rufibarbis* (both Formicinae); *Messor structor* and *Myrmica scabrinodis* (both Myrmicinae). Obtained results show that *Z. rubidum* was attracted to the air carrying chemical cues from *F. rufibarbis* (positive response: 81.3%) and *L. platythorax* (72.1%), but not to the air from the myrmicinae ants, *M. structor* (30.0%) and *M. scabrinodis* (26.7%). When using Formicinae ants the spider went to the arm with prey air directly. In trial with Myrmicinae ants the spider chose both arms at similar frequency but had increased activity as if trying to avoid the signals from these ants. Using different body parts of *F. rufibarbis*, the spiders selected more frequently the air source from ants without head (76.7%) than air from ants without abdomen (16.7%).

This study demonstrated the ability of *Z. rubidum* to locate its prey abusing their chemical cues. This zodariid species could recognize ants by chemical compounds produced from glands on abdomen, presumably the alarm pheromone. It further confirmed subfamily-specific tuning of their chemoreceptors for Formicinae ants.

COMPOSITION CHANGES IN OF GROUND-LIVING SPIDER COMMUNITIES AFTER LOGGING IN OAK-HORNBEAM FOREST IN BÁB RESEARCH SITE (SLOVAKIA)

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In 2007-2009 author studied the ground-living spider communities on 3 plots in oak-hornbeam forest of the Báb Research Site (west part of Slovakia), which was partly logged at the end of 2006 according to forest management plans. The influence of this forest management is assessed through studying of ground-living spiders, by comparison of their communities in differently managed parts of the locality, namely clear-cuts (O), oak-hornbeam margin forest and oak-hornbeam inside forest (L). For this research method of pitfall traps was used. During research period 7020 spider specimens belonging to 94 species and 24 families were captured. A number of the common species which were found out on all 3 plots is only 32 species and 26 species were common for 2 plots (17 species for plots O and L , 8 species for plots R and O and only 1 species for R and L). Rest 36 species were recorded only from 1 plot (L-10 species, O-10 species and R-16 species). The highest species richness was found out in spider fauna on forest margin (67 species). On clear-cuts (R) 57 species and in interior of the forest (L) 60 species were captured. Significant differences were documented in abundance on individual plots. Abundance of the community of the forest margin (O) was 2 time higher comparing with other 2 study plots. From ground-living spider fauna *Pardosa alacris* and *Urocoras longispinus* were eudominant, *Trochosa terricola*, *Scotina celans* and *Tenuiphantes flavipes* were dominant. Changes in abundance of the mentioned species and other recorded species and species richness in individual plots are analysed in the paper. The great changes in the composition of the epigeic spider communities after logging in the study area were documented as well.

MAINTENANCE OF POLYMORPHISM IN AN ORB-WEB SPIDER

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Maintenance of polymorphism within populations may be the result of many aspects of the biology of organisms as space use, rhythms of activity, predation, parasitism and reproduction activities. The present study focuses on the last aspect using an orb web spider, *Agalenatea redii* (Scopoli) (Araneae, Araneidae), which is characterized at adult stage, by five different morphs on the opisthosoma. In order to know the influence of reproductive activities on the preservation of the different morphs in the populations, we conducted field survey.

During four years, from 2008 to 2011, we checked adult spiders (males, females and pairs) in different sites. In 2011, we also made a survey on a single population during six weeks by controlling the number of spiders of each morh and the morph of the individuals in pairs.

Field data of spatial and temporal distribution of spiders based on their sex and morph over reproduction were analysed by using a theoretical model, in which pairs were associated at random based on the field proportion of males and females of different morphs. Field and theoretical data were compared by using the method of distance analysis. Results showed that if there is change in the female's morph proportions over time and location, as well as in the proportion of various pairings relatively to the morphs, it would not be bound to spider activity but due to chance.

GROUND-DWELLING SPIDERS ALONG AN URBANISATION GRADIENT IN LOWLAND FOREST PATCHES IN HUNGARY

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Ground-dwelling spider (Araneae) assemblages were studied using pitfall traps along a rural-suburban-urban lowland forest gradient in Debrecen (E-Hungary) in 2009. Overall species richness increased significantly from the rural sites to the urban ones. The number of open-habitat species increased towards the urban sites; these species could immigrate from the surrounding habitats into the disturbed suburban and urban sites. Generalist species richness was significantly higher in the urban area than in the suburban and rural area. The richness of forest specialist species was significantly higher in the suburban area than in the rural and urban area. The cover of canopy was the highest in the suburban sites; therefore, this area was the coldest which preferred by the forest species. Light-preferring and xerophilous species richness was the highest at the urban area. The number of individuals of *Pardosa alacris*, a typical forest specialist species, was the highest in the suburban area. This species prefers the drier and shadier sites with high amount of leaf litter. The suburban forested area was the shadiest and it had the thickest leaf litter among the studied sites. The specimens of two generalist species (*Trochosa terricola* and *Ozyptila praticola*) increased from the rural sites to the urban ones. It seems that these species prefer the open, dry sites; thus, they occurred in high number in the urban habitat type. These results suggest that different habitat affinity species respond to urbanisation in different ways.

SPIDERS UNDER COPPICE MANAGEMENT – AN EXPERIMENT WITH LIGHT VOLUME

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Spiders of coppiced forests are not well studied and there exist only few studies focused on diversity of such forests. The long history of this type of forest management leaded to high diversity of invertebrates and it is well known from case of butterflies mainly. Other thing of that problem is, that this type of management should be crucial for conservation of spiders and some of the endangered species of spiders should be endangered because lack of this type of management.

Our experiment was done on two locations (Brno – Sobesice and Brno – Hady) on the northern most edge of Pannonia – near Brno (Moravia, Czech Republic). On both localities were established 4 main square plots with different density of trees – clearing and with stocking 0,4; 0,6 and 0,8. We have there one plot per locality as a control plot. All this forests were afforested by English Oak as a main wood species. Location are differing in geological substrate (locality Brno – Hady is on limestone, Brno – Sobesice is on granites), in year of establishing (Brno – Hady 2008; Brno – Sobesice 2009) and in age of managed forest (Brno – Hady 100 years, Brno – Sobesice 80 years). We have one line of three pitfall traps per plot, so on each locality we have 5 lines for whole vegetation season (from end of April till end of August).

There were big differences in time after applying of coppicing. There is strong replacement of species according to trees density after two years. First year after management application there were change of species composition to the open habitat species – there were upshift of Gnaphosidae and Lycosidae. The most interesting record was *Pardosa bifasciata*, what is typical species of steppe like localities and this place (Brno – Hady has no conection to such habitat). The most abundant were two sibling species of *Pardosa* (*P. alacris* and *P. lugubris*) which differ in light volume preference. Spider species are able to colonize such localities without connection to their natural habitat, what is very important to know for nature conservation. The most important was upshift to rarer or more valuable species on managed plots after two years of management.

SPIDERS OF VINEYARD TERRACES IN THE NORTHERN PART OF PANNONIAN REGION (SOUTH MORAVIA, CZECH REPUBLIC) - A PRELIMINARY RESULTS

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In the year 2011 a research of the selected vineyard terraces of southern Moravia has been launched. It concerns artificial habitats that were established in the eighties of 20th century with intention of growing grapevine. Rate of natural succesion on this habitat was relatively slow due to steep slope, xeryophyly and calcareous loess geological substrate. Because this microclimatic conditions hosts this habitat very important and rare spider fauna.

There had been chosen 4 localities situated in the pannonian region of southern Moravia (Czech Republic). Examinated 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. Due to the fact that the project has been launched this year we have results available from collecting of land snail shells in the winter 2010 and from the first sweeping period of herbal vegetation in the month of April 2011. In spite of incomplete datas interesting and important findings were discovered.

We discovered in the preliminary analysis that the presence of the spiders in these habitats is affected by the microclimatic conditions first of all (vegetation structure, growth density, presence of the disturbed grass turf). The important feature is also the heterogenity of the surrounding environment and the presence of near situated steppe habitats from where the spiders can spread by ballooning and create metapopulation in the terraces.

Among the most important faunistic findings belong *Tibellus macellus*, *Synageles hilarulus*, *Cheiracanthium pennyi*, *Cheiracanthium montanum*, *Micaria dives*, *Ozyptila pullata* and *Heriaeus melloteei*. All these species are known maximally from 10 faunal squares in the Czech Republic. All these species are very rare, centre for the presence of these species are the most important steppe localities of the pannonian region. An important element for the presence of these rare species is disturbed grass turf that is created and maintained by the pasture in the steppe habitats normaly. In the explored vineyard terraces these important patches rise from high slope and powdery loess geological substrate. The preliminary results show that the vineyard terraces are important refugium for xerotherm spiders and it is necessary to analyze the material from pitfall traps for exploring other factors (way of farming, chemicalization) that may have influence on biodiversity of the vineyard terraces.

AFFINITY OF RARE SPECIES *CHEIRACANTHIUM PENNYI* AND *CHEIRACANTHIUM MONTANUM* (ARANEAE: MITURGIDAE) TO LAND SNAIL SHELLS – REASON FOR POORLY KNOWN ECOLOGY IN THE CZECH REPUBLIC?

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Overwintering of spiders in land-snails shells is not well known. There exists only few studies from Hungary, Germany and Czech Republic. All authors mentioned mainly spiders of families Theridiidae and Salticidae. The jumping spiders *Pellenes nigrociliatus* and *Talavera aequipes* belong to the best known examples. However nearly none of the authors mention findings of species from the family Miturgidae and their affinity to the land snail shells. Within the winters 2009 – 2010 we were collecting land snail shells of *Helicella* sp. and *Cepaea vindobonensis* in the xerothermic habitats of South Moravia. We discovered the findings of very rare species *Cheiracanthium pennyi* and *Cheiracanthium montanum*. These species are very rare considering the conditions in the Czech Republic and the case of *Cheiracanthium pennyi* represents just one historic record from the steppe locality Pouzdřany Kolby in the pannonian region of South Moravia. Since than no other record was discovered in that locality. *Ch. pennyi* was dicovered abundantly in the traditional vineyard terraces next to the villages Morkůvky and Mutěnice.

We collected 3220 snail shells of the genera *Helicella* sp. and *Cepaea vindobonensis* from which there were determinated 30 juveniles of *Ch. pennyi* and 14 juveniles of *Ch. montanum* that were bred until maturity in the laboratory conditions. Concerning the subadult specimens the determination was judged by the ethology and by the quantity of teeth on chelicery which distinguishes them from more abundant relative species *Cheiracanthium erraticum*. The findings of these species were confirmed by the herbal vegetation sweeping in May and June, when these rare species maturate. According to our proven results following conclusions are drawn: the presence of a disturbed grass turf is very important for the occurance of *Ch. pennyi* and *Ch. montanum*. This determinates the presence of the snails from genus *Helicella*, which are used for overwintering. The artifical habitats such as vineyard terraces, the importace of which was found out, are certain to be the perfect habitats for *Cheiracanthium* species. A methodology of the snail shells collection has never been used in the Czech Republic, except our published data. In most of the cases just some reserved steppe habitats, overgrowing due to the grazing absence, are being explored in the faunistic way. This absence of grazing causes a strong change in specific microclimatic conditions. The authors assume, these mentioned factors belong among the main reasons for such a few findings of *Cheiracanthium pennyi* and *Cheiracanthium montanum*.

THE EFFECTS OF WIND ON TRAP STRUCTURAL AND MATERIAL PROPERTIES OF A SIT-AND-WAIT PREDATOR

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Numerous terrestrial invertebrates use secretions produced by themselves to build prey traps. Potentially, the structural as well as material properties of such constructions will reflect adaptations to wind disturbances, but most relevant studies only focus on trap structural characteristics. In this study, we examined how wind disturbances affected the structural and material properties of prey traps constructed by a sit-and-wait Araneae predator. We first compared web structures and major ampullate (MA) silk properties of 2 *Cyclosa* spider species inhabiting seashores and forests to see whether these properties reflected the habitatspecific wind disturbances these spiders experienced. The MA silks of the seashore-dwelling *Cyclosa* mulmeinensis were significantly thicker and contained higher percentage of glycine and lower glutamine. Congruent with such amino acid variation pattern were higher ultimate tension and breaking energy of *C. mulmeinensis* MA silks. However, despite that this species' silks were relatively glycine rich and glutamine poor, they also showed greater extensibility. Compared with webs built by *Cyclosa ginnaga*, those built by *C. mulmeinensis* were composed of fewer drag-reducing silk threads but were stiffer. In a laboratory manipulation, MA silk amino acid composition and diameter did not differ between *C. mulmeinensis* receiving different levels of wind. However, those receiving persistent wind disturbances built smaller webs composed of fewer but stronger MA silks to reduce drag and prevent the web from damage. Orb web spiders inhabiting areas with different levels of wind disturbances exhibit variation and plasticity in structural and material properties of prey traps. Furthermore, the silk property plasticity does not have to involve alterations of amino acid composition.

FUNCTION OF BODY COLOR IN ASIAN CRAB SPIDERS *THOMISUS LABEFACTUS*

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Crab spiders are sit-and-wait predators which can change body colours depending on the colour of flowers they sit on. Results of previous studies show that the body colour of European crab spiders matchs that of the flowers, rendering them cryptic to pollinator prey. However, 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 colour of Asian crab spiders are still not clear. In this study, the function of body colouration of *Thomisus labefactus*, a crab spider commonly seen in Asia, will be investigated by a dummy approach. I will first measure the reflectance spectra of *T. labefactus* sitting on white and yellow flowers and use such information to construct dummies with appropriate white and yellow papers. I will perform field experiments by placing white and yellow spider dummies on white or yellow flower petals respectively. Video cameras will be used to monitor the response of prey and predators to these dummies. Hopefully, results of this field experiment can determine whether body colors of Asian crab spiders function to conceal themselves or to attract prey.

INVESTIGATING FOOD WEB INTERACTIONS AND COMMUNITY COMPOSITION IN A GRASSLAND ECOSYSTEM

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In both aquatic and terrestrial systems, strong interactions between predators and primary producers have been explored, and predators have been shown to exhibit top-down effects on lower trophic levels by reducing herbivory on the plant community. Additionally, predator influence and composition are often regulated by bottom-up effects, such as plant community structure and/or nutrient availability. More specifically, the presence of spiders in temperate grasslands has been shown to increase plant biomass and species evenness while releasing plants from herbivory. Alternatively, manipulations to habitat complexity, climatic conditions, and spider density have increased intraguild predation, thus lessening potential positive top-down effects on the plant community from predator presence. Here I propose a three-parted study to investigate food web interactions and community structure in a tall-grass prairie ecosystem in eastern Kansas USA. First I will implement a simple manipulation to the density of a prominent spider predator (*R. punctulata*) in a tract of tallgrass prairie containing two distinct plant community types. This manipulation will examine potential top-down effects of varying predator abundance (high, ambient, and low spider density) on the plant community in addition to exploring potential pressures promoting intraguild predation and possible bottom-up effects present in plots undergoing different fertilization regimes. Secondly I will survey the arthropod communities present in eight plant communities undergoing different fertilization, haying, and sowing treatments to understand possible bottom-up effects of nutrient availability and habitat structure on arthropod diversity, abundance, and coexistence. Lastly I will conduct analyses on the phylogenetic diversity of both the arthropod and plant communities to better understand diversity, mechanisms regulating species coexistence and community structure, and evolutionary relationships within the surveyed plots. This three-parted study aims to better understand community structure, diversity, interactions between trophic levels, and mechanisms underlying trophic interactions.

GROUND DWELLING SPIDERS IN OLIVE GROVES UNDER DIFFERENT FARMING SYSTEMS

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Olive groves play a primary role in the agroeconomy of the Mediterranean area. Despite their wide distribution (nine million hectares of land), only a few studies focused on spider assemblages living in such agroecosystem, mostly referring to their potential as natural pest-control agents. The main goal of the present study was to increase knowledge about spiders assemblages living in olive groves, with a special focus on the impact of different farming system on abundance and diversity of ground dwelling spiders. The study area is located in Tuscany (province of Pisa) in the area of Monti Pisani. Spiders were sampled with pitfall traps in six different sites, differing primarily according to the farming system: biological (according to Council Regulation EC No 834/2007) with organic fertilization, and conventional, in which glyphosate-based desiccant was used as herbicidal. Sampling took place from May to July 2010, in three consecutive series of three weeks. For each sampling period environmental characteristics (percentage of bare soil and shading) were registered. Spiders were identified to the species level. Data were treated to calculate classical diversity indexes and taxonomical distinctness ones. Different agricultural managements (biological vs conventional) were compared using Mann-Whitney and ANOVA test after testing normality. Indicator Species Analysis was applied to detect potential indicator species. Regarding faunistic aspects, fifty-nine species were collected, improving knowledge on spiders living in olive orchards. At regional level, sixteen species resulted new for Tuscany. When comparing our results to the only contribution ever published on spiders in Italian olive groves we found a remarkable similarity, both in terms of species composition and diversity. When comparing biological and conventional orchards, no significant differences were found in terms of abundance and species richness of spiders. A significantly higher diversity (Shannon index) was recorded in conventional olive groves attesting an intermediate level of disturbance, whereas the index of average taxonomic distinctness had higher values in biological ones. Such results seem to support that under biological farming, the lower degree of disturbance allows the establishment of taxonomically complex assemblages, presumably in consequence of the major diversification of the ecological niche.

"PRE-DISPERSAL" BEHAVIOR DOES NOT PRECEDE DISPERSAL IN JUVENILE SOCIAL SPIDERS (*STEGODYPHUS DUMICOLA*, ERESIDAE)

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Bridging and ballooning dispersal in spiders are preceded by 'tiptoe" behavior, in which the spider stands on the tips of its eight tarsi, with the legs extended downward and the abdomen raised, and releases one or more silk lines. The occurrence of tiptoe behavior has been used in experiments to indicate a propensity to initiate dispersal. Juvenile social spiders, *Stegodyphus dumicola* Pocock, 1898 (Eresidae), exhibited tiptoe behavior while walking along the upper strands of the web at night, simultaneously releasing long silk lines that streamed upward; no dispersal was observed during this time. In wind-tunnel tests we found that tiptoe behavior increased with time during the evening activity period and that spiders captured during web building had a greater likelihood of tiptoeing than those caught while handling prey. We suggest that tiptoe behavior in juveniles of *S. dumicola* is not associated with dispersal, but perhaps with vertical extension of the capture web.

REED TRAP – A NEW METHOD TO INVESTIGATE THE SPIDERS OF MARSHLAND HABITATS

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In the last years, research of Reeds, as typical marshland habitats, received special attention in Europe. Several national parks had been established for the preservation of these habitats, and numerous international treaties were signed to ensure their survival. In spite of the intensive efforts, our knowledge, concerning some groups of animals, including spiders live in the reeds, is still incomplete; partially due to research-methodological reasons. Although the intensive research resulted in many new findings, it could be assumed that the introduction of a new and standardizable sampling method could lead to may further valuable discoveries. For this reason we have developed and tested a new sampling method. Field testing was carried out in the Reeds of the three largest lakes in Hungary (lakes Balaton, Neusiedl and Velence) in parallel.

The idea of this new sampling method is based on the observation that spiders and other arthropods could often be found in the cavity of broken reeds; they use these holes as hiding place, for taking care of the offsprings or as wintering place etc. We hypothesized if the amount of these naturally broken reeds is limited in the habitat then the spiders will occupy artificial broken up reed parts (opened up, strategically placed and attached to the side of the natural reed). (Analogy: artificial cavities are preferred nesting places of birds in forests with limited hollow trees).

Based on the results of the studies started in August of 2010 we can conclude:

1. Reed traps are working effectively. Their occupation varied between 28 and 85% depending on the different collection points and collection periods (summer, winter).
2. More than 80% of the collected arthropods were spiders.
3. A number of rare, habitat specialist species could be effectively detected.
4. Using this method new information could be collected concerning the phenology of reed-inhabiting species, their mating and parental care habits or the interaction of different species (joint wintering or pray-predator relationships).
5. The different zones of Reeds, differences due to different reeds management (eg harvesting, burning) and the seasonal periods (summer-winter) could be effectively and quantitatively investigated using this new method.

In this presentation we report the first results obtained with the 'reed trap' method.

HIGH-SPEED INVASION OF DENMARK BY THE HARVESTMAN *DICRANOPALPUS RAMOSUS*

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The harvestman *Dicranopalpus ramosus* was first recorded from Denmark in 2007. In autumn 2010 a nation-wide survey of harvestmen living on house walls in larger towns was undertaken. Harvestmen were recorded during a one hour walk through each town. Supplementary data were obtained from personal information, records submitted to the internet site www.fugleognatur.dk, and one-hour observations in some of the towns during the period 2003-09. After only three years, *D. ramosus* had reached nearly all parts of the country though it was still absent (or at least not recordable in the standardized survey) from a majority of the towns. Negative records from earlier years from some of the towns where the species occurred in 2010 indicate that the invasion has actually taken place during the last 3-5 years. The recency of the invasion is also indicated by the finding that though the species is established in more than 25 localities, it has reached high densities only in a few places. It is speculated that the expansion of the species is still dominated by repeated invasion from south of the country rather than by lateral spread from established Danish populations. However, as Danish populations increase the latter mechanism will increasingly take over to fill up the still vacant areas.

ATTRACTION TO PREY BUT NO PREDATOR AVOIDANCE DUE TO SPIDER KAIROMONES IN SPIDERS OF THE BEECH FOREST FLOOR

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Spiders leave silk and other excreta in their habitat which can be used by other spiders to locate patches of potential prey (cannibalism or interguild predation) or to avoid potential spider predators. We used the same experimental design to test whether spiders of the beech forest floor use spider kairomones in both ways. Beech litter was cleaned in boiling water, dried, and kairomone treated by letting spiders inhabit them for 48 hours. Tests were made in petri dishes with one half filled with kairomone treated litter and the other half filled with untreated (control) litter; we observed whether test spiders settled in the side with treated or untreated litter. In the prey-attraction series of experiments small linyphiids or small wolf spiders (*Pardosa saltans*) provided the kairomones, and large (subadult) wolf spiders (*P. saltans*) acted as test predators. In the predator-avoidance series of experiments adult wolf spiders (*P. saltans*) of both sexes provided the kairomones against which small linyphiids or small wolf spiders (*P. saltans*) were tested. The latter experiments were repeated with treated filter paper instead of litter. The large wolf spiders were significantly attracted to prey kairomones from both linyphiids and small conspecifics, but neither linyphiids nor small wolf spiders avoided the kairomones from the large wolf spiders. We discuss possible explanations why the kairomone effects seemingly operated only one way.

ANOMALIES IN WEB: A MISUSE IN LOCAL INFORMATION

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Among animal constructions, spider's orb webs generally symbolize regular geometrical architecture models. Their realization is the result of successive, simple and reproducible behavioural patterns, often considered as stereotyped. It has been recently shown that spider's building behaviours present variations, which could alter web regularity. Anomalies, which can be defined as "alterations" within a "normal" geometric structure, have been identified and analysed in *Zygiella x-notata (*Clerck) (Araneae, Araneidae*).*

The sticky spiral results of successive pieces of thread (mesh) laid down between two radii. From video recording (n=42) of web construction, we described the different movements of the eight legs and compared their frequency and duration during the construction of a "normal" or "abnormal" mesh (anomaly). Positioning of the eight legs was also analysed.

Direction and trajectory of a mesh depend on the positioning of the legs by using local structural elements (radii, previous mesh). It appeared that the fourth leg in the periphery of the web was implied when an anomaly appears or when the mesh deposit corrects a previous anomaly.

Results suggest that spiders use local information to build the meshes. Moreover, the proportion of "anomaly correction" when spider are confronted with an abnormal mesh, suggests that spiders would have a more global spatial representation of their web.

MALE PREFERENCE AND FEMALE CUES: MALES ASSESS FEMALE SEXUAL MATURITY AND MATING STATUS IN A WEB-BUILDING SPIDER

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Reproductive success relies on communication signals used by females to exert mate attraction, and assessment of female reproductive value by males. During mate search males of the spider *Stegodyphus lineatus* experience high mortality and low female encounter rate. Females vary in sexual maturity (immature and mature), and mating status (virgin and mated) and hence in reproductive value for males, which should influence male mating effort. Males would benefit from mating preferentially with virgin females, whereas mating with mated females is costly as females are resistant to re-mating. Nevertheless mating with mated females pays off as males gain a share of paternity. Males should avoid mating with immature females, but could perform pre-copulatory guarding to get access to the female on maturation. Relative encounter rate should predict male mating preference, and under low encounter rates males should invest also in females of inferior reproductive value. Due to high costs of re-mating in this system, only virgin females are expected to signal to attract males. We investigated male ability to discriminate immature, virgin and mated females by assessing: i) the number of females males visit in the field; ii) male mating effort in laboratory trials; and iii) male discrimination of females based on silk cues. In the field, males were found most frequently with virgin females. Male mating effort and copulation success was higher with mature compared with immature females, and male also preferred mature over immature females based on silk cues. Our data suggest that females signal sexual receptivity, and that males are able to discriminate both sexual maturity and mating status, however, males do not exert strong preference for virgins. The combination of high costs of mate search and low encounter rate likely exerts selection on males to mate indiscriminately and overcome female resistance to re-mating.

SHEEP IN WOLF'S CLOTHING: PREDATOR MIMICRY BETWEEN MICROMOTHS AND JUMPING SPIDERS

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Predator mimicry refers to a peculiar and rarely investigated example of Batesian mimicry in nature. This mimicry scenario exists between predators and prey in which prey mimics the signals of the predator to avoid or reduce predation risk. In Lepidoptera, there are many micromoth taxa which are phylogenetically unrelated and geographically widespread exhibiting colour patterns that are putatively involved in jumping spider mimicry. We targeted the possible jumping spider mimicking moth *Eugauria albidentata* (Lepidoptera: Crambidae) as the experimental species, and tested the survival rate against *Ptocasius strupifer* (Araneae: Salticidae) spiders under laboratory environment. Behaviour comparison experiments were also carried between mimetic moths, conspecific and heterospecific (*Plexippus paykulli*) jumping spiders. Male *Ptocasius strupiter* spiders were tested toward mimetic moths, control moths, conspecific and heterospecific spiders of both sex. Behaviours of male *Ptocasius strupiter* spiders toward each group were analyzed to target the possible model for the mimicry system. The results showed that the predation rates of mimetic moths were significantly lower than non-mimetic moths, and spiders exhibited specific behaviours which suggested to be used in salticid communication. Female spiders showed significantly higher predation rate toward mimicking moths, while males tended to display more frequently to the moths. In behaviour comparison tests by male *Ptocasius strupiter* spiders, we found the behaviours displayed to mimicking moths were closer to conspecific and heterospecific female spiders, suggested that female spiders were more likely to be the model of the mimicry system. This type of mimicry may work better toward male jumping spiders because female spiders are more likely to be cannibals. Male jumping spiders are usually the one to behave courtship displays which may also enables mimetic prey to detect them more easily or having longer time to escape.

NATURAL MATING RATES IN THE ORB-WEB SPIDER *ARGIOPE BRUENNICHI*

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Male monogyny in the absence of paternal investment is arguably one of the most puzzling mating systems. Recent evidence suggests that males of monogynous species adjust their life-history and their mating decision to shifting spatial and temporal selection regimes. In the cannibalistic wasp spider *Argiope bruennichi* males can be either monogynous or mate with a maximum of two females while females are polyandrous and supposedly mate with several males. By observing all females of a population for a complete mating season we were able to determine the natural male and female mating rates. We studied factors underlying those mating rates and determined the degree of polyandry of *A. bruennichi* females and male mating decisions.

We found that females had a low average mating rate of 1.3 males per season and the majority of the observed females copulated only once. Female mating rate was mainly explained by factors that affected female pheromone dispersion such as density of virgin females and wind speed. In order to analyze male mating decisions we categorized the observed males into single-mated and double-mated monogynous as well as bigynous males. We found that all categories were continuously present with relatively stable frequencies throughout the season despite changes in the operational sex ratio. But males were more likely monogynous when copulating with relatively heavy and old females and otherwise bigynous. These results imply that variation in female mating rates is explained by pheromone dispersal and the proportion of bigynous males during the mating season while the males make conditional mating decisions based on the quality of the first female they encounter.

CHANGE OR DIE ? INCONSISTENT DECORATION SIGNALING IN *ARGIOPE* SPIDERS

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Many orb-web spiders of the genus *Argiope* build conspicuous silk structures on their webs called decorations. Previous studies suggested that *Argiope* decorations function to lure prey, but at the cost of an increased predation risk. Currently, it is not clear how *Argiope* spiders balance such tradeoff. According to field observations many *Argiope* spiders vary shape and building frequency of decorations on a daily basis. I hypothesize that the variation in decoration-building represents a strategy which prevents prey and predator from learning and remembering spider webs' locations. In this study, I tested whether an inconsistent decoration signaling pattern can render spiders higher foraging success and lower predation risk. In the field, I used cardboard dummies mimicking the coloration of decorations and spiders to test whether changing the arrangement pattern of decorations will affect prey and predator attraction rate. I used video cameras to monitor the responses of prey and predators to spider dummies with either consistent or variable decoration forms. The preliminary results showed that dummy spiders with variable decoration form attracted significantly more prey but fewer predators than those with invariant decoration form. Results of this study thus indicate that signaling polymorphism of *Argiope* spiders represents a strategy to simultaneously increasing hunting success and reducing predation risk.

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