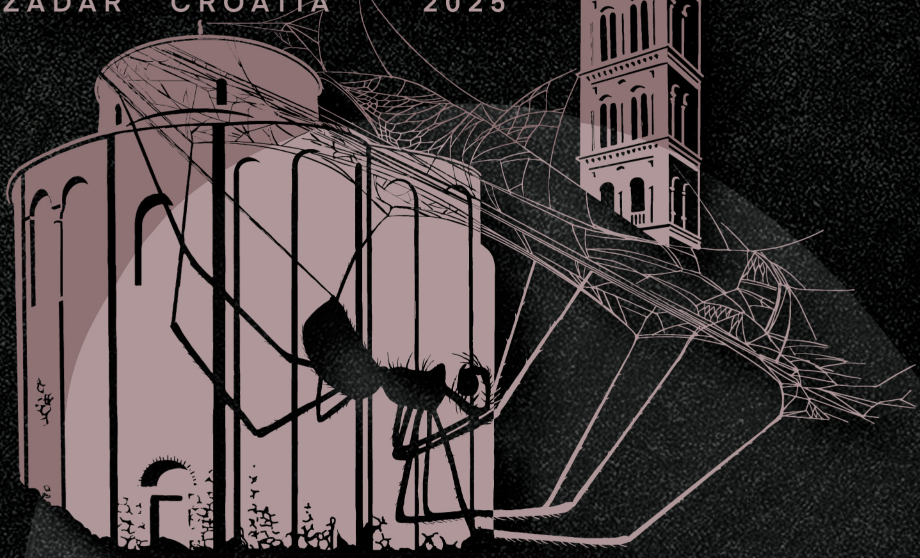
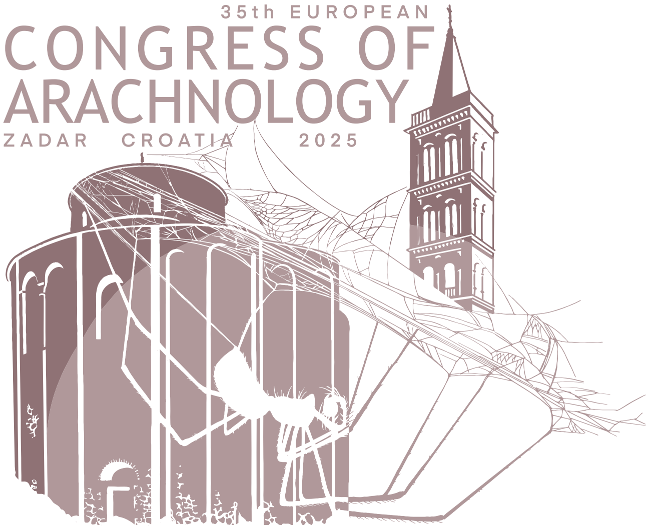
35th EUROPEAN

CONGRESS OF ARACHNOLOGY

ZADAR CROATIA 2025



BOOK OF ABSTRACTS



ECA2025 in numbers

175 participants (**62** students) from **41** countries across **5** continents, presenting **91** oral and **61** poster contributions

ORGANIZED BY

RB

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Universitas Studiorum
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Dear arachnologist and friends, welcome to the 35th European Congress of Arachnology!

It is our great honor to host the congress for the first time in Croatia. The congress is organized jointly by the Ruđer Bošković Institute in Zagreb, the country's largest scientific institute, and the University of Zadar, one of the oldest universities in Croatia, founded in 1396.

The arachnological community in Croatia is still quite small, and we hope this event will encourage its growth. The arachnid fauna, however, is rather diverse for a country of this size. Although no official checklist has yet been published, we know of around **800 spider species, 180 pseudoscorpions, 80 harvestmen, fewer than 20 scorpions, a few palpigrades, and many mites—still the least studied group.** The Dinaric region, and Croatia in particular, are especially notable for their rich cave fauna, considered among the most diverse worldwide. Arachnids are an important part of this community, with about **100 spiders, more than 120 pseudoscorpions, and 15 harvesters.**

Many arachnid species, particularly cave dwellers, remain undescribed, leaving much work for the future.

This book includes the list of all the people that participated in the organization and in the scientific part (we thank all of them!), a list of sponsors (big thanks to them as well!), the congress program, and the abstracts. The abstracts are arranged with four plenary talks first, followed by two symposia (Sensory and Cave), then by all other oral contributions ordered by topics in alphabetical order, and within topics arranged in alphabetical order of the surname of the main author. Poster abstracts follow the same structure. Presenting authors are underlined, and student presentations are marked with an asterisk (*).

The range of topics presented at this congress includes Applied arachnology, Behavioral Biology, Biodiversity & Community Ecology, Biogeography, Conservation & Management, Ecology & Ecosystem Roles, Evolutionary Biology & Genomics, Faunistics & Distribution, Morphology & Anatomy, Physiology & Adaptations, Systematics & Phylogenetics, and Taxonomy.

The congress logo features an undescribed cave-dwelling Leptonetid species of the genus *Sulcia,* hanging from its web spun over the symbols of Zadar—Church of St. Donat and the bell tower of Saint Anastasia Cathedral. During preregistration, participants were asked to guess the identity of the spider; 50 out of 93 people answered, five guessed Leptonetidae (with genera *Leptoneta* and *Barusia*), while only one correctly named *Sulcia.* The correct answer came from Croatian arachnologist Darko Ljubić, known to many as Darrell Ubick😊.

In current times of humanitarian, political, and climatic challenges, it is precious to spend time with friends and colleagues, to share positive energy and love, and we are very grateful to all of you for that. We hope that this congress will establish new and deepen the existing networks and collaborations.

On behalf of the organizing committee,

Welcome to Zadar. We wish you a pleasant congress and hope you enjoy the city, the sea, and the sunsets.

Martina Pavlek

Dear colleagues,

It is a great honour for me to welcome you to the 35th Congress of Arachnology, taking place in Zadar from 31st August to 5th September 2025. This will be my fourth arachnological meeting (my first was in Greifswald in 2022, when I began working with one of the most fascinating arachnid groups – pseudoscorpions). I am truly honored to organize this congress for the arachnological community, a group I deeply admire.

I am especially excited that many abstracts focus on neglected arachnid orders, including Mark Harvey's plenary on pseudoscorpions. Miquel A. Arnedo and Simona Kralj Fišer, with their expertise in spider genomics and behavioral ecology, make the plenary lineup outstanding. We have also organized a symposium on cave topics and a plenary by Stefano Mammola to highlight recent advances in subterranean research, promoting collaboration in this specialized field. Additionally, a symposium organised by Gabriele Uhl explores how arachnids perceive and interact with their environment, integrating senses, brain function, and development.

I am delighted that many students, 62 in total, from all over the world will be participating.

I wish all of us a successful congress, full of fruitful collaborations and new friendships!

Dora Hlebec

Last but not least, the Organizing Committee would like to thank all authors and co-authors of the abstracts to be presented at ECA 2025, as well as other members of the arachnological community who have supported us in organizing this congress. We are also grateful to our sponsors and everyone who contributed to making this event possible.

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Mark Harvey (Western Australian Museum, Perth, Australia)

Miquel A. Arnedo (Department of Evolutionary Biology, Ecology and Environmental Sciences, Universitat de Barcelona; Biodiversity Research Institute (IRBio), Universitat de Barcelona, Barcelona, Spain)

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18:00 **REGISTRATION OPENING**

19:00 **WELCOME RECEPTION**

MONDAY 01 SEPTEMBER

8:00 **Registration**

9:00 **Opening Ceremony**

9:30 COFFEE BREAK

10:00 **PLENARY TALK**
Miquel A. Arnedo: Fast & curious: How high-throughput sequencing redefines spider biodiversity research
CHAIR VERA OPATOVA

SYSTEMATICS & PHYLOGENETICS

CHAIR MARK HARVEY

11:00 **Vera Opatova et al.:** Phylogenetic relationships and biogeographic origins of the spider family Nemesiidae (Araneae, Mygalomorphae)

11:15 **Marc Domènech et al.:** Resampling multiple genomic matrices to evaluate chelicerate relationships

11:30 **Domagoj Gajski et al.:** Facilitating taxonomy and phylogenetics: An informative and cost-effective protocol integrating long amplicon PCRs and third generation sequencing

11:45 **Annui Sanz-LaParra** et al.:** Phylogeny of the *Savignia* genus group of dwarf spiders using UCEs and phylogenetic position within Linyphiidae

12:00 **Markéta Byronová**et al.:** When morphology fails - the role of cytogenetics in species delimitation of the scorpion genus *Euscorpius*

12:15 **Hsiang-Yun Lin**et al.:** Across islands and coastlines: Phylogenetic insights into the East Asian pseudoscorpion genus *Nipponogarypus* Morikawa, 1955

12:30 **Krisztián Szabó et al.:** Mitospecies: a novel concept for describing molecular diversity

12:45 **János Novák et al.:** Establishing the DNA barcode reference library of the Georgian pseudoscorpion fauna (Arachnida: Pseudoscorpiones): an initial assessment

13:00 LUNCH BREAK

SYSTEMATICS & PHYLOGENETICS; EVOLUTIONARY BIOLOGY & GENOMICS

CHAIR MIQUEL A. ARNEDO

14:30 **Peter Michalik et al.:** Alone no more - Integrative taxonomy of New Zealand odd-clawed spiders challenges the monotypy of *Pianoa* and *Gradungula* (Araneae: Gradungulidae)

14:45 **Tamás Szűts et al.:** A bridge close enough: sclerite homology hypotheses and salticid systematics

15:00 **Vladislav Ivanov et al.:** Genetic basis of complex traits in *Latrodectus katipo* and *L. hasselti*

15:15 **Alba Enguídanos García* et al.:** Unravelling diversification in speciose lineages: the red devil *Dysdera erythrina* species complex (Araneae: Dysderidae)

15:30 **Sabrina Torres Kalme* et al.:** Insights into karyotype evolution of Solifugae

15:45 **Maitry Jani* et al.:** A spider's guide to packing: The evolution of prey wrapping in spiders

16:00 COFFEE BREAK

FAUNISTICS & DISTRIBUTION; BIOGEOGRAPHY

CHAIR SIMONA KRALJ-FIŠER

16:30 **Tommaso Fusco* et al.:** The ground spiders of the Tolfa Mountains (Latium, Italy): diversity and community composition

16:45 **Gordana Grbić**
Tangled web of information and misinformation about spiders in Serbia

17:00 **Yuri Simone et al.:** Scorpion Fauna of northwestern Saudi Arabia

17:15 **Maria Chatzaki et al.:** An update of the spiders of Greece: diversity, knowledge gaps and conservation

17:30 **Laura Montes de Oca et al.:** Diversity and origin of the endemic tunnel-web spider family Porrhothelidae (Mygalomorphae) from New Zealand

17:45 **Nathan Viel** et al.:** Niche-biotope duality and population genetics to reconstruct the geographic range expansion history of the spider species *Zodarion rubidum* Simon, 1914

18:00 **Kyunghoon Jeong** et al.:** Biogeographical analyses showed the multiple dispersal history of *Allochthonius* in East Asia

18:15

TUESDAY 02 SEPTEMBER

PARALLEL SESSIONS

MAIN LECTURE ROOM		SMALL LECTURE ROOM
BEHAVIORAL BIOLOGY CHAIR VLADISLAV IVANOV		**TAXONOMY; MORPHOLOGY & ANATOMY; APPLIED ARACHNOLOGY** CHAIR NURIA MACÍAS-HERNÁNDEZ
Filip Solar* et al. Polysphincta group Parasitoids associated with sheet web spiders	9:00	**Kaïna Privet et al.** (How to) Make Paris' spider collection great again
Vincent Jackel* et al. Jump Scare: Biomechanics of reverse jumping in arboreal sac spiders (*Clubiona corticalis*)	9:15	**Armine Kosyan et al.** Ground spider diversity in Armenia: New records of the family Gnaphosidae
Yi-Chi Li* et al. Spider predatory aggressiveness exhibits diverse personality and plasticity associations and complex neurophysiological mechanisms	9:30	**Peter Jäger et al.** 5 - 50 - 500 - 50,000 - 500,000 – Revision of the genus *Heteropoda* in Laos
Sammi Huang* et al. Effects of biotic and abiotic factors on spiders' web phenotypic and material properties adaptation	9:45	**Yuri Marusik et al.** On the araneoid-nicodamoid relationships, once again: evidence from cuticular microstructures (Araneae: Araneomorphae: Araneoidea, Nicodamoidea)
Rok Golobinek* et al. Orb web asymmetry is explained by constraints in running speed	10:00	**Josefine Kreuz* et al.** Comparative Morphology of the Spinning Apparatus of Spiders
Ren-Chung Cheng et al. Urbanization alters web architecture and body coloration in a nocturnal orb-weaving spider	10:15	**Anna Derdak* et al.** The gross morphology and ultrastructure of egg envelopes in Parasitengona mites (Chelicerata: Acariformes)
Ming-yu Lee Body coloration associated with female pre-existing biases in nocturnal spiders	10:30	**Anděla Šimečková* et al.** Interspecific foraging response to thiacloprid treatment of top spider predators
Jonas Wolff et al. Hyper-elastic reeled radii enable swinging strike movements in netcasting spiders (Deinopidae)	10:45	**Nicola Sullivan* et al.** Prey capture abilities of horticultural spider species with and without vibrational disturbance

11:00 COFFEE BREAK

11:30 PLENARY TALK
Simona Kralj-Fišer
Unraveling Sexual Size Dimorphism in Spiders: Current Insights and Emerging Frontiers
CHAIR MATJAŽ GREGORIČ

BEHAVIORAL BIOLOGY
CHAIR MATJAŽ GREGORIČ

12:30 **Valeria Arabesky et al.**
Spiky or smooth: How should widow spiders construct their egg sacs?

12:45 **Tzu-Chi Yuan* et al.**
Spiders adjust orb web architecture and performance across an elevation gradient

13:00 LUNCH BREAK

TUESDAY 02 SEPTEMBER

SYMPOSIUM
"HOW ARACHNIDS EXPERIENCE THEIR WORLD: SENSES, BRAIN, DEVELOPMENT AND BEHAVIOUR"

CHAIR GABRIELE UHL

14:30 **Gabriele Uhl**
Symposium introduction

14:40 **SYMPOSIUM PLENARY**
Massimo De Agrò et al.
Biological point-light displays scanning by the principal eyes of a jumping spider

15:10 **Andres Rivera**
Brains behind the eyes: Unraveling visual system evolution in spiders

15:25 **Marcial Antonio Galan Sanchez* et al.**
The evolution of eye loss in spiders (Arachnopulmonata, Araneae)

15:40 **Morgan Oberweiser* et al.**
Pre- and post-copulatory consequences of male vibratory courtship performance in the nursery web spider *Pisaura mirabilis*

15:55 COFFEE BREAK

16:25 **Yoram Zvik* et al.**
Less is more: Chemical minimalism as myrmecophile evolution toward invisibility

16:40 **Andreas Fischer**
Tracing spider scent: A new analytical workflow for identifying pheromones and a call for collaboration

16:55 **Gabriele Uhl et al.**
The Chemosensory Toolkit of a Cursorial Spider

17:10 **Gabriele Uhl**
Symposium wrap up.

PHYSIOLOGY & ADAPTATIONS; APPLIED ARACHNOLOGY

CHAIR DOMAGOJ GAJSKI

17:15 **Weronika Porc* et al.**
Assessment of the effects of electromagnetic radiation on apoptosis and stress protein biomarkers in the spider *Parasteatoda tepidariorum*

17:30 **Izabela Jędrzejowska et al.**
Is *Chelifer cancroides* a purely matrotrophic pseudoscorpion?

17:45 **Eran Gefen**
Respiratory gas exchange, metabolic fueling and locomotor activity in scorpions

18:00 **Carolina Ortiz Movliav* et al.**
Winter warming increases metabolic stress and mortality in an overwintering spider

18:15 **Andreea Rebeka Zsigmond et al.**
Where is better to live? Influence of the habitat on the mineral element content of wasp spider (*Argiope bruennichi*)

18:30

18:45 **Guided tour of Zadar Old Town:** tour timed for the sunset at the Monument to the Sun. Meeting is in front of the main venue building.
20:15

SOCIAL ACTIVITY IN BRLOG BREWERY

WEDNESDAY 3 SEPTEMBER

MID-CONFERENCE EXCURSIONS

20:30 **PEACE PARTY AT THE BARBAKAN RESTAURANT**

THURSDAY 4 SEPTEMBER

9:00 **PLENARY TALK**
Mark Harvey
The wonderful world of pseudoscorpions and the quest for the ultimate phylogeny
CHAIR DORA HLEBEC

BIODIVERSITY & COMMUNITY ECOLOGY

CHAIR ADRIÀ BELLVERT

10:00 **Andrea Baldissari* et al.**
Optimizing spider community monitoring: testing the effects of sampling effort and season

10:15 **Emanuele Crepet* et al.**
Niche segregation in three crab spider species (Araneae: Thomisidae)

10:30 **Christian Komposch et al.**
BioBlitzes - A waste of time or valuable biodiversity research. Potential and limitations of a 24 hours mapping. (Arachnida: Araneae, Opiliones, Scorpiones)

10:45 **Jeremy Miller et al.**
The jumping spiders of Wallacea: Occurrence patterns and predictions

11:00 GROUP PHOTO

11:05 COFFEE BREAK

BIODIVERSITY & COMMUNITY ECOLOGY

CHAIR JEREMY MILLER

11:30 **Nuria Macías-Hernández et al.**
Community assembly and biodiversity drivers on islands and continents

11:45 **Manuel Marquerie-Córdoba* et al.**
A spider on the fourth corner: how microhabitat preference reshapes functional space and trait-environment relationships in Iberian spiders

12:00 **Christoph Muster et al.**
Time series of pitfall trap data reveal contrasting abundance trends in ground hunting versus web-building spiders

12:15 **Anna Piquet* et al.**
Spiders as effective indicators of urban ecological change: comparative patterns across arthropod taxa and cities

12:30 **Lea Ružanović* et al.**
A summer with spiders: Dispersal and assemblage composition during the drying of a Mediterranean intermittent river

12:45 **Marco Tagliabue et al.**
Spiders in the tundra: how communities assemble at archaeological sites

LUNCH BREAK

BIODIVERSITY & COMMUNITY ECOLOGY; ECOLOGY & ECOSYSTEM ROLES; CONSERVATION & MANAGEMENT

CHAIR PEDRO CARDOSO

14:30 **Alexandr Vasiliev* et al.**
Spiders (Araneae) of the Duruitoarea Canyon (Republic of Moldova): diversity on Former Sarmatian Sea Land

14:45 **Raphaël Grellety* et al.**
Cut less, save more: partial cutting to conserve boreal forest spiders in Canada

15:00 **Alireza Zamani et al.**
Persian silk road: diversity and distribution patterns of Iranian spiders under sampling bias

15:15 **Julia Lamprecht* et al.**
Penthouse spiders and harvestmen - Canopy research in the Eastern Alps (Arachnida: Araneae, Opiliones)

15:30 **Anna Maka* et al.**
Ecology-informed conservation of the Diamond-backed Spider (*Thanatus formicinus*) in England, UK

15:45 **Miguel Sousa* et al.**
Small scale spider biodiversity assessments as testing ground for environmental filtering under global warming

16:00 **Caroline Fukushima et al.**
A hairy business: investigating the interplay of species traits and trade dynamics in the tarantula pet market

16:15 COFFEE BREAK

CONSERVATION & MANAGEMENT

CHAIR STEFANO MAMMOLA

16:45 **Harriet Kinga* et al.**
Spiders as monitoring tools of restored forests in Ghana

17:00 **Marco Tolve* et al.**
Tracking climate-driven trait variation in *Vesubia jugorum* (Araneae, Lycosidae): insights from a multi-year monitoring program in the Maritime Alps

17:15 **Eva Liznarova**
Restoration of degraded wetland: How management measures shape spider community

17:30 **Cor Vink et al.**
The rather unpleasant smell of success - Developing a pheromone tool for the eradication of *Latrodectus hasseltii* in New Zealand

17:45 POSTER SESSION WITH REFRESHMENTS

19:15

21:00 **CONGRESS DINNER AT ARSENAL**

FRIDAY 5 SEPTEMBER

9:00 **PLENARY TALK**
Stefano Mammola
A deep dive into Europe's subterranean spiderverse
CHAIR MARTINA PAVLEK

SYMPOSIUM
SCIENCE BENEATH THE SURFACE: CAVE ARACHNID ECOLOGY, DIVERSITY, AND EVOLUTION

CHAIR EFRAT GAVISH-REGEV

10:30 **Efrat Gavish-Regev**
Symposium introduction

10:45 **Darrell Ubick**
Troglomorphy in Phalangodidae (Opiliones) **(virtual talk)**

11:00 **Evgenia Propistsova* et al.**
All eyes on caves: comparative anatomy of eyes and brains of the cave funnel-web spider genus *Tegenaria* Latreille, 1804 (Araneae: Agelenidae)

11:15 COFFEE BREAK

11:45 **Nikola Pischiutta* et al.**
Genetic and morphological diversity of the cave spider *Stalagtia hercegovinensis*

12:00 **Guilherme Prado* et al.**
Uncovering hidden diversity: Taxonomy and conservation of Brazilian cave pseudoscorpions

12:15 **Dora Hlebec et al.**
Genomic insights into the evolution of two highly troglomorphic pseudoscorpions from the Dinarides

12:30 **Marc Domènech et al.**
Widespread but not uniform: cryptic diversity in the cave-adapted pseudoscorpion *Troglobisium racovitzai* (Ellingsen, 1912)

12:45 **Peter Kozel et al.**
A preliminary overview of harvestmen (Opiliones) in Dinaric Karst caves

13:00 **Mert Elverici**
Adaptive trait divergence and functional morphological diversity in Anatolian subterranean spiders (Araneae: Linyphiidae)

13:15 **Adrià Bellvert et al.**
Where we're going, we won't need eyes to see: Distributional range size drivers for subterranean spiders

13:30 **Efrat Gavish-Regev**
Symposium wrap up and discussion

13:45 LUNCH BREAK

ECOLOGY & ECOSYSTEM ROLES; OTHER

CHAIR YAEL LUBIN

15:00 **Peter Kozel et al.**
Predictive ecological niche modeling and niche segregation in two harvestman species, *Gyas annulatus* and *G. titanus*, in Slovenia

15:15 **Stephane Mutel et al.**
Benefits of floods on riparian spider biodiversity and physiology

15:30 **Pedro Cardoso et al.**
Ecosystem services provided by spiders

15:45 **Matjaž Gregorič et al.**
Which web to invade? The distribution of *Argyrodine kleptoparasites* among host webs

16:00 **Walter Schuit**
Visibility of spiders, of webs and other things

16:15 **Henning Clausen**
Some thoughts on design and interpretation of ecological research projects

16:30 COFFEE BREAK

17:00 ESA GENERAL ASSEMBLY

18:30

PLENARY SPEAKERS

PL1.

Fast & curious: how high-throughput sequencing redefines spider biodiversity research

Miquel Arnedo[1]

[1]Biodiversity Research Institute (IRBio), Universitat de Barcelona, Avinguda Diagonal 643, 08028 Barcelona, Spain

Traditionally, technological advances have paved the way for major scientific revolutions. Systematics and biodiversity research have not been an exception. In the age of the so-called sixth mass extinction, when human activity has accelerated the extinction rate to levels never observed before in the fossil record, we urgently need to assess these effects everywhere, at any time. Ironically, even though we have discovered galaxies millions of light-years away, we still lack a complete catalog of life on Earth. Technological advances promise to provide new tools to overcome traditional limitations for inventorying, monitoring, and understanding biodiversity. Specifically, the emergence of new sequencing technologies, known as high-throughput sequencing technologies (HTS), have revolutionized biodiversity research by accelerating the production of genomic data at low costs in organisms with limited background information. In combination with the development of new theoretical frameworks based on coalescent theory, it has sparked interest in and facilitated the development of new methods for species delimitation. On the other hand, HTS has enabled the development of bulk or non-invasive methods to identify specimens in community samples, and even infer their ecological interactions, cost-effectively and with less labor. In this talk, I will explore the various technologies encompassed by the general term HTS, the timeline of their implementation, and the strategies developed based on the generated data to enhance our understanding of spider diversity and its cataloging and surveillance.

PL2.

The wonderful world of pseudoscorpions and the quest for the ultimate phylogeny

Mark Harvey[1]

[1]Collections and Research, Western Australian Museum, Locked Bag 49, Welshpool DC, Western Australia 6986, Australia

Despite their small size and cryptic habits, pseudoscorpions are widely distributed in most terrestrial ecosystems of the world, ranging from the highest peaks to the inter-tidal zone of seashores. There are now over 4,000 described Holocene species in 478 genera and 26 families, as well as increasing numbers of species described from Mesozoic and Cainozoic fossils. Interest in pseudoscorpion evolution dates back nearly 100 years but the last three decades has witnessed the application of empirical methods to better understand their phylogeny. The first study employed morphology based cladistic methods and later studies used molecular data. Both fields have transformed our comprehension of pseudoscorpion phylogenetics and have led to significant changes to their classification. Recent advances include the recognition of Garypinoidea as a distinct clade from Garypoidea, elevating the subfamilies Hesperolpiinae and Amblyolpiinae to family level and the recognition of Menthidae as a member of the superfamily Neobisioidea. Further studies are underway, some using traditional Sanger methods and others using genomic data, all of which are designed to continue refining the current phylogeny and to develop a robust classification. The results of some of these fresh advances are outlined, as well as highlighting key taxa for future research.

PL3.

Unravelling sexual size dimorphism in spiders: current insights and emerging frontiers

Simona Kralj-Fišer[1]

[1]Institute of Biology, Research Centre of the Slovenian Academy of Sciences and Arts, Novi trg 2, Ljubljana, Slovenia

Sexual size dimorphism (SSD), where females and males differ in body size, reaches extreme levels in spiders. Dramatic female-biased SSD—where females are much larger than males—presents intriguing evolutionary and mechanistic puzzles. This talk examines both well-studied ultimate drivers and less-explored proximate mechanisms. We highlight fecundity selection, scramble competition, sexual cannibalism, and the gravity hypothesis as key influences on body size evolution. While traditionally emphasized, these sex-specific pressures show mixed empirical support, indicating more complex evolutionary dynamics. We present the African hermit spider, *Nephilingis cruentata*, a model system with females, on average, 75 times heavier than males. Through a combination of experimental, developmental, and genomic approaches, we currently examine proximate causes of SSD in this species. Our findings reveal distinct sex-specific growth trajectories driven by divergent developmental timing, suggesting differential hormonal and genetic regulation. These dynamics are currently being investigated through transcriptomic analyses, supported by a newly assembled and annotated high-quality reference genome. A particularly novel insight from our research is the central role of maternal effects—trans-generational influences of maternal genotype/environment—in shaping SSD. While female size is primarily governed by direct genetic effects, male size is predominantly influenced by maternal effects. This provides the first empirical demonstration of sex-specific trait architectures enabling decoupled evolutionary responses via maternal effects. Finally, we call for comparative studies of proximate SSD mechanisms across spider taxa to evaluate the generality of our findings and identify shared or divergent developmental and genetic pathways. Such work is key to building a broader, predictive understanding of extreme SSD evolution.

PL4.

A deep dive into Europe's subterranean spiderverse

Stefano Mammola[1]

[1]National Research Council (CNR), Corso Tonolli 50, Verbania, Italy

Is there a diverse spider fauna in the deep darkness of caves? Where are subterranean spiders distributed, and what shapes their ecological dynamics? Most importantly, is this unique biodiversity threatened by the many anthropogenic changes occurring at the surface? Prepare for a deep dive into these and other questions concerning the more than 600 species of subterranean spiders that inhabit European caves. The focus will be on Europe, where a growing body of knowledge on subterranean spiders—including an updated checklist, distribution data, and trait information—has been assembled over the past decade, surpassing that available for other regions of the world. After introducing general aspects of subterranean spider adaptations and lifestyles, the lecture will explore the drivers of taxonomic and functional richness patterns across the continent. Subsequently, it will examine how this biodiversity may be threatened by human-induced impacts such as land use change and climate change and evaluate ongoing conservation efforts. Although subterranean ecosystems are currently only partially protected under the Natura 2000 network, there is considerable potential to expand this protection—especially as European countries commit to increasing the number of protected areas under multilateral agreements such as the "30x30" agenda. A data-driven, evidence-based approach to conservation will be crucial to achieving this goal, alongside continued exploration of the still largely undescribed biodiversity that thrives beneath our feet.

SYMPOSIA

* Student Competition
** **PeerJ Student Contribution Competition** (topics in Taxonomy/Systematics/Phylogenetics/Biogeography)

Symposium 1

How arachnids experience their world: senses, brain, development and behaviour

Chair: Gabriele Uhl

Gaining an understanding of how arachnids perceive their world sheds light on their ecological roles, evolutionary adaptations, and complex behaviors. Arachnids employ sensory systems and behaviors to navigate and interact with their environments. Many species exhibit remarkable spatial awareness, learning and memory. While vision and mechanoreception have been the most extensively studied sensory channels, chemoreception remains significantly understudied, despite substantial behavioral evidence suggesting that spiders can detect chemical signals and cues when locating prey, finding mates, and avoiding predators. In these contexts, multimodal signals likely play a crucial role in arachnids by integrating input from visual displays, chemical signals, and vibrations. However, studying multimodal communication is notoriously challenging, especially given the numerous knowledge gaps in spider sensory systems. How spiders process information and where this occurs in their nervous system remains largely unknown. Few studies have examined the relative functions of various brain structures and how experience and specific sensory inputs influence their development.

In this symposium, we will discuss the latest findings on vision, including eye loss, courtship vibration, and chemical communication through cuticular hydrocarbons and pheromones, and attempt to formulate research perspectives for this exciting field.

S1.1.

Symposium Plenary: Biological point-light displays scanning by the principal eyes of a jumping spider

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The semi-rigid structure of bodies forces animals to move in rhythmic patterns shared by all creatures with skeletons, exoskeletons, or limb connections. This pattern, known as biological motion, is instantly recognizable and conveys “animacy,” even when body shape is removed and only a cloud of moving dots is shown. The motion alone is so informative that some animals can reconstruct the original shape. Jumping spiders, highly visual arthropods, divide motion detection and shape recognition between their four pairs of eyes. Previous studies showed that they can distinguish biological from non-biological motion using only their anterior lateral eyes yet seemed unable to extract shape from motion. In this study, we examined how the anterior medial eyes of jumping spiders—which are used for shape recognition—respond to dot clouds depicting biological or non-biological motion. Using a custom eye tracker, we monitored retinal movements during presentation of static and moving stimuli. We found spiders change their retinal shifting pattern based on both the target’s motion (biological or not) and implied structure (i.e., whether dots suggest a coherent shape). These results reveal that jumping spiders analyze motion with more complexity than previously thought, suggesting a deeper integration of motion and form processing within their minuscule, modular brains.

S1.2.

Brains behind the eyes: unraveling visual system evolution in spiders

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How do spiders perceive their world, and how do environmental influences shape their brains? Over the past year and a half, I have used micro-CT scanning to examine the brains and visual systems of spiders. Alongside my team, I've been investigating the key drivers of their evolution, with a primary focus on eye enlargement in three visually oriented families: ogre-faced, wolf, and jumping spiders. We selected these groups to explore how behavioural and ecological factors contribute to the development of the visual processing portion of their central nervous system. In this presentation, I will share our preliminary findings, highlighting the role of eye enlargement in Deinopids and their relatives, ecological niche adaptation in Lycosids, and mimicry in Salticids. Understanding how the eye-brain system functions and how its components have coevolved is essential for interpreting the influence of traits like sociality, sexual selection, and complex behaviours on brain architecture.

S1.3.

The evolution of eye loss in spiders (Arachnopulmonata, Araneae)

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Spiders have some of the most diverse and successful multi-ocular systems among living arthropods. Although most species have four pairs of eyes in two distinct systems (two primary and three secondary eyes), spiders exhibit a huge variety of configurations in eye size, number, and arrangement. Many taxa have lost one or more pairs in independent phylogenetic events, where reductions to six, four, two, and no eyes are known. However, most reports of these losses are scattered throughout taxonomic literature, making them inaccessible and obscuring analyses about the plasticity of visual organs at a macro-evolutionary scale. Here, we present a review and meta-analysis of eye loss for the order. We found that eye loss occurs in ca. 12% of known spider species, predominantly in the Synspermiata clade. From these, the reduction to six eyes is the most common, with more than 5,000 species having lost at least one pair of eyes. Complete loss of the secondary eye pairs was identified in Caponiidae and Palpimanidae, with the former having 80% of its species retaining only the principal eyes. Different models of character evolution and ancestral states reconstructions inferred that the three secondary eye pairs configuration has evolved at least seven times independently across the order, with reversals to an eight-eyed condition in Synspermiata. Other eye configurations have independently evolved in different lineages. Retention of principal eyes with loss of secondary pairs has evolved in five families. Overall, transition rates between eye configurations are low (<0.01), with their maximum peak ~170 Mya ago.

S1.4.

Pre- and post-copulatory consequences of male vibratory courtship performance in the nursery web spider *Pisaura mirabilis*

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During courtship, male *Pisaura mirabilis* (nursery web spiders) employ several impressive signals to attract the attention of potential mates. Not only do they offer a nutritious nuptial gift made of a prey item wrapped in silk, but they additionally present the gift while performing a vibrational signal. This signal is composed of regular pulses generated by tremulation of the opisthosoma and is transferred to the receiver through the substrate. While vibration is a distinctive feature of *P. mirabilis* courtship, very little has been proven about the functional role of this signal in the context of mate selection. In order to investigate the influence of vibratory performance on both pre- and post-copulatory female choice, we conducted double-mating experiments using over 100 pairs of spiders. Males were first categorized as “high-signaling” or “low-signaling” based on their vibrational performance. Then, females were mated in sequence with a male from each category, and pre-copulatory choice behaviors were collected during the trials. Egg sacs were reared, and a sample of broods were then tested for paternity percentages between the two possible fathers (indicating sperm competition or post-copulatory choice). Preliminary analysis of pre-copulatory behavior indicates that vibrational quality has no effect on a male’s mating success, but ongoing work on the paternity data will reveal the full story of whether vibratory courtship has any impact on female choice in *P. mirabilis’* complex multimodal mating system.

S1.5.

Less is more: Chemical minimalism as myrmecophile evolution toward invisibility

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Cuticular hydrocarbons (CHCs) serve dual roles in arthropods: forming a protective barrier against desiccation and mediating key ecological interactions, such as nestmate recognition, sexual communication, and territorial defence. Myrmecophiles, organisms that live in close association with ant colonies, must evolve strategies to avoid detection or aggression within these chemically guarded societies. *Birulatus israelensis* Lourenço, 2002, is the first known scorpion species to exhibit obligate myrmecophily, residing in nests of the black harvest ant, *Messor ebeninus* Santschi, 1927 and frequently appearing on their foraging trails. In this study, we compared the CHC profiles of *B. israelensis* to those of sympatric, non-myrmecophilous scorpions. We found that *B. israelensis* possesses a reduced and simplified CHC profile, in terms of both diversity and abundance. One dominant hydrocarbon in its profile is also abundant in *M. ebeninus*, yet it is absent or present in only small amounts in other scorpions, suggesting chemical mimicry. This reduction likely functions as a strategy of chemical invisibility, reducing the risk of being identified as a foreign organism. However, it comes at a cost: *B. israelensis* loses water at a rate 2.7 times that of its related species, *Compsobuthus schmiedeknechti* Vachon, 1949. Behavioral trials showed that ants displayed minimal aggression toward *B. israelensis* but responded more defensively to other scorpions. These findings support a scenario involving multitrait evolutionary adaptation, encompassing chemical, physiological, and behavioral traits, that enables *B. israelensis* to exploit one of nature's most chemically exclusive environments.

S1.6.

Tracing spider scent: a new analytical workflow for identifying pheromones and a call for collaboration

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Sex pheromones bring mates together and elicit mating behaviours. In spiders, behavioural evidence for sex pheromones is widespread across taxa, yet the pheromones of only ~15 of over 52,000 described species have been (partially) identified. This disparity reveals a significant knowledge gap in arachnology, stemming from the analytical challenges associated with identifying metabolites of spiders. This presentation introduces a robust workflow that makes the discovery of spider pheromones a more tractable endeavour. By integrating complementary analytical techniques (mass spectrometry coupled with liquid- or gas chromatography) and non-targeted metabolomics, the reliable detection and identification of pheromones was achieved from the silk of cursorial and web-building spiders. The primary limiting factor for progress is now less methodological but rather access to broader taxonomic diversity. A comprehensive understanding of the evolutionary history and diversification of spider pheromones is therefore achievable. A collaborative approach is proposed that combines the community's expertise and access to diverse taxa with the established analytical workflow. This presentation will detail the workflow and recent findings and, to advance this arachnological frontier, extends an open invitation for collaboration.

S1.7.

The chemosensory toolkit of a cursorial spider

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Chemical sensing is essential for animals in locating food, evading predators, and finding mates. Spiders, akin to many arthropods, depend on chemosensory inputs; however, their detection mechanisms remain inadequately understood. Through the application of high-resolution electron microscopy, two types of chemosensory sensilla were identified in the cursorial spider *Pisaura mirabilis*. Tip-pore sensilla, present on the legs and pedipalps of both sexes, facilitate contact chemoreception, whereas wall-pore sensilla, found exclusively on the legs of adult males, are linked to olfaction. Behavioural assays corroborated that males perceive airborne female signals, thereby supporting the role of olfactory sensilla in mate searching. The nearly complementary distribution of these sensilla on the walking legs suggests distinct functions: contact chemoreception at the leg tips and olfaction near the leg bases. These findings enhance the understanding of the evolution of chemical sensing in spiders and hold implications for broader arthropod research.

Symposium 2

Science beneath the surface: cave arachnid ecology, diversity, and evolution

Chairs: Efrat Gavish Regev, Dora Hlebec & Martina Pavlek

Cave ecosystems, defined by darkness, scarce resources, and isolation, harbor unique arachnid assemblages that exhibit striking adaptations such as elongated appendages, depigmentation, and eye reduction. This symposium highlights recent advances in anatomy, morphology, taxonomy, systematics, biogeography, evolution, and functional ecology of cave-dwelling spiders, harvestmen, and pseudoscorpions from diverse karst regions worldwide. Spanning the Dinaric karst to Anatolia, the Levant, and Brazilian caves, these studies underscore the role of caves as both evolutionary laboratories and conservation priorities. Results reveal remarkable biogeographic patterns: species turnover along environmental gradients, clines in troglomorphy, and strong links between reduced dispersal and extreme range restriction. Mechanisms driving subterranean evolution include geographic isolation, historical climate change, and habitat connectivity—shaping both ancient relictual lineages and recent colonists undergoing rapid adaptation. Cryptic diversity emerges even in well-known species, while morphometric and genomic approaches expose deep evolutionary splits and fine-scale local adaptations. Neuroanatomical, morphological, and genomic studies, coupled with long-term monitoring and taxonomic revisions, highlights the processes of speciation and adaptation in these extreme environments. Together, the contributions of this symposium reveal that the study of cave arachnids is blooming, representing dynamic systems where sensory adaptation, evolution, ecology, and geography interact to drive diversification. Understanding these processes is essential not only for reconstructing the history of life underground, but also for guiding urgent conservation of these fragile, irreplaceable ecosystems.

S2.1.

Troglomorphy in Phalangodidae (Opiliones)

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Phalangodidae are small, armored opilionids (Laniatores), restricted to cool moist habitats, and are especially well represented in caves. Of the 140 species currently described, 60 are known from caves, and show varying degrees of cave adaptation. The acquisition of troglomorphies begins with leg elongation, evident even in cave populations of epigean species, followed by depigmentation and an increased tarsal count. Eye loss in troglobites starts with the reduction and loss of the retina, then the cornea, and finally to the reduction of the eye mound (ocularium). Species were scored to the degree of troglomorphy and their distributions plotted on maps. Two patterns are evident. In central Mexico, the northernmost species is epigean and southern troglobitic, whereas in the Holarctic, the northernmost species are more strongly troglomorphic. Several clines have been identified in the Nearctic: in *Banksula*, *Texella kokoweef* gp, Tex*ella mulaiki* gp. (three clines), and the *Phalangodes* complex of genera. A single cline occurs in the Mediterraneran fauna, with the epigean and troglophilic taxa towards the southwest, and the troglobites, *Lola* and *Paralola*, towards the northeast. If the acquisition of troglomorphies is a function of time, then the most troglomorphic elements (N-NE) must have entered the caves first, followed by the remaining (S-SE) taxa in succession. This suggests climatic changes altering surface habitats from N to S and catalyzed cave colonization.

S2.2.

All eyes on caves: comparative anatomy of eyes and brains of the cave funnel-web spider genus *Tegenaria* Latreille, 1804 (Araneae: Agelenidae)

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The reduction and loss of eyes is a recurring trait in various obligate cave-dwelling taxa, but there are multiple mechanisms whereby eyes can be lost. To date, no studies have compared the neuroanatomy of eye-bearing spiders to troglomorphic counterparts. Here, we applied histology, transmission electron microscopy and computer tomography to describe and compare the anatomy of eyes and brains in three closely related cave funnel-web spiders: *Tegenaria pagana* C. L. Koch, 1840 (developed eyes), *Tegenaria yaaranford* Aharon & Gavish-Regev, 2023 (reduced eyes) and *Tegenaria ornit* Aharon & Gavish-Regev, 2023 (completely blind). We show that principal eyes in *T. yaaranford* are more reduced than secondary eyes by comparison to *T. pagana*. By contrast, there are no traces of eyes at all in *T. ornit*. We also found incipient eye reduction at the level of retinal anatomy in the *T. pagana* species. The relative volumes of arcuate and mushroom bodies are much larger in *T. pagana* compared to its troglomorphic congeners. Comparison between these three taxa substantiates a model of a gradual reduction of the eyes and neuropils associated with the processing of visual information.

S2.3.

Genetic and morphological diversity of the cave spider *Stalagtia hercegovinensis*

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Dinaric karst is one of the global hotspots of underground biodiversity. As well as other peculiar and endemic organisms inhabiting Dinaric caves, certain groups of spiders show characteristic adaptations to underground conditions such as depigmentation and eye reduction. One such species is *Stalagtia hercegovinensis*, from the family Dysderidae, subfamily Harpacteinae. It is distributed in the southern Dinarides, from National Park Krka in the north, to northern Montenegro in the south. Such a large distribution area, more than 250 km long, is unusual for a cave adapted species, and raises a doubt that *S. hercegovinensis* is a species complex. To test this hypothesis, DNA of 68 specimens of *S. hercegovinensis*, collected throughout their whole distribution area, was isolated, and *COI*, *16S*, *18S*, *28S* and *H3* genes were amplified and sequenced. Phylogenetic analyses and species delimitation methods revealed the existence of six well supported and geographically separated groups. Further morphological analyses revealed discernible differences regarding the morphology of reproductive organs, the number and distribution of spines on anterior legs, and the degree of eye reduction. Observed morphological characters proved consistent in differentiating each previously established phylogenetic group from one another. In several cave localities, representatives of two genetic groups were discovered, representing a particularly rare occurrence for cave spiders. This research established a foundation for descriptions of new cave spider species in *S. hercegovinensis* complex. Recognizing this diversity could foster greater conservation efforts for these organisms and their habitat in southern Croatia.

S2.4.

Uncovering hidden diversity: taxonomy and conservation of brazilian cave pseudoscorpions

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This study presents a comprehensive taxonomic and ecological investigation of Brazilian cave-dwelling pseudoscorpions, focusing on three families: Chthoniidae (Chthonioidea), Ideoroncidae, and Syarinidae (Neobisioidea). The research addresses knowledge gaps in Neotropical subterranean biodiversity, combining species descriptions, taxonomic revisions, and conservation assessments. In Chthoniidae, the study documents: (i) cryptic troglobitic species from limestone caves in Northeastern Brazil and (ii) a new genus to accommodate morphologically divergent taxa from Amazonian caves. This new genus will include *Pseudochthonius orthodactylus* Muchmore, 1970 - a poorly understood species described from a single male holotype - as type species, based on comparative morphological analysis and upcoming examination of the original specimen at the American Museum of Natural History (AMNH). In Ideoroncidae, the research provides amendments to the genus-level key proposed by Harvey (2016), resolving classification challenges in Brazilian specimens. For Syarinidae, the study describes new cave-dwelling species, expanding the known diversity and distribution of the group. Methodologically, the research integrates detailed morphological analyses of museum specimens with new collections from caves across Brazil's diverse lithologies (e.g., ferruginous and limestone). Beyond taxonomic contributions, it underscores the value of museum collections in stabilizing species concepts and highlights institutional challenges faced by biodiversity researchers in the Global South. The findings advance pseudoscorpion systematics while providing a foundation for conserving Brazil's cave ecosystems and contribute with insights on cryptic species conservation for global subterranean biodiversity studies.

S2.5.

Genomic insights into the evolution of two highly troglomorphic pseudoscorpions from the Dinarides

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Subterranean biodiversity, including variation within and between species, remains poorly explored compared to that of surface ecosystems. *Neobisium spelaeum* (Schiödte, 1847), the first scientifically described cave-dwelling pseudoscorpion, inhabits the Dinaric Karst, a global hotspot of subterranean biodiversity. Despite a long-standing tradition of biospeleological research in the region, its genetic structure and evolutionary history remain unknown. This study investigates the taxonomy and evolutionary relationships of two endemic pseudoscorpion species from the Dinarides: *Neobisium spelaeum* and its morphologically similar *N. stygium* Beier, 1931. Large-scale mtDNA sequence data (304 specimens) and ddRADseq genomic data (91 specimens) were used to investigate the genetic diversity, evolutionary history, and biogeography of both species across their entire known distribution. Additionally, phenotypic data based on 22 characters from 102 fresh specimens, including those from type localities, as well as 22 type specimens, were used to explore phenotypic differentiation through geometric morphometrics. Species delimitation analyses were performed independently using both mtDNA data and nuclear genome-wide SNP data, while three complementary approaches were used to explore spatial patterns of genetic structure. The final dataset included 12,568 unlinked SNPs, with 32.81% missing data. No admixture was detected between lineages. All analyses consistently revealed seven deeply divergent, reciprocally monophyletic lineages, while molecular and phenotypic variation within lineages was low. The identified genetic clusters generally correspond to the two nominal species and their respective subspecies. Biogeographically, the distributions of lineages align with geographically isolated cave systems. These results underscore the importance of conserving karst regions and their narrowly endemic subterranean fauna.

S2.6.

Widespread but not uniform: cryptic diversity in the cave-adapted pseudoscorpion *Troglobisium racovitzai* (Ellingsen, 1912)

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Subterranean habitats are extreme environments, found just a few kilometers from urban areas. Species inhabiting them typically have extremely restricted distributions, largely due to limited dispersal abilities. However, some display unexpectedly broad ranges, which may result from enhanced dispersal, underground connectivity, or overlooked cryptic diversity. The highly cave-adapted pseudoscorpion *Troglobisium racovitzai*, the sole representative of its genus, is known only from caves in eastern Spain. Its distribution spans over 220 km north to south and can be divided into three geographically separated regions—northern, central, and southern—each isolated by natural barriers like the Ebre river. Given that many troglobionts exhibit strong genetic structuring across even short distances, we hypothesized that *T. racovitzai* may comprise multiple distinct evolutionary lineages. To test this, we analyzed both museum specimens (14) and recently collected material (5), using an integrative approach that combines morphological data (27 characters) and four molecular markers (three nuclear and one mitochondrial). The first three principal components accounted for 76% of the total morphological variation, with PC1 alone explaining 40% and primarily influenced by leg IV tarsus, and pedipalpal patella and pedipalpal femur ratios. PC2 (23%) captured variation in pedipalpal hand morphology, with the highest contributions from pedipalpal hand and movable finger. A phylogenetic analysis recovered three monophyletic lineages, with high mean *COI* pairwise distances between them (15.9-20.8% North-South). These results, together with morphological data, support the distinctiveness of the southern population as a new species, while additional material is needed to clarify species boundaries in the central region.

S2.7.

A preliminary overview of harvestmen (Opiliones) in Dinaric Karst caves

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The Dinaric Karst host one of the most diverse subterranean faunas in the world. Among arthropods, crustaceans and insects—especially beetles—exhibit the greatest species diversity. The proportion of arachnids is lower, but still significant. Here, we review the current state of knowledge on harvestmen (Opiliones) in the subterranean habitats of the Dinarides by synthesising published records, both primary and enriched, and including our own unpublished data. In total, this review includes over 500 records from Italy to Albania, about half of which are unpublished, and covers 87 valid species, considering only a single record of each species per cave. We discuss the gradual enrichment of the opilionid fauna along the Dinaric mountain range from northwest to southeast and present some further topics. The most diverse Dinaric troglobiont harvestmen are some Sironidae (*Cyphophthalmus*), Nemastomatidae (*Hadzinia*, *Nemaspela*) and Travuniidae. Species from the latter family are arbitrarily placed in three nominal genera *Travunia*, *Dinaria*, *Abasola*, as the genitalia of the first described *Travunia*, *T. troglodytes*, and its genetic relationships to other described species remain unknown. Two non-troglobiont Sclerosomatidae (*Amilenus*, *Nelima*) and two Nemastomatidae (*Paranemastoma*) have an important ecological role in Dinaric caves. An estimate of up to ten further, as yet undescribed species, some of which are troglobionts, likely brings the number of harvestman species living in the Dinaric caves close to the final count. Additionally, we reiterate that Travuniidae are missing in the northwestern Dinarides, and Ischyropsalididae in the central and southeastern Dinarides.

S2.8.

Adaptive trait divergence and functional morphological diversity in Anatolian subterranean spiders (Araneae: Linyphiidae)

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Spiders are among the most diverse and frequently encountered arthropods in subterranean ecosystems. In Anatolia, recent discoveries and morphometric analyses of cave-dwelling spiders, particularly members of Linyphiidae (*Troglohyphantes*, *Palliduphantes*, *Improphantes*, and *Lepthyphantes*) reveal extensive functional trait diversity at both interspecific and intraspecific levels. Trait-based assessments using hypervolumes and multivariate analyses of 15 species from these four genera reveal four distinct morphogroups that align along a gradient of troglomorphism, from weakly to strongly adapted forms. These patterns suggest multiple independent colonization events and varying depths of subterranean adaptation throughout evolutionary history, consistent with long-term lineage sorting and divergence. In contrast, focused analyses on the genus *Improphantes*, traditionally considered monotypic and restricted to moist epigean habitats, uncovered recently established subterranean populations that exhibit marked divergence in troglomorphic traits at both the population and species levels. These results support the adaptive shifts hypothesis, whereby ecological release and selection in novel subterranean niches drive rapid functional divergence from epigean counterparts. The juxtaposition of deep-time morphological sorting across genera with recent, niche-driven radiation within *Improphantes* highlights the dual roles of historical contingency and ongoing adaptive evolution in shaping the functional diversity of Anatolian cave spiders.

S2.9.

Where we're going, we won't need eyes to see: Distributional range size drivers for subterranean spiders

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Understanding species' range size and why closely related species can have drastically different distributions is a fundamental question in biology. This has implications in ecology, evolutionary biology, biogeography, and species conservation. However, answering this question is challenging due to the multiple inter-related factors that shape species distributions, particularly in continental regions, where unclear ecological and geographic boundaries and long evolutionary histories obscure the main drivers of range size variation. Island-like ecosystems such as caves, oceanic islands, and mountain tops provide exceptional models for studying species' biogeography and evolution due to their well-defined boundaries, reduced species pools, and often easily defined abiotic limiting factors. Against this backdrop, we aim to better understand the factors influencing distributional range size in subterranean species, choosing European spiders as a model system. We used Variation Partitioning Analysis to determine the relative influence of phenotypic subterranean adaptations, historical factors, and potential sampling biases on various range size metrics. Phenotypic adaptation to a subterranean lifestyle emerged as the most significant determinant of range size, particularly eye reduction and secondarily loss of pigmentation. In contrast, historical factors—past temperature fluctuations and ice coverage during the Last Glacial Maximum—and sampling biases had minimal impact on range sizes. Taxonomic relationships and other unaccounted factors also appeared to explain variation in range sizes, accounting for 33% random variance and 30% unexplained variance, respectively. This analysis suggests highly selective subterranean environments lead to specialized traits, which in turn seems to drive a drastic reduction in species' range size.

ORAL PRESENTATIONS

* Student Competition
** **PeerJ Student Contribution Competition** (topics in Taxonomy/Systematics/Phylogenetics/Biogeography)

O1.1.

Interspecific foraging response to thiacloprid treatment of top spider predators

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Neonicotinoids are nicotine-based substances used to control plant pests by targeting the nervous system of insects. Although considered selective, they may negatively affect non-target invertebrates such as spiders - abundant and diverse natural predators that contribute to pest suppression. Studies have shown both lethal and sublethal effects on spiders, affecting mortality, reproduction, movement, hunting efficiency, defence, and overall predation success. We studied the impact of thiacloprid, a neonicotinoid active substance, on the predatory activity of two common arboreal spider species in Europe: *Philodromus* sp. (Philodromidae) and *Anyphaena accentuata* (Anyphaenidae). We tested the effect on functional response and predatory activity (prey consumption, and overkilling). In addition, we monitored long-term survival of treated individuals and assessed whether insecticide residues affected predatory activity 14 days after application. We found that one-hour tarsal contact with thiacloprid reduced predatory activity in both spider species, but the effects were species-specific. *Anyphaena* spiders were more sensitive to the treatment, therefore the reduction of predatory activity was higher. In *Philodromus*, the treatment caused paralysis without increasing mortality. In contrast, *Anyphaena* showed significantly higher mortality without signs of paralysis. Fourteen days after application, we found no significant effects of insecticide residues on predatory activity in either species. Our findings demonstrate that neonicotinoid exposure elicits species-specific responses in spiders occupying similar trophic niches. These differences should be considered in ecological risk assessments of insecticides, especially regarding their impact on non-target arthropod predators.

O1.2.

Prey capture abilities of horticultural spider species with and without vibrational disturbance

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Integrated Pest Management (IPM) focuses on reducing agrichemical inputs into our ecosystems, whilst retaining productivity. Conservation biological control and applied biotremology are two approaches that have the potential to add to an IPM strategy. We measured the prey consumption rates of three spider species (*Maratus griseus*, *Socca pustulosa* and *Badumna longinqua*) commonly found in Aotearoa New Zealand kiwifruit (*Actinidia chinensis* var. chinensis) orchards, on two economically important kiwifruit insect pests (*Scolypopa australis* (PVH) and *Ctenopseustis obliquana* (Cob)). We also measured the prey-capture ability of these spiders on these pests under vibrational disturbance. This is the first study to analyse the off-target effects of applied biotremology on beneficial invertebrates. *Badumna longinqua* consumed significantly more (mean 10.4 PVH; 7.7 Cob) prey items than *M. griseus* (mean 4.9 PVH; 2.7 Cob) and *S. pustulosa* (mean 4 PVH; 2 Cob) over 5 days. In the vibrational disturbance experiment, the percentage of prey items consumed after 24 hours varied significantly with spider species ($p<0.001$), with fewer eaten by *S. pustulosa* (17%) than by *M. griseus* (57%) or by *B. longinqua* (77%). However, the differences between spider species varied with both vibration treatment and prey species ($p=0.022$ for the 3-way interaction). All three spider species studied have the potential to contribute to a reduction in pest insects of kiwifruit. Applied biotremology is likely to have a small effect on beneficial spider predators, but this may be positive or negative, varying by species and functional guild.

O1.3.

Where is better to live? Influence of the habitat on the mineral element content of wasp spider (*Argiope bruennichi*)

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The mineral content of spiders is almost unknown, especially at the species level. The effect of habitat on the mineral content of spiders is even less studied. The wasp spider (*Argiope bruennichi*) is a larger spider belonging to the *Araneidae* family that prefers humid habitats but also occurs in grasslands and even in agricultural areas. We investigated whether the wasp spider, as a top predator in the food chain, is affected by habitat in terms of mineral uptake. We selected three habitats that differed significantly in providing mineral elements to the living organisms: a stream valley, a peat bog and an agricultural field sown with corn. From the three habitats 41 samples were collected in August 2024. Each sample consisted of three female spiders. Each spider was kept alive in a plastic vial, the fresh weight was measured with an analytical balance on the same day, then the samples were dried at 70 °C. The dried samples were totally solubilized in concentrated nitric acid (65%) and hydrogen-peroxide (30%) in a microwave oven. The clear liquids were measured for macro and trace elements with a microwave plasma atomic emission spectrometer (MP-AES, Agilent). We found that the spiders inhabiting the peat bog had higher levels of aluminum, manganese and lead; those from the agricultural field had higher levels of zinc and magnesium; and spiders living in the stream valley had higher levels of calcium and strontium.

O2.1.

Spiky or smooth: How should widow spiders construct their egg sacs?

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The globally invasive brown widow spider, *Latrodectus geometricus,* constructs a spiky silk layer on the outer surface of its egg sacs, which has been shown to deter the wasp *Philolema latrodecti*, an egg sac parasitoid. In contrast, most other widow species have smooth-surfaced egg sacs. To gain insights into the costs of producing the spiky layer, we compared egg sac construction in the brown widow spider and the white widow spider, *L. pallidus*, a native species in the Negev desert with smooth egg sacs. We recorded the egg sac construction process and duration, and egg-sac characteristics such as total egg-sac mass, silk mass and number of eggs. In this study we show that the brown widows have smaller egg-sacs and fewer eggs compared to the white widow, and that the layer of silk covering the white widow egg sac is thicker than that of the brown widow. Despite this, the time that brown widows spent in covering the egg mass with silk was comparable to that of the white widow. Moreover, while covering egg sacs with silk, brown widows vigorously deposited silk, whereas the deposition rate of the white widows was lower. We conclude that the production of egg-sac spikes is relatively more costly for the brown widow in terms of silk deposition rate and energy than for the white widow. Nevertheless, such costs may be outweighed by the benefits of reduced parasitism.

O2.2.

Urbanization alters web architecture and body coloration in a nocturnal orb-weaving spider

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The influence of urbanization on animal behavior and phenotype has been increasingly studied in recent years. Although many controversies remain, urbanization may lead to smaller animals due to the urban heat island effect (UHI), artificial light at night, or various other factors. In this study, we investigated the effect of urbanization on the web-building behavior and body coloration of the nocturnal orb-weaving spider *Neoscona punctigera* by comparing body size, web architecture, and body coloration in 16 different urbanized populations. Our results indicate that urban spiders construct webs with more radii and have brighter abdomens than their rural counterparts. We discuss the potential influences of prey diet, wind effects, and UHI on the observed changes in web structure and body coloration between different urban habitats. Despite these findings, further research is needed to explore the ecological significance and potential drivers of these changes in web architecture and body color with urbanization. This study addresses the gap in research on the effects of urbanization on invertebrate behavior in Asia and provides a framework for future research.

O2.3.

Orb web asymmetry is explained by constraints in running speed

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Orb-webs differ greatly among spider lineages due to habitat and prey adaptations, phylogenetic constraints, and differences in body size. They also vary intraspecifically, with differences influenced by ontogenetic stage, body condition, food type, and weather conditions. One of the most striking architectural features that varies both within and between species is web symmetry. Both inter- and intraspecifically, small spiders generally build symmetrical, circular webs with the hub close to the geometrical center, while large spiders build vertically elongated webs with the hub displaced upwards. Prior studies identify body mass is the largest factor influencing the observed web symmetry variation, likely because gravity disproportionally affects running speeds in large spiders. However, the mechanisms by which body mass influences running speeds in webs remain unknown. We measured running speeds in vertical orb-webs across different directions and in relation to body mass and size, and we quantified underlying details, such as average and maximum speeds and acceleration, to infer the mechanisms by which gravity might affect heavier spiders. Preliminary results indicate that body mass alone does not fully explain running speed variation. While larger, and thus heavier, spiders generally run faster, body condition (mass relative to size) significantly affects running dynamics. Specifically, increased body condition is associated with greater differences between upward and downward maximum speeds and with reduced upward acceleration. These findings support the hypothesis that hub displacement in vertical orb-webs results from trade-offs in gravity-affected running speeds but also reveal that the underlying mechanisms are more complex than previously thought.

O2.4.

Effects of biotic and abiotic factors on spiders' web phenotypic and material properties adaptation

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Spider's extended phenotype, the spider web, has obtained considerable attention due to its high plasticity and toughness, as well as its sensitivity to the surrounding environment. We found several new species of spiders from the genus *Zygiella* in Taiwan at different elevations. In this study, we used the *Zygiella pervagata* spider, which has a wide elevation distribution along the same mountain line. My research aims to explore the intraspecific variation in spider, web, and silk along the elevation gradient. I first explored spiders, webs, and silk glue droplets' morphology, material properties, and prey type preferences of *Z. prevagata* spiders inhabiting high and low elevations. We then performed common garden experiments to examine the web and silk's architectural adjustment ability, including their size and number of glue droplets to environmental condition changes by placing spiders collected from high and lower elevations in a walk-in chamber with controlled humidity, temperature, and lights set to middle elevation conditions. Through field observations, we found that spiders had different body sizes and web structures at different elevations. In high elevation, their body, web, and gluedropet size are bigger compared to the low elevation group, but stickiness remains the same. In common garden experiments, no noticeable morphological changes were observed after treatments. Combining the two results shows that spiders ' web-building behaviour had been fixed to their original habitat and could not be adjusted after environmental changes. Our research shows the local adaptation of spiders' web-building behavior with field observation and a common garden experiment.

O2.5.

Jump Scare: biomechanics of reverse jumping in arboreal sac spiders (*Clubiona corticalis*)

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Jumping behaviour in spiders has been well known and studied extensively in jumping spiders (Salticidae), where it is primarily used for prey capture and locomotion. In contrast, jumping in non-salticid species remains poorly understood. In the present study, we investigated the behaviour and kinematics of the lesser known backwards-directed bungee jumps of sac spiders (Clubionidae). We studied *Clubiona corticalis* individuals performing escape jumps from an elevated platform. The jumps were recorded using a high-speed video camera at 4,500 frames per second and analysed by manual tracking of the movements of the spider's centre of mass and leg joints. From the movement tracks, we calculated velocity, acceleration, kinetic energy, and leg extension. The results revealed that *C. corticalis* primarily utilises its fourth pair of legs to take-off. The retraction of hind legs just before the jump, enables prolonged leg extension and thrust generation. After take-off the spiders perform a somersault and brace with their dragline few centimetres below the jump-off point. Investigation of the mechanical properties of the dragline via tensile tests revealed that it is very strong and able to absorb the kinetic energy of the falling spider. With the help of micro-computed tomography, it was found that *C. corticalis* possesses a muscle inside the anterior lateral spinnerets that could work to compress the spinning duct, helping to brace on the dragline without the use of legs. This reverse jumping behaviour in *Clubiona corticalis* is defensive, rapid, directionally backwards and an under-explored mode of locomotion in non-salticid spiders.

O2.6.

Body coloration associated with female pre-existing biases in nocturnal spiders

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Conspicuous body coloration in animals can serve various functions, including warning signals, species recognition, prey attraction, and mate attraction. This study investigated the role of conspicuous coloration in courtship interactions among nocturnal spiders. In Taiwan, two brown huntsman spider species (*Heteropoda venatoria* and *H. simplex*) coexist and exhibit similar morphology, though only *H. venatoria* possesses distinct white stripes on its forehead. We conducted three controlled experiments to assess whether this white stripe functions as a species recognition cue or a novel sexual trait in nocturnal wandering spiders.The first two experiments involved heterospecific pairings between *H. simplex* and *H. venatoria*; the third used conspecific *H. simplex* pairings. In Experiment 1, female *H. simplex* were paired with male *H. venatoria* with either intact or experimentally removed white stripes. In Experiment 2, male *H. simplex* were paired with female *H. venatoria*, also with or without stripes. In Experiment 3, white paint was applied to the foreheads of *H. simplex* males to mimic the trait. Results showed that female *H. simplex* preferred *H. venatoria* males with intact stripes (Experiment 1), while male *H. simplex* courted *H. venatoria* females regardless of stripe presence (Experiment 2). In conspecific trials (Experiment 3), female *H. simplex* preferred males with artificial stripes. These findings suggest the white stripe does not serve as a species recognition signal. Instead, *H. simplex* females exhibit a pre-existing visual bias toward novel traits, highlighting the role of sensory exploitation in nocturnal arthropod mate choice.

O2.7.

Spider predatory aggressiveness exhibits diverse personality and plasticity associations and complex neurophysiological mechanisms

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Although animal personality has been extensively studied for decades, its relationship with behavioral plasticity remains poorly understood, and the underlying neurophysiological mechanisms are largely unexplored. In this study, we addressed this gap by integrating field surveys, behavioral assays, transcriptomic profiling, and biochemical analyses to investigate personality and plasticity in the predatory aggressiveness of the wolf spider *Hippasa holmerae*. A total of 103 individuals were collected from the wild, and their willingness to attack a dangerous East Indian harvest ant (*Carebara diversa*) was evaluated. Nearly half of the spiders displayed high behavioral plasticity, while the others exhibited consistent individual differences indicative of personality. Modeling results further suggested that proactive personalities may constrain adaptive plasticity. Transcriptomic analyses of brains from individuals with high and low aggressiveness revealed that over 20% of genes within 19 physiological systems were differentially expressed, predominantly due to gene upregulation in highly aggressive individuals. Biochemical assays showed significantly lower brain tryptophan concentrations in highly aggressive spiders. These patterns align with the “big vs. small engine” concept proposed in the pace-of-life syndrome and energy management models. Our findings reveal a personality-plasticity trade-off and suggest that personality variation may stem from systemic physiological differences, emphasizing the need to distinguish personality from plasticity in behavioral research and to consider multiple physiological systems in mechanistic studies.

O2.8.

Polysphincta group Parasitoids associated with sheet web spiders

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Polysphincta genus group wasps (Ichneumonidae: Pimplinae, Ephialtinae) are koinobiont ectoparasitoids specialized in parasitizing spider hosts. One of the most frequently parasitized families is the family Linyphiidae. This is one of the most abundant families of spiders, however, few representatives of parasitoid wasps are known to use these spiders as hosts. Therefore, their parasitic interactions are particularly interesting and poorly studied. This study summarizes all knowledge, published and unpublished, on their ecology and host interactions, including behavioral manipulation. The wasps of the genera *Acrodactyla*, *Eruga*, *Longitibia* and *Zatypota* are associated with spiders of the family Linyphiidae. Differences in host specificity and behavioral manipulation exist between genera. In Europe, the association of parasitoid wasps with spiders is known only for the genus *Acrodactyla*. The latter is mainly represented in this area by *Acrodactyla degener*, but it is assumed that cryptic species exist. Based on our preliminary results, we hypothesize that these cryptic species may differ ecologically, specifically in their preference for different altitudes. We also report new host associations of the parasitoid wasp *Acrodactyla degener* with spiders *Mughiphantes mughi* and *Entelecara congenera*. This research contributes to a deeper understanding of host-parasitoid coevolution and the ecological dynamics of spider-parasitoid systems.

O2.9.

Hyper-elastic reeled radii enable swinging strike movements in netcasting spiders (Deinopidae)

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Netcasters (Deinopidae) have evolved a unique predatory behaviour, where the cribellar net is held with the front legs and thrown against the prey. During the strike the spiders launch themselves forward and rapidly extend the net before casting it over the prey. Subsequently, the net collapses around the prey and the spider swings back into its original position. During this dynamic movement the strains and elastic responses of the netcaster web radii and frame exceed by far those observed in orb web radii subject to prey interception as well as such strains spider draglines can typically sustain, which prompted us to investigate the properties, structure and spinning of these threads. We found that netcaster radii have a unique structure, highly distinct from orb web radii, with an elastomeric core and a shell comprised of loops of bundles of thin fibres. During extension such compound threads are initially very soft, allowing for long, effortless stretching before the looped fibre bundles become straightened and add substantial strength, preventing the thread to break. The structure results from a special spinning technique that involves reeling with the hind legs. The spiders tailor the extensibility of each web element by adjusting reeling cycles and thread mixture, creating an elasticity gradient from stiff and strong in the main load bearing line to initially soft and hyper-elastic in the lower radius, which is subject to most extreme deformation during the strike. These results demonstrate the functional specialisation and extreme divergence of the net caster web architecture.

O2.10.

Spiders adjust orb web architecture and performance across an elevation gradient

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Environmental gradients impose a variety of selective pressures on organisms, influencing their morphology, physiology, and behavior. Although research on elevational gradients has largely focused on physiological or morphological adaptations, behavioral responses are less frequently quantified, especially in natural settings. Web-building spiders offer a valuable model for filling this gap, as they interact with their environment through their webs, which serve as quantifiable extended phenotypes. The mechanical properties of silks along with how spiders deploy it during web construction, influence web performance and represent crucial components of individual fitness. Here, we investigate the newly discovered species *Zygiella pervagata* that is unusual in spanning a wide elevation of more than 2,000 m in Taiwan, where average temperatures vary from ~25°C to 5°C. This species provides a rare opportunity to explore how spiders cope with altitudinal variation in both behavioral and biomaterial traits. We collected adult females across the full elevation range and assessed: (i) variation in body size; (ii) investment in web construction, including volumes of radial silk, capture spiral, and glue; and (iii) web performance, measured in terms of interception, stopping, and retention potential. Our results reveal that spiders at higher elevation tend to be larger, invest less silk but produce more glue, and build webs with reduced stopping potential. We hypothesize that increased glue production at high elevations, possibly to counteract low temperatures, trades off with overall web performance. This study highlights how behavioral and material traits shape invertebrate adaptation and calls for further research into plastic and evolutionary responses.

O3.1.

Optimizing spider community monitoring: testing the effects of sampling effort and season

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Optimal sampling strategies have been developed to efficiently survey highly diverse taxa, such as arthropods, which is a crucial task in the current biodiversity crisis. The Conservation Oriented Biodiversity Rapid Assessment (COBRA) is a standardised, plot-based, sampling protocol optimised for characterising spider communities. Although initially designed for community inventorying, several low-effort versions have been developed in-silico, tailored explicitly for monitoring purposes. Here, we aim to empirically test the ability of the newly designed monitoring protocol to detect changes in spider communities across habitats and seasons. We used spider assemblages sampled in different forest habitats in a natural park near Barcelona (Catalonia, Iberian Peninsula). A high sampling effort was conducted in the fall (September), while a low sampling effort was conducted in the same habitats in the spring (May). To compare the two protocols, we generated a reduced matrix from the inventory datasets using resampling to simulate a reduced sampling effort for monitoring purposes. By comparing alpha- and beta-diversity captured with different sampling efforts, we obtained similar abundance-based diversity and beta-diversity patterns across habitats. When comparing between seasons, our results uncovered higher species diversity in spring, but otherwise similar beta-diversity patterns across habitats. However, community composition was significantly different between seasons. Our study demonstrates that low-effort COBRA is an effective protocol for capturing common species and accurately documenting shifts in diversity patterns across diverse forest types and over time. Moreover, requiring fewer resources, the low-effort COBRA represents a valuable and easily repeatable tool for biodiversity monitoring.

O3.2.

Niche segregation in three crab spider species (Araneae: Thomisidae)

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Understanding ecological niches makes it possible to assess how species respond to alterations of environmental conditions and trophic interactions caused by climate change. However, integrating abiotic and biotic niche axes remains challenging. Citizen Science platforms provide large-scale and multi-taxa data to support those efforts, but spiders are frequently underrepresented due to public aversion. Thomisidae, being colourful and frequently observed on flowers with prey, are promising models for studying ecological niches using Citizen Science data. In this study, we analysed 627 iNaturalist Italian records of three Thomisidae species, *Misumena vatia*, *Thomisus onustus* and *Synema globosum*, photographed with prey on flowers to assess their ecological niches in terms of environmental and trophic preferences. We first assessed the affinity of each species with the Italian Köppen's climatic regions by analysing niche overlap, equivalency and similarity, unfilling, expansion, and stability. *Misumena vatia* emerged as a more Alpine-Temperate spider, while the other two species were more Mediterranean-Temperate. The same parameters were used to assess overlap in environmental niches between the species, showing the highest overlap between *T. onustus* and *S. globosum*. Finally, bipartite networks highlighted that all the three species primarily hunted on Asteraceae flowers, and their prey mainly belonged to the Apidae family, although network structure, dietary overlap, and specialisation varied slightly across climatic regions. This study highlights Citizen Science data's value in capturing multidimensional niches and shows how climate influences spider-prey-plant networks. Such insights are crucial for understanding how climate change may disrupt trophic dynamics involving these underappreciated arachnids.

O3.3.

Cut less, save more: partial cutting to conserve boreal forest spiders in Canada

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In Quebec, Eastern Canada, the success of ecosystem-based forest management depends on its ability to maintain diverse, high-quality habitats for different taxa. Clearcutting simplifies habitats and restarts forest succession. In contrast, partial cutting better preserves mature forest features and may increase heterogeneity. Spider diversity and composition respond quickly to logging disturbances, and recovery speed of their assemblages depends on retained forest cover. Research has shown they remain modified 15 years after cutting in boreal mixedwoods. Here, we compare ground- and bark-dwelling spider assemblages 23 years after partial cuts and clearcuts in Quebec boreal mixedwoods. Over 3 months, we set 255 traps in a 114-year-old mixed forest. Our design included four treatments: control, clearcut, regular and gap partial cuts. A 264-year-old primary forest serves as old-growth reference. Over 10,000 spiders representing more than 100 species were sampled. We compared these assemblages using HMSC (Hierarchical Modelling of Species Communities) models, accounting for random, spatial, phylogenetic and biotic effects. Changes in spider assemblages were also related to forest complexity: stand structure, tree-microhabitats, deadwood; and through remote sensing: canopy, humidity and topography. With analyses nearly complete, we expect clearcuts to yield modified assemblages, poorer but more abundant than controls, dominated by ground-runners (Lycosidae). In partial cuts, which better preserve habitat features, we expect no significant modification. We anticipate better conservation of species richness and forest specialists (Linyphiidae, Amaurobiidae), perhaps shifting toward old-growth assemblages through accelerated succession. This study therefore quantifies lasting impacts of forestry on spiders and identifies key forest features for their conservation.

O3.4.

BioBlitzes - A waste of time or valuable biodiversity research: potential and limitations of a 24-hour mapping. (Arachnida: Araneae, Opiliones, Scorpiones)

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BioBlitz is a biological survey which attempts to record a maximum of species within a designated area. Scientists and naturalists conduct a field study over a time frame of usually 24 hours. Moreover, there is a public component to BioBlitzes, with the goal of getting people interested in biodiversity research. The first BioBlitz was held in 1996 in Washington D.C., later in Europe as the so-called GEO-days of biodiversity from 1999 onwards. So far our arachnological team has participated in 25 BioBlitzes in Austria. They took place from within the Pannonic Region to the Southern, Central and Northern Alps, from valleys up to the high alpine zone and from riparian forests up to alpine grassland and rock debris. Over all the years we collected a total of 400 spider species, 44 harvestman species (60% of Austria´s fauna) and 1 scorpion species. Mean values and maxima of documented species numbers are 56/119 for Araneae and 12/24 for Opiliones. Beside several new records for Austria, or our federal states, remarkable findings of Red List species include *Acantholycosa lignaria*, *Araneus grossus* and *Anelasmocephalus hadzii*, myrmecophilous species like *Syedra myrmicarum*, alpine species like *Pardosa nigra* and endemics like *Troglohyphantes subalpinus*, *Nemastoma relictum* or *Megabunus lesserti*. Questions arising are: (1) Concerning zoological field work - what´s possible within 24 hours? (2) Are these gained, not standardized datasets useful in term of faunistics or nature conservation? (3) Is BioBlitz a valuable biodiversity event or an ecological fig leaf for poor research activities?

O3.5.

Community assembly and biodiversity drivers on islands and continents

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One of the main aspects in the study of global patterns of biodiversity is understanding how communities assemble, and the evolutionary and ecological consequences of it. In this study we use spiders as model organisms and multiple island and continent datasets (Macaronesian archipelagoes and Iberian Peninsula) to compare taxonomic (TD), phylogenetic (PD) and functional (FD) diversity drivers between systems where distinct processes have shaped the current species composition. A phylogenetic tree with 492 taxa and 2 genes (mitochondrial and nuclear) was reconstructed to calculate PD indices. A functional database that includes life history traits (morphology, dispersal abilities, circadian activity, foraging strategy, prey range and vertical stratification) was used to build a global functional space and calculate FD indices. Furthermore, data on climate and vegetation productivity was collected to examine their effects on the observed patterns. Our preliminary results showed that, due to the differing ecological and evolutionary characteristics of islands and continent, contrasting patterns of phylogenetic and functional community structure were observed between both ecosystems. As expected, the number of species and the functional and phylogenetic diversity was higher in the continent compared to the islands. However, when corrected by species richness, the functional diversity was similar in both ecosystems, suggesting that the ecological role of many species from the continent not present in the the archipelagoes is being replaced by lineages occupying broader vacant niches on islands. Furthermore, we were able to detect both competitive exclusion and environmental filtering in the assembly of island communities.

O3.6.

A spider on the fourth corner: how microhabitat preference reshapes functional space and trait-environment relationships in Iberian spiders

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Functional ecology aims to understand the diversity of species' traits that influence ecosystem processes, as well as the interaction between these traits and the environment. The variability of traits across taxa is used to generate a functional space, from which the scores for species are extracted for further analyses. To build a functional space, the choice of traits, their quantification, and codification are critical. The study of functional diversity has gained traction in recent years, and one trait considered in many studies is microhabitat preference. Spiders are a megadiverse and ubiquitous group of organisms that play a key role as generalist and specialist predators in ecosystems. Different spiders may exhibit similar morphologies and hunting strategies, but they are performed on different vegetation layers or the ground, and therefore each species can access a vastly different array of prey. Some commonly implemented sampling protocols capture spiders across vegetation layers, which can be used as a proxy for microhabitat preference. However, this straightforward approach may not be the most appropriate because habitat preference is not the only factor in determining the likelihood of a spider being captured by a specific sampling method and vegetation layer. Here, we explore how different functional traits coding methods for microhabitat preference can affect the functional space of Iberian spiders. Furthermore, we examine how different functional spaces impact the outcome of modelling trait-environment interactions across forests of the northeastern Iberian Peninsula.

O3.7.

The jumping spiders of Wallacea: occurrence patterns and predictions

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Positioned between Southeast Asia and Australia, Wallacea is among the world's most fascinating regions for investigating tropical biodiversity, biogeography, and evolution. We limited this study to the Salticidae because of their broad appeal within the citizen science community as well as the international research community. We accessed occurrence data for the spider family Salticidae from Southeast Asia, Australia, and the Wallacean islands using the Global Biodiversity Information Facility, the central aggregator of records indicating which species were observed where and when. Aware that not all records have been digitized and mobilized to GBIF, we also consulted the World Spider Catalog, which includes a distribution summary for each species based on records published in taxonomic literature. We were able to rank regions by sampling intensity, and the relative contributions of institutional researchers and citizen science communities. We attempted to identify synanthropic species, a relatively recent phenomenon that can obscure the deeper historical pattern and also have implications for conservation. Hierarchical clustering based on the salticid species community splits at Wallace's line. Records from the island of Java are abundant thanks to an active citizen science community. Based on this relatively complete inventory, we extrapolate the expected species richness on other islands.

O3.8.

Time series of pitfall trap data reveal contrasting abundance trends in ground hunting versus web-building spiders

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Several studies confirmed widespread decline in biomass and abundance of insects during the last decades, yet it remained unclear whether spiders were affected to a similar extent. Here we present the first large-scale time series analysis of spider data from pitfall trapping. We compiled a dataset of > 1500 plots across Germany that were re-sampled with standardized methodology in multiple years, comprising approximately 2 million individuals from 835 species. Our time series covered the period from 1979 to 2023. Data from overlapping periods were analysed by fitting generalized linear models per locality and species for species abundance data with time as a predictor. For analysis at the species level, linear trends were aggregated across all plots and intervals and subjected to a binomial test. At the community level across all habitats, we found neither significant trends in abundance nor in biodiversity indices (Shannon, Pielou, Inverse Simpson). Also at the species level a balanced pattern emerged, with 54 species showing significant positive and 54 species showing significant negative trends. However, there was strong taxonomic bias in the increasing and decreasing species sets. Among Linyphiidae 40 species showed negative abundance trends, but only 10 increased significantly. Vice versa, 11 species of Lycosidae showed significant positive abundance trends, while only two decreased. Analysis at guild level across all taxa and habitats confirmed significant negative trends in web weavers, but positive tendencies in cursorial and ambush hunters. Thus, our study disclosed substantial shifts in taxonomic and functional composition of central European spider communities.

O3.9.

Spiders as effective indicators of urban ecological change: comparative patterns across arthropod taxa and cities

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Urbanization strongly impacts biodiversity and related ecosystem services, making its proper evaluation essential. This study examines how ground dwelling spiders respond to urbanization across four Italian cities—Torino, Milano, Roma, and Firenze—and compares their patterns with those of other ground-dwelling arthropods. In each city, seven to nine sites were selected along an urbanization gradient. At each site, two subplots were established: one in an urban park, and one in a smaller green patch embedded in the urban matrix. Sampling was conducted using pitfall traps during three sessions of three weeks each, from mid-April to late July 2023. Nearly 14000 individuals from six major arthropod groups were collected and identified to species level: Araneae, Coleoptera Carabidae and Tenebrionidae, Isopoda, Chilopoda and Pseudoscorpiones. Spiders (Araneae) were the most abundant (3,407 individuals) and the species-rich (155 species) and responded consistently to both local and landscape-scale variables. Their diversity was higher in less urbanized, less fragmented, and more herbaceous subplots with no significant variation across cities. In contrast, the other groups exhibited more variable patterns: Pseudoscorpiones and Isopoda were mainly influenced by regional factors, while Carabidae, Tenebrionidae responded more to local site conditions. Our findings reinforce the reliability of spiders as bioindicators in urban ecological studies, particularly within multi-city frameworks.

O3.10.

A summer with spiders: dispersal and assemblage composition during the drying of a Mediterranean intermittent river

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Intermittent rivers, common in Mediterranean, exhibit seasonal changes that create a mosaic of aquatic and terrestrial habitats that can be colonized by different invertebrate communities. This study investigated spider dispersal patterns and assemblage composition during the seasonal drying of the Krčić River in Croatia. Spiders were collected using pitfall traps from June to October, covering the transition from flowing to dry conditions. Sampling occurred in four habitats, depending on availability: upland, riparian, habitats around temporary pools, and the dry riverbed. Lycosidae was the most abundant family, while Gnaphosidae exhibited the highest species richness. Activity density varied spatially and temporally, with riparian habitat constantly showing the highest values, followed by dry riverbed, which also showed significantly higher activity density than temporary pools, potentially due to karst features providing moisture below the surface and the short availability of pools. Spider assemblage composition differed significantly among habitats at both the family and species levels. Lycosidae dominated newly available habitats, with *Pardosa proxima* emerging as dry riverbed indicator species due to its higher activity density compared to other habitats. In contrast, Gnaphosidae species were more associated with upland habitats. Beta diversity across months revealed high dissimilarity overall, with species replacement the primary driver across all habitats. However, in the riparian habitat, richness differences contributed more to beta diversity compared to other habitats, particularly during the drying phase. These findings highlight the potential of spiders as indicators of habitat dynamics in intermittent rivers, but further research across different rivers is needed to validate these patterns.

O3.11.

Spiders in the tundra: how communities assemble at archaeological sites

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Arthropod communities, especially spiders, remain understudied in subarctic environments compared to their temperate counterparts. Understanding how communities assemble under these climates is of key importance, to better predict how they will react to on-going and further climatic changes. In order to get a better understanding of both taxonomic and functional diversity, three complementary sampling methods, namely hand-collecting, G-Vac suctioning and pitfall trapping were employed in Nunavik (Quebec, Canada) inside and outside archeological structures (Inuit houses, built around 300 to 200 years ago), where vegetation assemblages differed. 1205 arthropods were sampled, among them 183 were spiders, while the others belonged to 11 arthropod non-Araneae orders. Spiders were most efficiently sampled through hand collection in terms of numbers, while G-Vac was more effective for the other arthropods, particularly mites. Spiders were split into two guilds: ground hunters and web builders. Four families were sampled inside archaeological houses: Araneidae, Gnaphosidae, Linyphiidae and Lycosidae, the latter turning out to be the most abundant. Ground hunters dominated the functional composition with 70% of individuals of that guild. Higher taxonomic diversity, however, was observed outside houses, where six families, Clubionidae, Hahniidae, Linyphiidae, Lycosidae, Salticidae and Theridiidae were sampled, with a more even 41%/59% split between functional guilds (grounds hunters vs web builders respectively). Further studies and additional sampling sessions are planned, in order to better understand community composition of arthropods in subarctic environments, and how they relate to unusual structures, once focal points of human activities, now claimed back by the tundra.

O3.12.

Spiders (Araneae) of the Duruitoarea Canyon (Republic of Moldova): diversity on Former Sarmatian Sea Land

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In 2024, a systematic survey of spider diversity (Araneae) was conducted near Duruitoarea, Rîșcani District, Moldova. Seven sampling sites were established, each with five pitfall traps placed on a limestone slope among steppe and meadow vegetation in varied microhabitats (under tree canopies, near boulders, and among the herbaceous cover). Spiders were collected monthly from these traps and by sweeping vegetation. The study area lies in a unique limestone landscape shaped by remnants of the Sarmatian Sea, characterized by massive limestone formations and approximately 200 m high rocky ridge forming a small canyon through which the Duruitoarea River flows, though its course has been partially modified by anthropogenic activity. In total, 3,613 spider specimens were collected and identified, representing 168 species. Pitfall traps yielded 2,474 individuals (156 species) and sweeping yielded 1,139 individuals (30 species). We recorded 62 species for the first time in Moldova, including several Eastern European endemics. Notably, at a ridge-top site, *Eresus kollari* Rossi, 1846 was dominant with 76 individuals. The study revealed biotope-specific assemblages and habitat associations in a geologically and ecologically significant landscape. The presence of steppe and rocky vegetation communities hosting seven rare vascular plant species protected at the national level (including four listed in Moldova's Red Book) further underscores the site's importance for biodiversity monitoring and conservation in Eastern Europe.

O3.13.

Persian silk road: diversity and distribution patterns of Iranian spiders under sampling bias

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Over the past two decades, Iranian spiders have been the focus of extensive taxonomic and faunistic surveys. Currently, approximately 1,000 species are known from the country, including roughly 250 endemics. However, large portions of the country remain poorly studied, with vast regions either inadequately sampled or entirely unsurveyed. We conducted a comprehensive review of spatial variation in the diversity patterns of Iranian spiders and assessed the impact of sampling bias on our current understanding of their distribution. For this, we compiled a database of over 4,400 non-duplicate spider records from Iran. Despite significant advancements in taxonomic research over the past two decades, the records were found to be highly unevenly distributed across the country and its 18 terrestrial ecoregions. Most records are concentrated near major population centres, with approximately 85% of the country's land area lacking a single documented spider record, which suggests a severe Wallacean shortfall. On the other hand, we observed a significant reduction in the Linnean shortfall concerning the Iranian spider fauna, as evidenced by a sharp increase in recorded and described spider species for the country, at a rate higher than the global average. Our analyses revealed a strong correlation between the number of spider records and species richness with the number of records of plants and other animals in Iran, suggesting that the biodiversity shortfalls observed for spiders likely extend to other taxa. Similar biases are expected in other countries, as land area alone explained only 33.24% of spider species richness across 171 compared countries.

O4.1.

Biogeographical analyses showed the multiple dispersal history of *Allochthonius* in East Asia

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East Asia is a geologically dynamic region shaped by tectonic subductions, volcanic activity, and plate movements. These processes have profoundly influenced regional biodiversity, yet the evolutionary origins and diversification patterns of many invertebrate groups remain unclear. One such group is *Allochthonius*, a genus within the ancient arachnid order Pseudoscorpiones De Geer, 1778. Thought to have originated in the Late Cretaceous, *Allochthonius* is now found in South Korea, Japan, northeastern China, and the Russian Far East. Due to its limited dispersal ability and distinct geographic distribution, East Asia's complex geological history has likely played a significant role in shaping its current range. To explain this pattern, two hypotheses have been proposed: the isolation hypothesis, which emphasizes the genus's low dispersal capacity and the role of geographic barriers in promoting allopatric speciation; and the overlap hypothesis, which highlights how East Asia's shifting landscapes, such as alternating land connections and separations, may have facilitated both dispersal and vicariance, leading to areas of sympatry. To test these ideas, we conducted phylogenetic reconstructions, divergence dating, and biogeographic analyses. Our findings reveal that *Allochthonius* exhibits a complex, partially overlapping distribution pattern shaped by cycles of land connectivity and isolation, as well as the formation of geographic barriers.

O4.2.

Diversity and origin of the endemic tunnel-web spider family Porrhothelidae (Mygalomorphae) from New Zealand

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The distribution of species is driven by two processes: vicariance and dispersal. In New Zealand, many events have shaped the current biogeography of its species. Since its separation from Gondwana 80-65 Ma, the land was mostly submerged in the Oligocene, uplifted by plate collisions 15 Ma and glaciations in the last 2.5 Ma. New Zealand's isolation explains the great diversity and high levels of endemism in its flora and fauna. For example, the endemic, monogeneric spider family Porrhothelidae, which currently has five species. *Porrhothele* spp. are large burrowing spiders and not obvious candidates for trans-oceanic dispersal. In a 2020 study that included most mygalomorph families, the origin of the family lineage was estimated ca. 180 Ma, though only one porrhothelid specimen was included. This would mean that the ancestors of this family were extant in Gondwana prior to the rifting of Zealandia from Australia. If they then survived all the events involved in the creation of modern New Zealand (since 80-65 Ma) and all resulting effects (isolation, drowning, landmass reduction, mountain building) they may represent a taxon resulting from ancient vicariance, something not yet found in any other New Zealand spiders and only twice in other terrestrial arthropods. To reconstruct the history of the family Porrhothelidae, we increased sampling across New Zealand to include all known species. Using UCE to reconstruct the phylogenetic hypothesis, our results revealed greater diversity, new inference of the origin and divergence of the family.

O4.3.

Niche-biotope duality and population genetics to reconstruct the geographic range expansion history of the spider species *Zodarion rubidum* Simon, 1914

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Understanding the history of a geographic range expansion is crucial. It helps to identify the factors responsible for such phenomenon and to conclude on its nature (e.g. natural recolonization vs human-mediated expansion) and provides a basis to generate further fundamental eco-evolutionary hypotheses. While historical records allow to investigate the niche-biotope duality to predict the distribution of an expanding species, molecular methods can bring additional information for reconstructing the history of an expansion, e.g. by identifying the potential origin and main colonization events such as multiple introductions, or by estimating the genetic structure of populations over space. In this study, we investigated the understudied geographic range expansion of the European spider *Zodarion rubidum* Simon, 1914, focusing on the history of its expansion and on its potential actual and future distribution. First, we investigated the spatial relationships between 55 field-sampled populations, by building a haplotype network based on mtDNA data (*COI*), and by correlating genetic and geographic (air, road and railway) distances. We then assessed the species expansion rate by building a diffusion model using occurrence data. Finally, we estimated current and future suitable habitat areas across Europe by building two species distribution models, based (i) on the species' native climatic niche only and (ii) on all known occurrences including different climatic scenarios, anthropogenic factors and landscape connectivity. We hypothesized that the range-expansion of *Z. rubidum* followed a continuous southeast-to-north and eastward progression across Europe, following major anthropogenic transport routes. Here, we present the preliminary results of our analyses.

O5.1.

A hairy business: investigating the interplay of species traits and trade dynamics in the tarantula pet market

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Species traits play a crucial role in shaping dynamics within the exotic pet trade, influencing consumer demand, patterns of exploitation, and extinction risk. In this study, we examined how species-level traits and advertisement-specific factors affect tarantula abundance and pricing in online markets, with particular attention to rarely studied fine-scale characteristics. Our dataset comprises 1014 advertisements representing 177 species and 78 trade names, collected from eight e-commerce platforms across six countries in May 2023. Using a Piecewise Structural Equation Modelling (SEM) framework, we explored the relationships among species traits, advertisement-level variables, online popularity, market abundance, and price. We identified a significant positive effect of online popularity on species market abundance, which in turn had a small but significant positive effect on mean advertised price. Older species, with more vivid colours, longer body hairs, and with evidence of captive breeding were significantly more popular. Species with older, more stable name combinations were significantly less abundant in the market, as were newly described species. However, time since original description had no direct effect on price. Species from Nearctic regions were advertised at significantly higher prices than Afrotropical and Neotropical species while species with synonyms were also significantly lower in price. These findings have important implications for tarantula conservation as well as for the regulation and management of the trade. Leveraging marketing insights can help conservationists more effectively engage with consumers, promote informed and responsible choices, foster sustainable practices, and support benefit-sharing with wildlife-dependent communities.

O5.2.

Spiders as monitoring tools of restored forests in Ghana

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Ghana, is experiencing accelerated deforestation driven by anthropogenic activities, including logging, mining, and agricultural expansion, and infrastructural development. The practice of sustainable forest management has historically relied on the involvement of concession companies whose practices has led to the introduction and subsequent propagation of several plant species that were not previously present in the ecosystem. Consequently, monitoring of the overall biodiversity of restored forest areas cannot rely solely on plant composition. Spiders are the most dominant predators of arthropods in forest ecosystems worldwide consuming more prey in tropical forests and are potentially sensitive to even minor changes in local conditions. The objective of this study was to assess the diversity of spiders in tropical forests in Ghana that have been managed in different ways: a) primary forest as reference for a natural system, b) restored forest following post-logging, c) agroforestry and d) and an open area as worst-case scenario. Sampling was conducted in the dry and rainy seasons using pitfall traps for ground-running species, visual searching for web-building species, and sheet beating for arboreal species. A total of 41 distinct spider families were identified. High level activity density observed in sheet beating, pitfall traps and visual searching respectively across habitats. Spider activity was highest in agroforestry systems, followed by primary forest. Conversely, spider activity was lowest in restored forests and open areas. The most abundant families identified were Salticidae, Lycosidae, Zodariidae, Araneidae and Ctenidae. This demonstrates that management strategies implemented can influence not only the spider activity, but also diversity.

O5.3.

Restoration of degraded wetland: how management measures shape spider community

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Wetlands are important habitats within agricultural landscapes, playing a vital role in water and nutrient retention, which supports the small water cycle and contributes to local cooling. However, many wetland sites face severe degradation or loss due to drainage, inappropriate agricultural practices, and stream regulation. Because wetlands provide a suitable habitat for specific and often very rare biota, efforts to restore them have gained increasing attention, aiming to recover ecosystem functions, hydrology, and biodiversity. This case study examines the effects of various management measures on the spider community in a degraded wetland in South Moravia, Czech Republic. From 2020 to 2022, two common practices—extensive grazing and mowing—were implemented. Additionally, in 2023, hemiparasitic plants (*Odontites vernus* and *Melampyrum arvense*) were introduced to suppress invasive plant species, mainly *Symphyotrichum lanceolatum*, *Solidago gigantea*, and *Solidago canadensis*. Spiders were monitored from 2020 to 2024 using pitfall traps, net sweeping, and a modified garden vacuum. Across five years, 109 spider species from 18 families were recorded. Alongside common meadow and open-habitat spider species, several wetland specialists and species classified as endangered to critically endangered in the Czech Republic were found. Among the most threatened species recorded at the site were *Clubiona juvenis*, *Prinerigone vagans*, *Trichoncoides piscator*, and *Zora armillata*.

O5.4.

Ecology-informed conservation of the Diamond-backed Spider (*Thanatus formicinus*) in England, UK

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The Diamond-backed spider (*Thanatus formicinus*), once presumed extinct in Britain, was rediscovered in 2017 at Clumber Park, Nottinghamshire, 250km north of its historical range. This prompted surveys across the neighbouring Sherwood Forest complex to reassess its distribution, ecology, and conservation needs. Fieldwork confirmed a single population restricted to a 9.6-hectare patch of heathland within Clumber Park (Long Valley), with 126 records over 28 days between July and December 2024. Although commonly found on Common Heather (*Calluna vulgaris*), juveniles were also observed in grasses and mosses, highlighting the species' dependence on structurally diverse vegetation. Activity peaked on warm, sunny days, particularly on south-facing vegetation, highlighting the influence of climate and orientation. Comparative habitat surveys showed Long Valley's distinctive heather-moss composition was lacking in nearby sites, potentially explaining the spider's restricted range. The study recommended conducting year-round population monitoring, and a conservative approach until the breeding phenology is clarified; there has been a lack of adult females recorded to date. Genetic sampling will compare the Clumber population with historical British material and with European populations, while observations of captive gravid females will provide critical insight into reproductive behaviour. This work informs habitat management strategies to replicate favourable conditions in nearby heathlands and supports a long-term recovery plan. Through partnerships with Natural England, the National Trust, the British Arachnological Society, and academic collaborators, this project demonstrates how targeted conservation actions and ecological understanding can guide the recovery of *T. formicinus* and other thermophilic invertebrates that rely on fine-scale habitat and climate features.

O5.5.

Small scale spider biodiversity assessments as testing ground for environmental filtering under global warming

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Usually when we think of habitats we only think on the large-scale, however, large differences are often found at small scales. This variety is caused by both microclimatic and ecological factors, increasing beta diversity and leading to a large diversity of species. Our study focuses on the spider communities of Herdade da Ribeira Abaixo (HRA), ca. 100km South of Lisbon, in cork oak and mixed forest areas within 1km2, divided between South and North-facing plots respectively. Fieldwork was done during May 2024 (3-5th) with 96 samples collected from 16 plots, eight per habitat type in a paired scheme. Preliminary results have already reached 148 species, with several potential undescribed taxa. Morphological, life-history and ecological traits will be extracted from both preserved specimens and literature to quantify functional diversity per plot. We are now testing hypotheses related with the environmental filtering of communities under higher aridity and the role of traits in explaining species adaptations to future conditions under global warming.

O5.6.

Tracking climate-driven trait variation in *Vesubia jugorum* (Araneae, Lycosidae): insights from a multi-year monitoring program in the Maritime Alps

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Vesubia jugorum is a relict wolf spider endemic to the Maritime Alps, recently listed as Endangered on the IUCN Global Red List. As one of the few spider species globally with formal IUCN status, it inhabits a fragmented alpine range above 2300 m in elevation, restricted to scree habitats in both Italy and France. Due to its narrow ecological requirements and high sensitivity to climate change, a long-term cross-border monitoring program was initiated in 2019, focusing on 17 populations. The protocol, based on a five-year sampling interval, integrates individual-level traits, such as IV femur length and cocoon diameter, used as proxies for performance and reproductive success. Three indicators of local abundance and density were also tested but proved unreliable, as they were compromised by the relatively high local mobility of the species. A comparison between 2019 and 2024 data reveals local variation in femur length, which correlates with reduced snow cover over the past five years, suggesting a long-term, climate-related decline in individual performance. In contrast, cocoon size appears to reflect annual environmental variability and does not show consistent temporal trends across sites. These findings underscore the utility of functional traits, particularly femur length, as sensitive indicators of climate-driven ecological change. They also highlight the importance of multi-year monitoring to distinguish short-term fluctuations from long-term trends, offering essential insights into the conservation needs of cold-adapted endemic arthropods.

O5.7.

The rather unpleasant smell of success - Developing a pheromone tool for the eradication of *Latrodectus hasseltii* in New Zealand

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Latrodectus hasseltii, the Australian redback, is an invasive spider that has been established in New Zealand since 1980. It is a threat to the endangered Cromwell chafer beetle as well as another threatened chafer beetle, skinks and the New Zealand endemic widow spider, *Latrodectus katipo*. *Latrodectus hasseltii* has also established in Osaka, Japan and has the capability to spread further in New Zealand and to other parts of the world, including Europe. Virgin female *Latrodectus hasseltii* produce a pheromone to attract males, which have a suicidal mating behaviour. We have identified and synthesised this pheromone and hope to use it to reduce *L. hasseltii* populations in Central Otago, New Zealand. Initial fieldwork results have been successful at luring and capturing males in the field. We have also identified the pheromones produced by *L. katipo*, which is closely related to *L. hasseltii*. We will be testing a new trap design later this year in the New Zealand summer as the next step in developing a pest management tool for these invasive spiders.

O6.1.

Ecosystem services provided by spiders

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Spiders provide a diverse spectrum of ecosystem services and inspire nature-based solutions. Here, we summarize these services and solutions with the aim to promote discussion on how to quantify them from small to large scales. Provisioning services include the versatile uses of silk-like and other materials, inspiration for biomimetic technology, medicines derived from venom, hemolymph and silk, bio-insecticides that offer eco-friendly alternatives to synthetic chemicals, food sources for various human communities worldwide, and serving as unconventional yet increasingly valued pets. Regulating services extend to vital roles in pest suppression across diverse agricultural settings, mitigating diseases by curbing insect-mediated pathogen dispersal, and controlling invasive species. Supporting services are equally extensive, involving nutrient cycling through the breakdown of organic matter, acting as food sources for predators, or creating habitats for other organisms. Beyond their tangible contributions, spiders hold substantial cultural and spiritual significance, are integral to many traditional medicine practices, inspire contemporary culture, provide educational value, contribute to mental health improvement, evoke a sense of place, offer models for scientific discovery, and are commonly employed for monitoring biodiversity and ecosystem health. To pave the way for future research, we present suggestions for exploring and quantifying the economic value of ecosystem services by spiders. While many of these services are well established and studied from various perspectives, others harbour untapped potential.

O6.2.

Which web to invade? The distribution of *Argyrodine kleptoparasites* among host webs

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Many argyrodine cobweb spiders (Theridiidae) are obligate kleptoparasites that have largely abandoned web building, relying instead on webs of larger host species. Theory and limited prior research indicate that kleptoparasites are not randomly distributed among available host webs, where web architecture, size and prey availability impact their abundance and host choice. In Madagascar's Analamazaotra National Park, we conducted a real-time snapshot investigation of a multi-species endemic community of spider kleptoparasites and their *in-situ* distribution among three contrasting hosts: *Nephilingis* (Nephilidae, large nocturnal orb weavers), *Caripetella* (Pisauridae, large nocturnal sheet web builders), and *Anelosimus* (Theridiidae, small social nests). We discovered an unexpectedly high diversity of nine argyrodine kleptoparasite species, remarkably belonging to six genera, non-conspecific with the five species previously known from all of Madagascar. Kleptoparasite species composition and abundance varied across the three hosts: some appear host-specific while others seem versatile. In general, argyrodine kleptoparasites discriminate among hosts but their webs seem to offer resources of different value. Such community level data remain limited but based on our study we can hypothesize that species assembly into host webs involves a complex interplay between host preference and species competitive hierarchy. Future fieldwork should investigate this system as a community of multiple interacting species to better understand the ecological rules that govern the assembly of diverse kleptoparasites into equally variable host webs. Complementary laboratory research is needed to elucidate key cues facilitating kleptoparasite web detection and choice, potentially involving eavesdropping on pheromones.

O6.3.

Predictive ecological niche modeling and niche segregation in two harvestman species, *Gyas annulatus* and *G. titanus,* in Slovenia

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Harvestmen represent an important model group for ecological and biogeographical studies due to their limited dispersal capabilities, strong fidelity to biogeographic regions, and dependence on specific environmental conditions. The Slovenian opiliofauna is among the best studied in Central Europe, largely due to intensive sampling efforts in recent decades. Sharing the Alpine, Pannonian, Mediterranean and Dinaric regions make Slovenia an ideal country for comparative ecological studies. However, ecological knowledge remains limited for most harvestman species, largely based on descriptive habitat data. In this study, we analyzed the ecological niches and niche segregation of *Gyas annulatus* and *G. titanus*, two large-bodied European harvestmen, using a species distribution modelling approach based on over 350 georeferenced locations from Slovenia. Preliminary results indicate that both species prefer cold, moist habitats with relatively stable temperatures, commonly occurring in rocky environments such as ravines and torrent banks. *Gyas annulatus* is an alpine calciphilous species preferring beech forests in calcareous regions and associated with shady rock faces, boulders, boulder accumulations, and cave entrances. On the other hand, *G. titanus* is a montane species inhabiting both calcareous and non-calcareous regions, preferring wet microhabitats such as rocks with trickling water, rock niches, gravel accumulations in brook gorges, and cave entrances. These differences reflect subtle variations in elevation range, geological preference, and microhabitat specialization in the two species. According to SSP370 and SSP585 climate scenarios, the suitability of potential habitats and the distribution of both species are projected to decline by 2100.

O6.4.

Penthouse spiders and harvestmen - canopy research in the Eastern Alps (Arachnida: Araneae, Opiliones)

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How is it possible, that we know almost nothing about this?

Zoological canopy studies have been carried out in Central and South America since the 1980s, but Central Europe remained a blank space on the map. The reasons for this are methodological difficulties in reaching the treetops and a generally low interest in forests for nature conservation purposes. Our canopy investigations took place in the Austrian Alps, namely in the forest property of Pichl in the Mürz valley and the Gesäuse National Park in 2023 and 2024. By means of modified pitfall traps ("tree traps"), shelter traps and branch samples we documented the invertebrate fauna at the base, mid and top of the trees, supported by professional tree climbers. A total of 35 individual trees across 14 tree species were investigated. We collected 4443 specimens from 22 invertebrate groups. The species numbers from Gesäuse and Pichl were: Araneae (32/41), Opiliones (5/6), Pseudoscorpiones (3/4) and Oribatida (25/36). In the Pichl area the most abundant taxon was spiders with a total of 1885 specimens (53%) recorded. The proportion of juvenile spiders is 80%. The linyphiid spider *Cinetata gradata* was found in high abundances on a fir at a height of 45 m. There is a significant positive correlation between the age of the tree and the number of recorded spider species and individuals. Harvestmen were found on all trees; on average 21 individuals per tree. Taxonomically remarkable is the record of an oribatid mite *Scutovertex* sp., which is very likely new to science!

O6.5.

Benefits of floods on riparian spider biodiversity and physiology

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Floods play a dual role in riparian ecosystems: they act as ecological filters, shaping community composition, and they facilitate the exchange of materials and organisms across ecosystem boundaries. However, human-driven alterations to flow regimes have reduced flood frequency, promoting dominance of generalist species. Simultaneously, changes in hydrology affect the emergence of aquatic insects. While shifts in aquatic subsidies influence spider abundance and diversity, their effects on predator physiology remain poorly understood. Using a mesocosm facility, we simulated four flood events between May and September to investigate their effects on riparian spider communities. We monitored aquatic insect emergence during each flood and sampled ground-dwelling spider communities before and after each event. We examined physiological responses of *Tetragnatha extensa*, using Geometric Morphometrics to assess head's size and symmetry. Relative to the unflooded control, spider richness dropped by 30% after the first flood but rose by 43% after the second, with a 73% increase in abundance. Wetland specialists (*Piratula latitans*, *Pirata piraticus*) were 5× and 3× more abundant in flooded mesocosms, while generalists (*Pardosa hortensis*, *P. palustris*) appeared only in controls. After the fourth flood, *T. extensa* showed 20% higher head symmetry in flooded treatments but were not bigger despite 45% more chironomid emergences in the flooded mesocosm, suggesting reduced developmental stress despite no resource scarcity. Our results show that floods can enhance riparian biodiversity by supporting specialists and improving prey-driven spider development. Restoring natural flood regimes may help conserve resilient, flood-adapted species essential for conserving riparian ecosystems and maintaining their ecological integrity.

O6.6.

Visibility of spiders, of webs and other things

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Seek spiders that you don´t see or See spiders that you don´t seek?

This presentation examines some environmental and optical factors influencing the perception of spider webs, particularly how elements such as dirt, dew, rain, frost, and dust alter web visibility under different lighting and background conditions. These transient changes highlight the influence of environmental variables on web perception. The discussion also includes the coloration and visibility of spider droppings, analyzing how contrast with various background hues and textures affects visibility. The roles of light direction, observer position, and viewing angle are explored in detail, demonstrating how these factors influence the visibility of web structures and the spiders themselves. Observer movement and spider activity further contribute to a dynamic visual field shaped by shifting light, shadow, and motion. Many spiders are nocturnal, making their detection more difficult. Artificial illumination and its movement may increase visibility of webs and spiders. The coloration of spiders, along with their choice of background surfaces, is considered in the context of concealment and signaling. This presentation explores how spiders and their webs are perceived in varying ecological and optical contexts. The examples are supported by photographic slides made by the author.

O7.1.

Unravelling diversification in speciose lineages: the red devil *Dysdera erythrina* species complex (Araneae: Dysderidae)

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Understanding why some lineages diversify more than others remains a key question in evolutionary biology. The red devil spiders (Dysderidae) serve as an excellent organismic model for studying the factors that contribute to asymmetric diversification. Remarkably, two of the family's 25 genera account for 80% of its species richness, with numerous species complexes. In particular, the *Dysdera erythrina* complex comprises 20 recently diverged species, mostly endemic to the northeastern Iberian Peninsula. Despite their genital and overall morphological similarity, these species exhibit striking chromosomal differences (9 to 20 chromosomes), suggesting that chromosomal evolution may have contributed to their rapid radiation. In this study, we aim to assess the contribution of geographic and ecological barriers to shaping species boundaries and provide a high-resolution phylogeographic framework for understanding speciation within the group. To accomplish this, we generated genome-wide SNP data using ddRADSeq for 216 specimens sampled across all known species, integrating this dataset with a high-quality chromosome-level genome. Our analysis uncovered substantial cytonuclear discordance and revealed genetic clusters largely corresponding to nominal species, along with several admixed clusters. Hierarchical population structure analyses indicated potential ongoing gene flow between species despite their karyotypic differences, or recent divergence events leading to incomplete lineage sorting. Altogether, our findings shed light on the interplay between chromosomal evolution and speciation and highlight the potential role of introgression following secondary contact in shaping patterns of genetic diversity.

O7.2.

Genetic basis of complex traits in *Latrodectus katipo* and *L. hasselti*

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The closely related spider species *Latrodectus katipo* and *L. hasselti* present an excellent model for studying the genetics of speciation, behavior, and adaptation. Although they are believed to have diverged relatively recently, they exhibit pronounced differences in multiple traits, including sexual size dimorphism and mating-associated behaviors. Notably, these behaviors include male suicidal somersaulting and abdominal constriction. In this study, we investigate the genomic basis of these traits using both pure-species populations and experimental backcrosses of F_1 hybrid females with *L. hasselti* and *L. katipo* males. Our analyses incorporate whole-genome sequencing and transcriptomic data. First, we examined differences in selective pressure between the pure species. Preliminary results reveal strong signals of positive selection across the genome of *L. hasselti*, but not in *L. katipo*. The weaker signal in *L. katipo* may be attributed to the absence of a relevant environmental stressor in New Zealand, or to qualitative shifts in mating behavior where no single phenotype consistently confers a mating advantage. Second, we reassessed the previously reported association between sex chromosomes and male suicidal behavior. Our findings indicate that this link is weaker and more dispersed. Transcriptomic and association analyses suggest that an autosome—rather than a sex chromosome—harbors genes implicated in this trait. Abdominal constriction appears to be a polygenic trait involving multiple genomic regions, with autosomes playing a more significant role than sex chromosomes. Future research will focus on identifying and functionally characterizing candidate genes involved in speciation and mating success in both species.

O7.3.

A spider's guide to packing: the evolution of prey wrapping in spiders

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Prey wrapping is a key predatory behaviour in spiders, serving functions such as immobilization, storage, and even killing of prey. This behaviour occurs in only a subset of the 136 described spider families and shows remarkable variation in behavioural sequences (e.g., wrap-attack vs. post-bite wrapping), silk types (dry vs. sticky), and the use of body parts (e.g., legs). These variations suggest that prey wrapping, and its specific characteristics evolved multiple times in correlation with foraging niches. Despite its important aspect in spiders' life, the evolutionary history and convergence have not been tested using a phylogenetic comparative framework. To address this, we conducted a comparative survey of prey wrapping behaviour, identified silk glands involved, and measured the mechanical properties of the silk used. Behavioural observations were performed on 52 species across 37 spider families in lab settings, using high-speed video to capture leg and spinneret movements and silk gland activity. Silk wrap samples were collected either post-wrapping or mid-process using coverslips or cardboard frames and analysed with scanning electron microscopy to identify silk types and diameters. Further, snap freezing experiments were conducted to determine the silk gland activity during wrapping. From these observations, we compiled a character matrix coding the presence/absence of behavioral characters and analysed them in a phylogenetic comparative framework. Our results reveal that prey wrapping evolved convergently across lineages, progressing from simple to complex forms, and was also repeatedly lost. Moreover, the different morphological and behavioral adaptations played a key role in the evolution of prey wrapping.

O7.4.

Insights into karyotype evolution of Solifugae

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Solifuges are an enigmatic, poorly studied arachnid order including two suborders, 15 families, 144 genera, and 1214 species. Concerning cytogenetics, only the diploid number of one species was determined. To elucidate basic traits of solifuge karyotype evolution, we analysed 15 species representing both suborders and belonging to six families (Ammotrechidae, Daesiidae, Eremobatidae, Galeodidae, Rhagodidae, Solpugidae). The diploid numbers ranged from 8 (*Biton* sp., Daesiidae) to 24 chromosomes (*Ammotrechula mulaiki*, Ammotrechidae). Karyotypes were predominated by monoarmed (acrocentric and subtelocentric) chromosomes except for galeodid and rhagodid karyotypes, which were formed predominantly by biarmed (metacentric and submetacentric) chromosomes. Homologous chromosomes were associated during mitosis and interphase, which is unusual. Sex chromosomes were not morphologically differentiated. Solifuges exhibited a single nucleolar organizing region (NOR) except for galeodids, which displayed a high number of NORs. Galeodid and rhagodid chromosomes contained huge blocks of constitutive heterochromatin forming more than 50% of the genome in some species. The diploid number has convergently decreased in some clades by chromosome fusions. The absence of morphologically differentiated sex chromosomes, the predominance of monoarmed chromosomes, and the single NOR locus seem to be the ancestral solifuge characters. The enormous amount of heterochromatin and the predominance of biarmed chromosomes are most probably synapomorphies of Galeodidae and Rhagodidae.

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O8.1.

An update of the spiders of Greece: diversity, knowledge gaps and conservation

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Following the first online version of the national catalogue of the spiders of Greece (https://araneae.nmbe.ch/spidonet) we here present the results of a critical curation of 187 papers covering all available records of spider species occurring in Greece. The curated data contain geographic location and taxonomic validity of all 1310 species occurring across more than 18000 unique records, excluding *nomina dubia*, subspecies and incomplete or erroneous taxonomic identifications. Of these, 226 species (17.25 %) are endemic to Greece revealing the richness and uniqueness of this fauna which is in part attributed to the exclusive occurrence of species in the Greek islands. Furthermore, an analysis is performed to present the distribution of the spider families/species richness in the complex landscape of Greece, and the identified geographical/taxonomic gaps in our knowledge. The conservation status of 202 IUCN-assessed species is also presented, alongside a critical analysis of their documented threats and pitfalls faced during the evaluation process.

O8.2.

The ground spiders of the Tolfa Mountains (Latium, Italy): diversity and community composition

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Spiders are one of the most diverse and ecologically important arthropod groups of terrestrial predators, playing key roles in maintaining the balance of ecosystems and providing essential ecosystem services. The latest Italian checklist of spiders lists 1735 species. Despite this richness and ecological importance, knowledge of Italian spiders is still incomplete, especially in central and southern Italy. To help fill the knowledge gap, the Tolfa Mountains was chosen as the sampling area. Seven sites were selected: 3 grasslands, 2 thermophilous forests and 2 mesophilous forests. At each site pitfall traps were placed from March 2024 to February 2025. A total of 3628 individuals were collected belonging to 30 families, 99 genera and 148 species. Four species are new reports for Italy and four are possible new species. The most numerous families are Gnaphosidae (21%), Linyphiidae (20%) and Lycosidae (16%), while the families with the most species are Linyphiidae (39), Gnaphosidae (31) and Dysderidae (16). Significant differences were found in both abundance and species richness across seasons and habitats, and the interaction between these two factors. More spiders were caught in spring and summer, while the lowest numbers were recorded in winter. The autumn season recorded the highest number of immature individuals (>70%). Regarding the spider community, a significant difference emerged in relation to both season and habitat type. Some species show a strong association with specific environments at certain seasons. In conclusion, this study confirms that more in-depth research is needed in some parts of Italy, including Lazio.

O8.3.

Tangled web of information and misinformation about spiders in Serbia

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What can be more confusing than information about spiders in Serbia? Historically, the interest in arachnology started early, with the oldest faunistic data published in 1891 by Spasojević on the species *Geolycosa vultuosa*. In contrast, all recent manuscripts begin with statements like: “no information”, “poorly documented”, “not researched area” or “randomly collected material”. There is a wide range of reasons for that, some are easily noticeable, but others are hidden. Twenty-two years after the book “The Spiders of Serbia” (Deltshev et al., 2003) that represents literature reweaving, and a basic list of 618 spider species, it is still very blurry how many species could be considered new for the national fauna. Furthermore, between 2003 and 2023, additional manuscripts appeared concerning the hypogeic and epigeic spiders. As it seems, all important for the faunistic data, but not comprehensive enough, that resulted in many cases of unexplored protected and unprotected areas. Keeping pace with other countries, Serbia has tried to improve legal protection of spider species. Regrettably, this area is also difficult to understand. A long time ago, in 1993, the uniqueness of the spider *Dolomedes plantarius* and its habitat was recognized, and it was proclaimed a natural rarity of Serbia. However, in 2010 this spider did not enter the new list of strictly protected wild species, 17 others added and became important. Mysteriously enough, some of them do not even exist as names in scientific literature. As expected, the new list is under preparation, but the result will be uncertain.

O8.4.

Scorpion Fauna of northwestern Saudi Arabia

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Scorpions, with approximately 2,800 described species, constitute a taxonomically complex and underexplored group within arachnids. Despite their crucial ecological role as predators across a variety of terrestrial ecosystems, they remain relatively neglected compared to other arachnid orders. Their generally conservative external morphology hampers species-level identification, especially when based solely on morphological traits. Nevertheless, current scorpion taxonomy continues to rely heavily on these characters, despite limited insight into intra-and interspecific variation. As a consequence, species boundaries often remain ambiguous, and morphology-based diagnoses have repeatedly proven insufficient for accurate delimitation. The Kingdom of Saudi Arabia is overall poorly surveyed, particularly for scorpions. Many species descriptions from this area are based on very limited material, frequently a single specimen per sex, or in some cases, for the species itself. Molecular data are also scarce, and the closest related taxa with available genetic information are often located far outside the region, further complicating efforts to clarify species boundaries. The northwestern Saudi Arabia is characterized by extensive desert landscapes, isolated mountain ranges, and recent volcanic fields (harrats). This region offers a mosaic of potential barriers to gene flow and drivers of diversification but is one of the least explored regions of the Kingdom in terms of biodiversity, particularly its scorpion fauna. This study aims to present the most comprehensive assessment of Saudi Arabia's scorpiofauna to date.

O9.1.

The gross morphology and ultrastructure of egg envelopes in Parasitengona mites (Chelicerata: Acariformes)

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Egg envelopes play a crucial role in the development of embryos, serving primarily as a barrier and a mediator between the embryo and its external environment. However, the formation of these egg envelopes has not been well studied in mites. Our objective was to analyze the egg envelopes in representatives of acariform mites, specifically terrestrial Parasitengona and Hydrachnidia, using light microscopy, scanning electron microscopy (SEM), and transmission electron microscopy (TEM). In Parasitengona, oocytes develop without the support of follicular cells. The precursors of the vitelline envelope (the first egg envelope, referred to as VE) are synthesized by the female germline cells. In all species we studied, the formation of the egg envelopes begins during vitellogenesis, a phase during which oocytes accumulate reserve materials and the VE forms on the surface of the oocyte. Consequently, the VE is formed through the synthesis and secretion of materials produced by the oocyte. Initially, the VE consists of electron-dense granules deposited between the oocyte's microvilli. In most species analyzed, the VE ultimately becomes two-layered, with an outer layer that is electron-dense and an inner layer that has lower electron density. In Hydrachnidia, the outer layer of the VE exhibits a spongy structure. However, in two species of terrestrial Parasitengona, only a single-layered egg envelope was observed. The structural differences observed in the VE may result from the varied biology of different species, which can include factors such as the environments in which oviposition occurs and the distinct incubation times for the eggs.

O9.2.

Comparative morphology of the spinning apparatus of spiders

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Silk production is a defining characteristic of spiders, with silk being extruded through spigots on the spinnerets, which are one- to multi-membered paired appendages at the abdomen's posterior end. Most extant spiders possess three pairs of spinnerets and either a cribellum (spinning plate) or colulus (vestigial organ), distinguishing them as cribellate or ecribellate species. Both forms appear across most spider lineages throughout the tree of life. Research has demonstrated that cribellate and ecribellate spiders differ in both spinning apparatus composition and spinneret movement kinematics during silk spinning. This study aims to determine whether these movement differences stem solely from variations in spinneret degrees of freedom or if they reflect differences in muscular anatomy, and whether any muscular variations align with phylogenetic reconstructions. The investigation utilises micro-computed tomography (μCT) scans of the posterior abdomen from multiple spider species across different spider families. Initial findings from micro-CT data reveal that despite their small size, spider spinnerets possess complex musculature enabling fine-scaled manoeuvres for constructing various fibre-based materials. The results indicate that while muscle count remains consistent between cribellate and ecribellate species, distinct differences exist between families. Notably, the vestigial colulus retains muscles that appear homologous to those of the cribellum. The study also revealed that, not only in Araneoidea, but in different families, a variety of muscles can be found controlling the silk flow in the spinning duct of the major ampullate gland inside the anterior lateral spinnerets.

O10.1.

Some thoughts on design and interpretation of ecological research projects

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Interpretation of results can often be facilitated substantially by small changes in design of the project and in choice of statistical analysis. Further, a change in statistical philosophy, depending on the scope of the project, also seems relevant. Statistical significance is not the same as biological significance. For example, the greater the variance the greater the difference (effect) needed to achieve statistical significance. Traditional hypothesis testing (t-test, ANOVA etc.) is heavily influenced by the variance, and especially in field studies the variance increases significantly thus reducing the statistical power, often to an extent where the result becomes meaningless. Regression and correlation analyses on the other hand are far less influenced by the variance, and if data can be arranged along a gradient, then regression and correlation analyses will have far greater power. Traditional statistical philosophy is centered around acceptance of the null hypothesis. You accept there is no difference (effect) unless this can be shown to be very unlikely. In assessment of risk, you really ought to turn that philosophy upside-down, i.e. you accept there is a difference (effect), unless this can be shown to be very unlikely. You should further consider which is most important in your project: To avoid concluding wrongly that there is a difference (effect), or to avoid concluding wrongly that there is no difference (effect).

O11.1.

Respiratory gas exchange, metabolic fueling and locomotor activity in scorpions

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Aerobic capacities in arachnids are typically correlated with considerable structural variation in their respiratory systems. However, all scorpions are non-tracheated and possess four pairs of book lungs, yet they vary greatly in their locomotor activity patterns. Non-burrowing Buthidae species express short bursts of activity and rapid fatigue. In contrast, Scorpionidae species dig burrows up to 1 m deep within hours, suggesting aerobically fueled locomotion. We hypothesized that locomotion in surface-dwellers is largely fueled anaerobically, whereas that in burrowers is more aerobic, and that this would be reflected both structurally and functionally in their respiratory gas exchange pathway. We used an experimental design consisting of two burrowing scorpionids (*Scorpio fuscus* and *S. palmatus*), two surface dwelling buthids (*Hottentotta judaicus* and *Leiurus hebraeus*) and a burrowing buthid (*Buthus israelis*). Significantly higher respiratory exchange ratios were recorded for buthids during activity and subsequent recovery, indicating higher reliance on anaerobically fueled locomotion compared with scorpionids. We measured significantly higher carbonic anhydrase activity in the buthid hemolymph, essential for rapid hemolymph buffering and emission of excess CO_2 resulting from anaerobic exercise. Larger book lung surface area in *L. hebraeus*, compared with *S. palmatus*, further supports CO_2 emission rates. A comparative analysis of hemocyanin properties revealed higher P_{50} values (lower affinity to oxygen) in scorpionids, which may serve to enhance oxygen unloading in the working muscle during aerobically fueled burrowing.

O11.2.

Is *Chelifer cancroides* a purely matrotrophic pseudoscorpion?

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Pseudoscorpions are matrotrophic arachnids. The development of their embryos relies on nutrients provided by the mother. Previous studies have revealed that pseudoscorpions exhibit a wide range of adaptations to matrotrophy. In this study, we focus on *Chelifer cancroides*, a representative of the family Cheliferidae, considered one of the most specialized for matrotrophy pseudoscorpion species. Our results demonstrate that, as is typical of matrotrophic animals, the oocytes of *Chelifer* accumulate a small quantity of reserve materials (yolk spheres, lipid droplets, and glycogen granules), which are utilized during the initial stages of embryo development. However, in addition to these reserve materials, the oocytes are also equipped with unique organelle complexes consisting of mitochondria and endoplasmic reticulum. These complexes are long-term, they persist from advanced previtellogenic stages until the oocytes reach maturity, undergo ovulation, and are fertilized. Within these complexes, the mitochondria change their morphology and exhibit a lower inner membrane potential compared to those in early stages of oocyte growth. Such changes are interpreted as the decreased mitochondrial activity in ATP production, which protects mtDNA against mutations caused by reactive oxygen species. Following fertilization, these complexes are unevenly segregated to the blastomeres. Most of these complexes are inherited by the micromeres which eventually form the body of the embryo. In summary, matrotrophic embryonic development in *C. cancroides* is supported by reserve materials and a set of ready-to-use organelles gathered in the egg cytoplasm. It clearly indicates that *Chelifer cancroides* is not a purely matrotrophic pseudoscorpion.

O11.3.

Winter warming increases metabolic stress and mortality in an overwintering spider

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Climate change has profound ecological consequences; however, its effects on overwintering arthropods remain poorly understood. In particular, how rising winter temperatures influence the survival and energy balance of generalist predators, such as spiders, remains largely unexplored. Elevated temperatures can disrupt metabolic processes and energy balance, thereby threatening survival. We investigated the impact of warmer winter conditions on populations of the wasp spider *Argiope bruennichi* from Southern France. Spiderlings hatch in autumn and overwinter within egg sacs, where they rely on yolk reserves. We hypothesized that elevated temperatures would increase metabolic rates during winter and that ensuing higher energy expenditure would accelerate fat store depletion and reduce survival probability until the time of emergence. To test this hypothesis, we exposed egg sacs in the lab to two winter temperature regimes that were +3.7°C and +4.8°C above ambient based on IPCC (Intergovernmental Panel on Climate Change) projections. We compared these higher temperature regimes to a control simulating current Southern France conditions. Our results demonstrate that increased winter temperatures significantly increased mortality. In those spiderlings that survived, higher temperatures increased metabolic rates, reducing the amounts of fatty acids involved in energy storage. These findings suggest that even moderate winter warming, as simulated in our study, could have severe consequences for *A. bruennichi*, potentially driving range shifts by 2100, as predicted by species distribution models (SDMs). Our study highlights the susceptibility of overwintering arthropods to climate change and underscores the importance of incorporating seasonal temperature effects into ecological projections.

O11.4.

Assessment of the effects of electromagnetic radiation on apoptosis and stress protein biomarkers in the spider *Parasteatoda tepidariorum*

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Electromagnetic fields (EMFs), increasingly prevalent due to technological advancements, have raised significant concerns regarding their potential biological effects on living organisms. While much attention has focused on human health, growing evidence suggests that EMFs can also affect invertebrates, which play vital ecological roles. This study investigates the biochemical and cell death biomarker responses to EMF exposure for 24 h or 72 h in *Parasteatoda tepidariorum*, a common house spider frequently found in human-associated environments. The focus is placed on the 10 MHz frequency range, which is relevant to environmental exposure scenarios. Biochemical biomarkers include heat shock proteins (HSP70) and the percentage of apoptotic and living cells in individuals at their embryonic, juvenile and adult stage, with particular attention given to the potential shielding effects of the spider's silken egg sac. Results indicate that exposure to EMFs can induce measurable stress responses at the biochemical level, with variations depending on developmental stage and protective structures. Embryos outside of the egg sac exhibited significantly elevated levels of HSP70 and apoptosis markers compared to those within the sac, suggesting a partial protective effect of the cocoon layers. Furthermore, differences in biomarker sensitivity were observed across all the developmental stages and increased with prolonged exposure. These findings contribute to the understanding of EMF-induced biological effects in invertebrates and support the use of *P. tepidariorum* as a model species for environmental electromagnetic pollution.

O12.1.

When morphology fails - the role of cytogenetics in species delimitation of the scorpion genus *Euscorpius*

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The evolution of organisms is closely linked to differentiation at the genomic level. These differences are manifested not only in species-specific traits of individual genes but also in the composition of repetitive sequences, genome structure and size, and in chromosome number and morphology. Cytogenetic traits therefore represent an important tool for studying the evolution of individual lineages and also hold potential for species delimitation, particularly in morphologically uniform groups such as scorpions (Scorpiones). Despite certain existing cytogenetic knowledge, scorpions remain understudied regarding genomic and karyotypic diversity. Research shows remarkable karyotypic variability in this order, with chromosome numbers ranging from 2n = 5 to 2n = 175. Even closely related species with minimal morphological differences exhibit such variability. We focused on families with monocentric chromosomes, particularly the family Euscorpiidae, which includes over 100 species and is relatively common in European fauna. Using classical (to determine 2n, chromosome morphology, *18S* rRNA localization) and molecular cytogenetic methods (DNA sequencing) as well as flow cytometry (to estimate genome sizes), we examine cytogenetic variation across as many species as possible. Monocentric chromosomes exhibit significant interspecific variability in both morphology and size. We recorded specific differences in the position of *18S* rRNA genes. Genome sizes also appear to be species-specific. These findings demonstrate that cytogenetic traits can help in identifying species boundaries when morphology alone is insufficient. Karyotype differentiation may represent one of the mechanisms driving speciation. Our findings enrich the understanding of biodiversity in this morphologically conserved but genomically and cytogenetically diverse group of arachnids.

O12.2.

Resampling multiple genomic matrices to evaluate chelicerate relationships

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Currently, we have thousands of complete genome assemblies from multiple species. This is an ideal scenario to resolve the tree of life based on molecular data. However, there are still several remaining difficult ancient nodes to resolve, such as the phylogeny of chelicerates. This can be partially caused because the analyses of genome scale datasets are often compromised by the computational burden of large phylogenomic analyses. We propose a workflow to assess the robustness of phylogenetic results using multiple multi-protein, clade-specific matrices with different taxa and different genes. In each matrix, we include different species for each of the major clades within our group of interest, we infer single-copy orthologs and analyse the resulting concatenated supermatrices using complex models. We assess the nodal support for competing topologies under different strategies, such as outgroup removal and recoding, both at the amino acid and nucleotide level. We applied this approach on chelicerates, and used molluscs and vertebrates, ancient groups with similar age, as controls. We found that while the phylogenies of molluscs and vertebrates show stable support across competing analytic strategies, chelicerate phylogenies are greatly condition-dependant. Furthermore, our results and topology tests do not refute the monophyly of terrestrial chelicerates, the arachnids. This suggests that the evolutionary history of chelicerates and terrestrialization processes in the group remain unresolved, even with all the genomic data currently available.

O12.3.

Facilitating taxonomy and phylogenetics: An informative and cost-effective protocol integrating long amplicon PCRs and third generation sequencing

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Phylogenetic inference has become a standard technique in integrative taxonomy and systematics, as well as in biogeography and ecology. DNA barcodes are often used for phylogenetic inference, despite being strongly limited due to their low number of informative sites. Also, because current DNA barcodes are based on a fraction of a single, fast-evolving gene, they are highly unsuitable for resolving deeper phylogenetic relationships due to saturation. In recent years, methods that analyse hundreds and thousands of loci at once have improved the resolution of the Tree of Life, but these methods require resources, experience and molecular laboratories that most taxonomists do not have. In this talk, we introduce a PCR-based protocol that produces long amplicons of both slow- and fast-evolving unlinked mitochondrial and nuclear gene regions, which can be sequenced by the affordable and portable ONT MinION platform with low infrastructure or funding requirements. As a proof of concept, we inferred a phylogeny of a sample of 63 spider species from 20 families using our proposed protocol. The results were overall consistent with the results from approaches based on hundreds and thousands of loci while requiring just a fraction of the cost and labour of such approaches, making our protocol accessible to taxonomists worldwide.

O12.4.

Across islands and coastlines: phylogenetic insights into the East Asian pseudoscorpion genus *Nipponogarypus* Morikawa, 1955

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Pseudoscorpions are small predatory arachnids commonly found in sheltered habitats where direct sunlight is limited, such as in leaf litter, under stones, and in rock crevices. The genus *Nipponogarypus* is a pseudoscorpion group distributed across coastal habitats in Japan and Korea. Although three species are recognized in this genus, none have been studied using molecular data. Two of them, *N. enoshimaensis* and *N. okinoerabensis,* were originally described as subspecies under *N. enoshimaensis* but recently elevated to species rank in 2024. In this study, we revisited the systematics of *Nipponogarypus* by conducting molecular phylogenetic analyses based on *COI* and *H3* sequences of 60 newly collected specimens from Korea, Japan, the Ryukyu Archipelago, and Taiwan, including the type localities of two species described 65 years ago. Our phylogenetic analyses support the full species status of *N. okinoerabensis* and *N. enoshimaensis*. We also found that both species have remarkably wide distributions: *N. okinoerabensis* ranges from Amami Island to Okinawa, while *N. enoshimaensis* occurs from the Miura Peninsula in eastern Honshu to the southern coast of Korea. In addition, we reported the first record of the genus in Taiwan and discovered two new species, one from northern Taiwan and the other from the southeastern part of the country. These findings provide new insights into the systematics and biogeography of *Nipponogarypus*, and offer important molecular data for future research on the group.

O12.5.

Establishing the DNA barcode reference library of the Georgian pseudoscorpion fauna (Arachnida: Pseudoscorpiones): an initial assessment

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DNA barcoding enables rapid species identification using short gene fragments, most commonly the 658 bp long ‘Folmer region' of the mitochondrial *cytochrome c oxidase I* (*COI*) gene in invertebrates. DNA barcode reference libraries also support metabarcoding, which assesses biodiversity directly through the sequencing of environmental samples (eDNA), bypassing the need for individual specimen sorting and morphological examination. This approach is especially useful for detecting rare or taxonomically challenging invertebrates of conservation concern, which are often missed by conventional sampling methods. Georgia, located in the Caucasus region - a globally recognized biodiversity hotspot - hosts a remarkable number of endemic species across diverse terrestrial, subterranean, and freshwater habitats spanning from sea level to 5193m. Due to their complex topography, the Caucasian Mountain ranges likely serve as drivers of speciation and lineage isolation. In cooperation with the Caucasus Barcode of Life (CaBOL) project, this study aimed to build the first DNA barcode reference library for Georgian pseudoscorpions using the mitochondrial *COI* gene. Based on more than 250 newly generated *COI* sequences, phylogenetic trees were constructed using maximum likelihood and Bayesian inference methods. Molecular species delimitation approaches (ASAP, PTP, and GMYC) were applied to reveal cryptic diversity and to investigate the differences between intra- and interspecific morphological variation. Our preliminary results also reveal potential pre-Pleistocene refugia of the forest soil fauna in the Caucasus. These findings provide new insights into the evolutionary history of the region's fauna and support future conservation and biomonitoring efforts.

O12.6.

Phylogenetic relationships and biogeographic origins of the spider family Nemesiidae (Araneae, Mygalomorphae)

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Mygalomorphs represent an ancient sedentary group of spiders whose world-wide family-level distribution often reflects past geo-climatic events. Family Nemesiidae, currently comprising nearly 200 species, spans across parts of Europe, Northern Africa, Asia and North America. The spiders have a cryptic lifestyle: they typically inhabit underground burrows with or without a trapdoor or hide in small cavities under rocks. Because of their limited dispersal capability, they have tendencies to microendemism; however, the species boundaries among nemesiid taxa are generally poorly understood due to common external morphological homogeneity among closely related lineages. Thanks to the implementation of genomic data in mygalomorph research, the boundaries of the family Nemesiidae have been recently relimited, but the phylogenetic position of some genera remains unknown. Here we use ultraconserved elements (UCEs) to reconstruct the evolutionary relationships of the family, infer its biogeographic origins and provide a temporal framework of its diversification. Our results suggest that the family most likely originated in present-day North America prior to the split of Laurasia. *Raveniola* was recovered as sister lineage to North American *Mexentypesa*, Mediterranean genera *Amblyocarenum* and *Brachythele* were recovered as monophyletic, *Iberesia* was recovered paraphyletic in respect to the genus *Nemesia*.

O12.7.

Phylogeny of the *Savignia* genus group of dwarf spiders using UCEs and phylogenetic position within Linyphiidae

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Linyphiidae is the second most diverse family of spiders, with more than 4900 species described. However, the systematics of Linyphiidae is hindered by the presence of numerous genera with ambiguous or poorly resolved generic delimitations. Within the subfamily Erigoninae, Millidge (1977) defined the *Savignia* genus group to include the genera *Alioranus* Simon, 1926, *Araeoncus* Simon, 1884, *Diastanillus* Simon, 1926, *Dicymbium* Menge, 1868, *Diplocephalus* Bertkau, 1883, *Erigonella* Dahl, 1901, *Glyphesis* Simon, 1926, *Saloca* Simon, 1926 and *Savignia* Blackwall, 1833. All of them have a highly homogeneous and complex morphology which makes taxonomic work difficult. *Diplocephalus* is the most heterogeneous genus within the group with 52 species described and with very diverse palpal morphology. Previous studies of this group have only used morphology or molecular markers. Here we present the first phylogeny of the *Savignia* genus group based on genomic data and large number of mitochondrial makers: 16 mitochondrial and 1270 nuclear genes. We also infer the phylogenetic position of this group within the family Linyphiidae based on three nuclear (histone *H3*, *18S*, *28S*) and two mitochondrial markers (*16S*, *COI*) from GenBank database. We find that *Diplocephalus* is not a monophyletic group and that the *Savignia* genus group falls into the Distal Erigoninae clade where it is closely related to *Nihonella chicka* Ballarin & Yamasaki, 2021, a troglophile species from Japan.

O12.8.

Mitospecies: a novel concept for describing molecular diversity

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Mitochondrial markers are frequently used tools in molecular barcoding and species delimitation. Despite the many advantages, their biggest drawback is that they can only reconstruct maternal lineages due to the uniparental inheritance. That is, in analyses and evaluations based solely on mitochondrial data, we only see one side of the coin, and important events, such as introgressions, hybridizations or male-mediated gene flow, remain invisible to us. This may be especially true in species like *Eresu*s ladybird spiders, where males and females contribute very differently to gene flow due to their different lifestyles. When attempting to reconstruct phylogeny and to delimit species boundaries within the *Eresu*s genus on a much larger scale than previously known, we found a well-structured phylogeny with several cryptic species. This pattern, however, was present only in mitochondrial data and absent in analyses based on morphology or biparental markers, suggesting that the real relationships of the species within the *Eresus* genus can only be revealed via phylogenomic methods. Even so, species-level differences in the maternal lineage caused by limited gene flow or local adaptations can represent actual units of biodiversity (we propose the name „mitospecies”), which can be easily mapped and identified using the barcode approach.

O13.1.

5 - 50 - 500 - 50,000 - 500,000 — Revision of the genus *Heteropoda* in Laos

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The genus *Heteropoda* is the second largest genus in the spider family Sparassidae. It currently comprises 212 species, which are mainly found in South, Southeast and East Asia as well as in Australia. So far, seven species have been identified in Laos. New material of the genus *Heteropoda*, as well as previously identified material is revised. Thirteen species are recognised as new to science. Diagnoses of species groups have been modified, and distribution maps have been provided. Supposedly large distribution ranges are considered to be an assembly of smaller ranges of different species. A molecular analysis confirms the species hypotheses for those cases where sequences are available.

O13.2.

Ground spider diversity in Armenia: new records of the family Gnaphosidae

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Spiders collected during field expeditions in Armenia between 2020 and 2022 were identified to species level and partially characterized using genetic barcoding of the mitochondrial cytochrome oxidase subunit I (*COI*) gene. Among the recorded taxa, one species — *Drassodes lutescens* (C. L. Koch, 1839) (Gnaphosidae) — is documented for the first time from the entire Caucasus Ecoregion. Additionally, five genera — *Scotophaeus* Simon, 1893; *Drassyllus* Chamberlin, 1922; *Talanites* Simon, 1893; *Berlandina* Dalmas, 1922; and *Marinarozelotes* Ponomarev, 2020 — and 18 species are recorded for the first time from Armenia. These newly recorded species from the family Gnaphosidae are: *Scotophaeus scutulatus* (L. Koch, 1866), *Drassyllus praeficus* (L. Koch, 1866), *Drassyllus pusillus* (C. L. Koch, 1833), *Drassodes lutescens* (C. L. Koch, 1839), *Drassodes pubescens* (Thorell, 1856), *Drassodes villosus* (Thorell, 1856), *Nomisia ripariensis* (O. Pickard-Cambridge, 1872), *Nomisia exornata* (C. L. Koch, 1839), *Gnaphosa taurica* (Thorell, 1875), *Micaria silesiaca* (L. Koch, 1875), *Haplodrassus silvestris* (Blackwall, 1833), *Haplodrassus kulczynskii* (Lohmander, 1942), *Haplodrassus soerenseni* (Strand, 1900), *Zelotes subterraneus* (C. L. Koch, 1833), *Zelotes latreillei* (Simon, 1878), *Talanites atscharicus* (Mcheidze, 1946), *Berlandina mesopotamica* (Al-Khazali, 2020), and *Marinarozelotes malkini* (Platnick & Murphy, 1984). These findings contribute significantly to the understanding of spider biodiversity in Armenia and the Caucasus region.

O13.3.

On the araneoid-nicodamoid relationships, once again: evidence from cuticular microstructures (Araneae: Araneomorphae: Araneoidea, Nicodamoidea)

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Cuticular microstructures of nicodamoid spiders were reexamined using scanning electron microscopy (SEM). The superfamily Nicodamoidea, comprising the cribellate Megadictynidae and ecribellate Nicodamidae, is widely regarded as the sister group to the superfamily Araneoidea in modern classifications. Although this clade was previously considered solely supported by DNA sequence data, we identify two morphological synapomorphies: (1) a simplified trichobothrial pattern (absence of tarsal trichobothria and a single metatarsal trichobothrium), and (2) hooded bothria lacking a ‘multiridged’ structure. Nicodamidae shares scaly cuticle and serrate setae with Araneoidea - the characters traditionally listed as the araneoid synapomorphies. Megadictynidae, in contrast, has ridged (fingerprint-like) cuticle and plumose-laminar setae - a usual in the RTA-clade combination of correlated plesiomorphic characters. Notably, Nicodamidae also possess transitional setae, intermediate between the plumose-laminar and the serrate types, in addition to typical serrate setae. Based on microstructure evidence, we propose that ‘Nicodamoidea’ is paraphyletic, with the cribellate Megadictynidae representing the sister group to an ecribellate lineage comprising Nicodamidae + Araneoidea.

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O13.4.

Alone no more - integrative taxonomy of New Zealand odd-clawed spiders challenges the monotypy of *Pianoa* and *Gradungula* (Araneae: Gradungulidae)

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The enigmatic spider family Gradungulidae, endemic to Australia and New Zealand, exhibits a combination of morphological characteristics from both modern and early branching lineages. These spiders are rare, challenging to collect, and not well-documented, with only 18 described species across seven genera. This study presents the first comprehensive review of the gradungulid fauna in New Zealand, utilizing extensive field sampling, molecular phylogenetics, and high-resolution imaging. Previously, this fauna was understood to comprise three monotypic genera: *Gradungula*, *Pianoa*, and *Spelungula*. However, we discovered an unexpected diversity of gradungulids in the northern region of New Zealand's South Island, both genetically and taxonomically. This led to the identification of several new candidate species, including *Gradungula kahurangi,* sp. nov. and *Pianoa civis,* sp. nov., which are formally described from adult males. Despite high diversity in the north of the South Island, these genera exhibit notable differences in their biogeographical distribution: the forest-dwelling *Pianoa* and cave-inhabiting *Spelungula* are climatic relicts with limited distribution ranges and poor dispersal capabilities, whereas the widespread *Gradungula sorenseni* shows genetic signatures of southern range expansion, potentially originating from northern glacial refugia, reflecting patterns observed in other invertebrates across the island. Overall, this study establishes a significant framework for conservation biology concerning some of New Zealand's most iconic yet rare spiders.

O13.5.

(How to) Make Paris' spider collection great again

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The French Natural History Museum's arachnid collection is one of the world's largest. It includes a total of about 3 million specimens from the twelve orders of arachnids: spiders (2 million specimens), scorpions (10,000), parasitiforms and acariforms (together as acari, 30,000), pseudoscorpions (7,000), opilions (4,500), amblypygi, palpigradi, ricinulei, schizomids, solifugae and uropygi (altogether 1,200), from all over the world. The biggest collection is the one of spiders, which was started in the 1860s by Eugène Simon (1848-1924), an araneologist who is still considered one of the most prolific spider descriptors today and has grown considerably over the years. It includes 26,000 species, out of the 53,000 described to date, and some 12,000 types. Despite its historical and scientific importance, the Natural History Museum arachnid collection has suffered over the years. Conservation issues like evaporation, dehydration, slides conservation, label degradations or mold development are to be faced in the collection. Furthermore, the arachnid collection has not undergone the technological and cultural transformation other natural history collections may have. The specimens' catalogs are not yet computerized and types not identified nor individualized. Therefore, and even if the Natural History Muséum of Paris has embraced and implemented a culture of data sharing, its arachnid collection is not visible enough nor easily accessible to potential users. Here I detail the state of Paris' collection today, the major challenges we are facing, and the projects we are developing to preserve, valorize and make it accessible to researchers worldwide.

O13.6.

A bridge close enough: sclerite homology hypotheses and salticid systematics

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Jumping spiders, the family Salticidae is the largest spider family accounting about 1/8 of all spider species. Organizing such a large taxon is not an easy task, moreover their rapid diversification, coupling with parallel evolution made it virtually impossible to create a natural system. As a negative feedback loop this hinders many aspects of behavioural evolutionary research. Current advances have been clearing up a lot regarding the phylogenetic structure of the family, and in this lecture, we would like to share some homology statements regarding an extra sclerite often called salticid radix. We argue this region in the jumping spider palp has been present in most of the species but locating it may provide a challenge. The most advanced jumping spiders, the saltafresians representing about half of the diversity of the family, we explore the basic bauplan of the saltafresian palps and introduce a new tribus sister to it.

POSTER PRESENTATIONS

* Student Competition
** PeerJ Student Contribution Competition (topics in Taxonomy/Systematics/Phylogenetics/Biogeography)

P1.1.

Belly shots boost upside down spider identification

Peter Koomen[1]

[1](retired)

To investigate prey preferences of spider wasps (Pompilidae), photographs of wasps with prey are collected from the website waarneming.nl, the Dutch branch of observation.org, biodiversity platform for citizen science and monitoring. Wasp specialists identify the spiders wasps, spider specialists (like me) are asked to identify the spiders. Spider identification from photographs is a tricky business. Identification of spider prey from photographs of spider wasps (Pompilidae) is even more complex: often some or all of the legs are missing (amputated by the wasp), and the spider is dragged on its back. Often only (a part of) the belly (ventral site of the abdomen) is more or less well visible. Ventral views of spiders are not so often represented in field guides and scientific descriptions. So, I started to build up a collection of 'belly shots' of freshly collected spiders. After a few years, the results become helpful for upside down spider identification.

P1.2.

Exploring the use of the group-living spider *Cyrtophora citricola* (Araneae: Araneidae) as a biological control agent in a biodynamic greenhouse agroecosystem

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Range shifts of invasive agricultural pests, influenced by anthropogenic activity and the effects of climate change, have contributed to increased levels of crop destruction, food insecurity and economic deficit on a global scale. Additionally, increased pesticide use in response to more frequent infestations has resulted in pesticide resistance in many agriculturally significant pests. Therefore, it is becoming ever more important to assess the efficacy of natural predators as biological control agents, to sustainably mitigate crop damage and preserve food security. Spiders are among the most diverse and abundant natural enemies in agroecosystems, and impressive species variety has been observed at our field site, the HaciendasBio greenhouse-based biodynamic farm in Almería, Spain. One remarkably abundant species here is the group-living tent-web spider, *Cyrtophora citricola*. The spider could potentially be uniquely suited to a role in biological control, as it is globally ubiquitous, exhibits high conspecific tolerance, and creates large, predator-dense colonies. With this work, we aim to achieve a comprehensive picture of the arthropod species consumed by *C. citricola* in this unique agroecosystem; in order to understand the impact this spider has on both pests and agriculturally beneficial invertebrates. Using DNA metabarcoding, the invertebrate species comprising spider diet can be simultaneously identified, furthering our knowledge of the impact of these natural predators on pest reduction. This work could redefine the perception of generalist predators as biological control agents and could encourage the uptake of natural enemies in commercial biodynamic agroecosystems, paving the way to pesticide-free food security.

P2.3.

Arid vs. productive landscapes: predatory efficiency in *Steatoda paykulliana*

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Predatory efficiency is the predator's ability to retain and subdue prey upon encounter. While this trait has been widely studied in vertebrates, it remains understudied in arthropods. Yet within this phylum, spiders represent the most diverse group of predators in terms of both species richness and hunting strategies. Although various studies have examined spider prey capture abilities focusing on venom metering, prey orientation, or visual capacities, no research has addressed how predatory efficiency may vary intraspecifically across habitats. We investigated predatory efficiency in the theridiid spider *Steatoda paykulliana*, a lapidicolous species specialized in semi-arid environments. Twenty-six subadult to adult females were collected across an environmental gradient in Spain, covering two habitat types: arid and productive. Three populations were sampled per habitat type, with field campaigns conducted from 2021 to 2025. Spiders were acclimated individually for one month without feeding to standardize hunger and venom availability. Trials were performed under controlled conditions (25 °C, 55% humidity, reversed 12h:12h photoperiod) and red light. We measured behavioral traits such as attack latency and number of bites in response to two prey types: an easy-to-handle prey (*Tenebrio molitor*) and a more challenging one (*Pycnoscelus surinamensis*), randomly assigned across individuals. The results of this study, still in a preliminary phase, suggest that spiders from arid environments display shorter capture times and more intense predatory responses (more bites, lower immobilization latency) than those from productive ecosystems, which also subdued prey successfully, but with less urgency and fewer bite attempts.

P2.4.

When less is more: male dwarfism as a potential adaptation to avoid female cannibalism in *Trichonephila clavate*

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The golden orb-weaver spider (*Trichonephila clavata*) exhibits extreme sexual size dimorphism, with males significantly smaller than females. We tested the hypothesis that male dwarfism evolved as a detection avoidance strategy to reduce the risk of female-initiated cannibalism. In behavioral experiments, female spiders were presented with male models of varying weights (0.01, 0.02, 0.03, 0.05, and 0.06 g). The models were manually placed on the female's web using fine tweezers at a randomized direction (90°, 180°, or 270°). Behavioral responses were video-recorded for 3 minutes per trial. Model weights and placement directions were randomized across trials. Non-response rates were highest in the natural weight range (0.01-0.03 g) but dropped to 28% at the heaviest model, suggesting the presence of a female detection threshold. Behavioral responses were more strongly associated with relative weight (model/female) than with absolute weight, implying that females may assess stimuli proportionally to their own size. Also, lighter models were detected more slowly but dismissed rapidly. However, once predation was triggered, females made rapid decisions and attacked quickly regardless of weight —indicating that avoiding detection may be a more effective survival strategy than post-recognition escape. Morphological analyses showed that heavier females were associated with males with shorter legs and larger bodies, while long-legged females were linked to smaller-bodied but longer-legged males. These patterns, together with behavioral results, suggest that male strategies may be shaped by individual differences in female sensory thresholds. Overall, our findings support male dwarfism as an adaptive strategy to avoid detection.

P2.5.

Puppet masters: the hidden mechanisms behind parasite-induced behavior in spiders

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Some parasites enhance their fitness by manipulating host behavior. Evidence suggests that parasites often exploit innate host pathways to induce these behavioral changes. Considering that phylogenetically distant parasites that use the same group as hosts may converge on similar manipulation strategies, we reviewed and synthesized evidence from the literature suggesting that wasps, dipterans, and fungi can manipulate host spiders by triggering preexisting mechanisms related to ecdysis. In addition, we investigated whether ecdysone levels increase in parasitized spiders, *Leucauge volupis* and *Trichonephila clavipes*, and whether the expression of key transcription factors associated with ecdysis processes is altered in parasitized individuals of *T. clavipes*. Our results indicate that behavioral manipulation through activation of the innate ecdysis pathway may represent an evolutionary convergence among different groups of spider parasites. However, we did not observe an increase in ecdysone levels in parasitized spiders, nor did we detect changes in the expression of genes associated with ecdysone production. Despite this, we found an upregulation of genes dependent on ecdysteroid activation in *T. clavipes*, such as *Blimp1*. These results suggest that, although behavioral manipulation through the ecdysis pathway may represent an evolutionary convergence among spider parasites, activation of the normal ecdysteroid production pathway does not appear to be the primary mechanism in these hosts. From this, we propose that the activation of ecdysis-related pathways may result from an adaptive immune response triggered by the type of infection imposed by the parasites or from neuromodulators produced by the parasites capable of directly accessing the hosts' nervous system.

P2.6.

Micaria sociabilis and batesian mimicry, a pilote experiment

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The accuracy of the mimetic phenotype can be variable relative to the model, and some species may be considered less accurate in their imitations of the model. Here, the quality of the mimetic phenotype in *Micaria sociabilis* Kulczyński, 1897, which occurs on tree bark and that visually mimics the arboreal ant species *Liometopum microcephalum* Panzer, 1798, is investigated. We quantified mimetic accuracy by comparing the results of multitrait analysis of the model and its mimic. We measured coloration, body size, body shape, appendage size, and movements. The analyses revealed that *M.sociabilis* mimics some, but not all, features of the model. We conclude that *M.sociabilis* is an inacurrate batesian mimic of *Liometopum microcephalum* ants. This pilot study aims to determine whether further research on Batesian mimicry in this species is feasible.

P2.7.

The brown widow spider (*Latrodectus geometricus*) shares a parasitoid with native widow spiders

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The brown widow spider (*Latrodectus geometricus*) is invasive globally. It is the only widow spider species that has spread nearly worldwide, and its range continues to expand. This widespread success raises the question: What enables this species to thrive in newly invaded regions? A potential explanation is its preference for urban habitats, where predation and parasitism risks can be lower than in native habitats. We proposed that superior defenses against natural enemies, particularly parasitoids, give the brown widow a competitive advantage. Egg sacs of widow spiders are targeted by parasitoid wasps, which lay their eggs inside the sac and consume the spider eggs. We showed previously that *L. geometricus* exhibits stronger defenses against an egg sac parasitoid wasp, *Philolema latrodecti*, compared to the native white widow, *L. pallidus*, resulting in a lower parasitism rate for the invasive species. Here, we compared parasitism rates on *L. geometricus* egg sacs with two additional widow spider species that overlap in distribution with *L. geometricus* in Israel: a Mediterranean species, *L. tredecimguttatus*, and a desert species, *L. revivensis*. We proposed that these native species are more vulnerable to parasitism owing to their smooth-surface egg sacs, unlike the silk-spike covered egg sacs of *L. geometricus*. Parasitism rates indeed were higher on egg sacs of both native species than on *L. geometricus*; however, the geographic distribution of the wasp was patchy with respect to its hosts. Indirect evidence suggests that the parasitoid arrived with *L. geometricus* and is spreading in the less well defended native species.

P3.8.

Species diversity and population density of web spinning spiders (Arachnida, Araneae) in urban areas

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Urbanization processes induce rapid environmental alterations that can disrupt the functional roles of organisms within their ecological niches. Species with different ecological requirements respond differently to natural and anthropogenic disturbances, making it essential to study them separately. For our research, we selected web-building spiders along a rural-suburban-urban forest gradient. The objectives were to: (i) assess the species richness, diversity, and population density of web-building spiders in urban environments; (ii) identify the most common synanthropic species within the studied urban areas; and (iii) compare spider population densities between urbanized areas and those with minimal urban impact. Spiders were collected at six locations representing three different habitat types (urban, suburban, and forest habitats). A total of 30 spider species were identified, with Araneidae (orb-weaver spiders) showing the highest abundance and species richness. *Nuctenea umbratica* (Clerck, 1757) stood out as the most abundant species. An increase in both abundance and species richness was recorded with decreasing levels of urbanization. Urban habitats showed the lowest density and species richness, whereas forest habitats had the highest values. Temperature had a negative effect, while air humidity had a positive effect on the overall abundance of spiders, with these effects being particularly pronounced in urban areas. The results of this study provide a foundation for understanding the impact of urbanization on spiders, which, among other roles, are important as natural pest control agents and thus contribute to ecosystem services.

P3.9.

Shadows and sunshine: slope-driven divergence in zodariid spiders and the discovery of *Lachesana salam*

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Monitoring arthropod diversity can be tedious and resource-intensive, but it is vital for understanding spatial and temporal shifts in assemblages and for biodiversity discovery. Such monitoring schemes also help reveal how direct (e.g., cultivation, urbanization) and indirect (e.g., global warming) anthropogenic effects impact biodiversity, supporting long-term monitoring and conservation efforts. We monitored arthropods over 24 months using pitfall-traps in a Plio-Pleistocene canyon within the Nahal Keziv Nature Reserve, Upper Galilee, Israel. The site is characterized by sharp environmental contrasts between north- and south-facing slopes, including differences in solar radiation and vegetation cover. Our sampling yielded 1748 arachnid specimens representing 111 taxa across five orders. Arachnid abundance and richness were significantly higher on the south-facing slope. Six spider species from the family Zodariidae were recorded, with two species: *Pax islamita* (Simon, 1873) and *Lachesana salam* Hammouri, Ganem & Gavish-Regev, 2024 — represented by over 50 individuals each and presenting contrasting spatial and temporal distribution patterns. *Pax islamita* was more abundant on the north-facing slope (113 vs. 43) and peaked in spring-summer, while *Lachesana salam*, was more abundant on the south-facing slope (45 vs. 3) and occurred mainly in early winter. On the south-facing slope, *Pax islamita* showed a tendency to occur under trees and shrubs, while *Lachesana salam* was found primarily in open patches without woody vegetation. We also described key morphological differences among regional *Lachesana* species. This study highlights the value of continued sampling and the importance of microhabitats with sharp environmental gradients for understanding species distributions in Mediterranean ecosystems.

P3.10.

The impact of a wildfire on spider communities in temperate forest landscape

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Wildfires are major ecological disturbances, yet their impact on arthropod communities in temperate forest ecosystems remains poorly understood. In the summer of 2022, an extensive wildfire in the Bohemian and Saxon Switzerland National Parks (Czech Republic and Germany) created a heterogeneous post-fire landscape. We examined how this event affected ground-dwelling spider (Araneae) communities over the two years following the fire. We established a total of 36 research plots in deciduous and coniferous forests, with varying fire severity. In each plot, we installed four pitfall traps. Samples were collected every three weeks from May to August in both 2023 and 2024. Around each pitfall trap, we recorded the vegetation structure at two different spatial scales: micro- (3 m² directly around the trap); macro- (500 m² of the surrounding area). Our findings show that burn severity and vegetation structure affect both species composition and the distribution of functional traits. While fire can reduce forest specialized species, it also promotes habitat heterogeneity and allows colonization by generalist and open-habitat species. Maintaining a mosaic of burned and unburned patches may thus enhance biodiversity at the landscape level. These results highlight the importance of fire-induced habitat heterogeneity in shaping spider communities and underscore the need for further research in temperate fire ecology.

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P3.11.

Indirect effects of a mosquito larvicide on riparian spiders

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Emergent aquatic insects are an important prey for riparian spiders. Thus, human alterations to the aquatic fauna may propagate to adjacent terrestrial systems. To test this, we monitored terrestrial spider communities in twelve floodplain pond mesocosms in the Palatinate Forest, Germany. Spiders were sampled using pitfall traps. Between 2021 and 2023, six of the mesocosms were treated with *Bacillus thuringiensis israelensis* (Bti), a biological larvicide effecting Chironomidae and Culicidae, to reduce the availability of emerging aquatic prey. The remaining six mesocosms served as untreated controls. A notable decline in Chironomid emergence occurred only during the first year of Bti treatment, which coincided with a significant reduction in *Oedothorax* spider numbers. This suggests that short-term decreases in aquatic prey can affect terrestrial predator populations, although these effects may be reversible if prey availability rebounds. Our findings underscore the importance of aquatic-terrestrial energy flows in shaping predator community dynamics. The four-year dataset provides valuable insight into the temporal variability of these cross-ecosystem interactions.

P3.12.

Spiders in tree cavities in Czechia

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Tree cavities are a microhabitat with specific microclimatic conditions that provide spiders with shelter, a place to lay eggsacs, and also provide a lot of prey. Spiders inhabiting tree cavities can be sorted into several groups in relation to cavities: 1) specialist species for tree cavities (e.g. *Midia midas*), 2) species that temporary inhabit tree cavities but also occur in other habitats (e.g. *Liocranum rupicola*, *Lepthyphantes minutus*) and 3) species that occur randomly in cavities. Both species that hunt without webs (e.g. *Scotophaeus*) and web-building species (e.g. Linyphiidae, Theridiidae) occur in cavities. The araneofauna of tree cavities in Czechia have been poorly studied and only a few papers have been published, mostly marginally mention spiders living in tree cavities. The most common species of spiders in tree cavities in Czechia are *Tegenaria ferruginea*, *Steatoda bipunctata* and gnaphosids from the genus *Scotophaeus*. Some endangered and rare species such as *M. midas*, *Dipoena nigroreticulata*, *Dipoena torva*, and *Haplodrassus* cognatus also occur in the cavities of old trees. In the nests of ants in tree cavities, lives rare species such as *Mastigusa arietina* or *Micaria sociabilis*. Tree cavities are an important microbiotope, not only for saproxylic insects, bats, and birds nesting in cavities, but also for spiders. A total of 76 species of spiders from 12 families were recorded in tree cavities in Czechia, some species are rare and endangered. This poster brings a list of spiders from tree cavities in Czechia and notes about their ecology and relation to the tree cavities.

P3.13.

Spatial and temporal analysis of spider diversity in Teide National Park (Canary Islands)

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One of the main limitations in the study of global biodiversity loss patterns is the scarcity of comprehensive databases that enable the comparison of local-scale patterns across defined temporal frameworks. This study evaluates temporal changes in spider biodiversity within Teide National Park (Tenerife, Canary Islands) by comparing standardized field surveys conducted in 1995 and 2024. Biodiversity was assessed through three complementary dimensions: taxonomic (TD), phylogenetic (PD), and functional (FD) diversity. Results indicate a substantial decline in species richness, with only 49 species recorded in 2024 compared to 92 in 1995. Despite this taxonomic loss, there were no significant changes in PD or FD. This apparent stability is attributed to high functional and phylogenetic redundancy: most of the species lost were replaced by ecologically and evolutionarily similar taxa. Beta diversity analyses revealed a dominant species turnover component in all three dimensions, especially taxonomic, suggesting substantial reorganization of community composition rather than simple species loss. Our findings suggest early signs of environmental filtering possibly driven by increased aridity and vegetation changes occurred during the last 30 years. This study underscores the need for long-term, multidimensional biodiversity monitoring in insular and high-altitude ecosystems, where arthropod communities face increasing pressure from climate change and habitat shifts. The results provide a baseline for future conservation efforts and highlight spiders as sensitive indicators of ecological change.

P3.14.

Hidden predators of Plitvice Lakes: spiders and carabids under tourism pressure

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Plitvice Lakes National Park is an ecological treasure, renowned for its unique karst landscape, tufa-forming waterfalls, and rich biodiversity with many rare and endemic species. As one of the most visited natural sites in Croatia, attracting over a million tourists annually, preserving its delicate ecosystems is vital for maintaining long-term ecological balance. The park's grasslands, which extend within and around the iconic waterfalls, are an integral part of this ecosystem but have never been studied for two of the most diverse arthropod predator groups—spiders and carabids. To address this, we surveyed their biodiversity across 17 grassland sites within the park from May to October of 2024 using non-selective pitfall traps (deployed five times for 2-3 weeks) and net sweeping during each collection. In total, we identified around 100 spider species and 50 carabid species, which, according to rarefaction curves, likely represent the full species pool of these groups in the park's grasslands. Notably, spider assemblages near major tourist zones were completely distinct from those in more remote grasslands, while carabid species showed unique compositions in nearly every location, with slight differences between sites in the proportions of forest and open-habitat species. These results suggest that mass tourism may be altering spider communities, possibly through disturbance-driven shifts in species composition.

P3.15.

Zombies in the tropics: the fungus *Gibellula* manipulates nine spider families in the Atlantic and Amazon forests

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Some parasites induce behavioural modifications in their hosts, enhancing their transmission. Spiders parasitised by the fungus *Gibellula* die attached to specific vegetation sites, suggesting potential behavioural manipulation. Although *Gibellula* is specialised to spiders, its degree of host specificity remains unclear. We investigated host-parasite interactions across seven Atlantic Forest sites and one Amazon site in Brazil, sampling from October 2020 to May 2025. Parasitized spiders and their fungi were identified using morphological traits to the lowest taxonomic level possible. We recorded 42 spiders across nine families (over 17 reported in literature): Anyphaenidae (15), Araneidae (2), Corinnidae (2), Pholcidae (4), Salticidae (1), Sparassidae (4), Theridiidae (12), Theridiosomatidae (1; first host record), and Thomisidae (1). These were infected by 17 species of *Gibellula* and one *Hevansia* (the closest related genus), highlighting their relevance in spider population control. A matrix of fungal-host occurrences was used to generate a heatmap and bipartite interaction network. The network showed moderate connectance (12.9%) and low nestedness (NODF = 8.06). Host niche overlap (LL = 0.17) was low, indicating that most spider families are infected by distinct fungal taxa and shedding light on the complexity and ecological significance of host-parasite networks. Some species, such as *G. pulchra*, *G. aurea* and a new species (under description), parasitised multiple spider families, revealing a variable host specificity within the genus. All parasitised spiders were found dead underneath leaves, regardless of their natural foraging niche. This consistent death location suggests a parasite-induced host displacement, an established route of behavioural manipulation

P3.16.

High-throughput sequencing of Iberian spiders for biodiversity monitoring and conservation

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The Iberian Peninsula hosts one of the richest spider faunas in Europe, with approximately 1,500 species recorded, 20% of which are endemic. Recent estimates suggest that this number could rise even higher. This remarkable diversity and high endemicity highlight the need for efficient tools for species identification and biodiversity monitoring. The SPIDCHANGE project investigates the factors influencing spider assemblages under varying environmental conditions and human impacts, and how these factors impact ecosystem functioning in Mediterranean cork oak (*Quercus suber*) forests. It also aims to provide crucial data for conservation planning. With those goals in mind, 24 plots distributed throughout the Iberian Peninsula were sampled using optimized, standardized protocols during the period of peak adult spider activity, from mid-May to mid-June, in two consecutive years. To overcome the bottleneck created by the high diversity and abundance of specimens, the project employs a cost-effective identification strategy that combines mega- and metabarcoding approaches, based on Oxford Nanopore and Illumina sequencing technologies. However, accurate DNA-based identification requires a robust reference library of barcodes. To date, barcodes are available for approximately 60% of the Iberian spider fauna. The SPIDCHANGE project will not only rely heavily on this resource for automating identification but also provides a significant opportunity to complete the library. By integrating extensive fieldwork high-throughput sequencing, and expert morphological validation, SPIDCHANGE will significantly enhance our understanding of spider diversity, composition, and distribution in Mediterranean forest ecosystems and will further strengthen our capacity for long-term biodiversity monitoring and conservation in the face of climatic change.

P3.17.

Vertical distribution of spiders in forest stands: implications for biodiversity assessment

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The vertical distribution of spiders in forest stands is rarely studied. We investigated patterns of species richness, diversity, life-history traits, and functional diversity of spiders in oak-dominated forests, and their response to the canopy cover gradient. Sampling was conducted at three localities over four growing seasons (2008-2011, Southern Moravia, Czech Republic), using three flight intercept trap complexes placed at different vertical levels of oak stands. In total, 3592 spiders from 18 families and 112 species were collected. We found that species richness, total abundance, and the abundance of ambush hunters, other hunters, and rare spider species increased from ground level to the canopy, with species composition shifting along the vertical gradient. Canopy cover interacted significantly with some of these characteristics. Less common ballooning species preferred the ground layers. Orb-web weavers and less common ballooning species were most abundant in closed canopies, while sheet-web weavers, abundant species, and open-habitat species were more common in open canopies. Space web weavers, other hunters, and common ballooning species showed higher abundance in upper layers with more open canopies. Our findings suggest that sampling spiders across the vertical gradient is important for accurate biodiversity assessments and forest management, as most previous studies focused on ground-dwelling spiders from pitfall traps.

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P3.18.

How local and microhabitat conditions shape overwintering spider assemblages in leaf litter

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Understanding the role of non-productive woody vegetation elements in shaping overwintering spider assemblages is essential for biodiversity conservation. It was investigated how local, and microhabitat conditions influence spider assemblages overwintering in leaf litter. Leaf litter was sampled from an area of 1 m^2 in three types of woody vegetation formation across three landscape types with varying proportions of arable land and orchard/vineyard (collected twice per winter; 99 samples of solitary trees, 106 samples of vegetation in lines, and 110 samples of aerial woody vegetation). The leaf litter was sifted in the lab, and spiders were identified. It was evaluated the effects of adjacent land use, detailed woody vegetation characteristic, and microhabitat features on spiders.Significant effect of adjacent land use on the mean number of individuals was observed, with all land use types differing ($p < 0.0001$), except for grassland-vineyard ($p = 0.98$). Detailed characteristics of woody vegetation also showed significant differences in spider abundance: for solitary formation, between “walnut trees” and “fruit trees” ($p = 0.009$), and “walnut trees” and “other trees” ($p = 0.007$); for linear formations, between “mixed shrubs and trees” vs. “trees” ($p < 0.0001$) and “shrubs” vs. “trees” ($p = 0.0003$); and for areal formations between “monoculture native trees” vs. “monoculture non-native trees” ($p < 0.0001$), and “monoculture non-native trees” vs. “polyculture” ($p < 0.0001$). Microhabitat characteristics, particularly leaf litter weight and grass cover, significantly influenced spider abundance and guild composition.

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P3.19.

Spider community composition and functional changes in Mariarano forest reserve, NW Madagascar

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The Mariarano forest reserve is a roughly 5,000-hectare community managed Dry Deciduous Forest block in northwestern Madagascar in the Boeny region. Alongside an ongoing long- term biomonitoring programme focussing on vertebrates, we recently began a systematic sampling protocol to examine changes in community composition of spiders depending on land- use changes and structural properties of forest in the region. We used four sampling methods and split survey effort between a transition of habitat classifications from interior forest to agricultural land, with edge habitats and palm savannah as intermediaries. Forty 10 x 10 m radius circles were sampled between the habitats and were sampled in 2024 and 2025; and will be sampled for at least the next three years. We uncovered a highly endemic and remarkably diverse fauna, with > 270 morphospecies identified and we estimate that > 70% of these are new to science, including at least a half dozen new genera. We demonstrate that conversion of natural forest into agricultural land decimates endemic spider faunas and homogenises functional diversity but does not alter overall abundance of spiders. Habitat type explained most of the differences in community structure, but more resolution is needed within habitats. We posit several additions to sampling for the coming years that could allow us to test potential management actions that could retain a better portion of spider diversity.

P3.20.

Above the researchers' heads: spider assemblages on green roofs in NE Poland

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Green roofs are becoming an increasingly popular element of an urban landscape. Not only do they improve its aesthetic aspects but also contribute to the maintenance of biodiversity. In such habitats, there were often recorded both rare and endangered species, as well as those alien or spreading northwards. Apart from data on spider assemblages on urban green roofs in e.g. Germany, Switzerland, France or UK, there is currently little data from East-Central Europe. The aim of our research was to investigate the spider assemblages on extensively managed green roofs on the campus of the University of Białystok (NE Poland). The studies were carried out from April to October in 2024 on the roofs of seven buildings. Through the use of pan traps and pitfall traps, we have collected around 3000 specimens belonging to 70 species. The common synanthropic species characterized by preference for xerothermic and disturbed areas were the dominant group. The only invasive species that we have observed was the common *Mermessus trilobatus*. The relatively high species richness of these habitats speaks in favor of ongoing development of urban green infrastructure.

P3.21.

Tracking spider invasion: the spread and ecological impact of *Mermessus trilobatus* in Hungary

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Mermessus trilobatus (Araneae: Linyphiidae) is recognized as one of Europe's most rapidly spreading invasive spider species. Unlike many other introduced arachnids that remain confined to urban or anthropogenic habitats, *M. trilobatus* has successfully colonized a wide range of natural and semi-natural ecosystems. Following its initial establishment in Germany during the 1970s, the species was first recorded in Hungary in 2014.This study synthesizes data from multiple Hungarian arachnological surveys to reconstruct the annual progression of the species' distribution up to 2023. We present a timeline of its geographical expansion, characterize the range of habitats it has occupied, and analyze its integration into native spider assemblages. By interpreting these ecological patterns, we evaluate the potential impacts of *M. trilobatus* on native biodiversity, including possible competitive displacement of indigenous species and shifts in community structure. Finally, we discuss the species' prospective future spread in light of ongoing climate change, identifying potential risk areas and conservation implications for European spider fauna.

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P3.22.

Reclaiming the unwanted: mining scientific gold from forest reserve bycatch

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Faunistic monitoring projects are often focused on specific target taxa by however, generating a huge amount of bycatch specimens. In the best case, bycatch samples are properly stored after the target specimens have been removed. Here, we present data on examined bycatch samples from three different forest reserves in the eastern pre-Alps of Switzerland. Originally, sample collection was focused on xylobiontic beetles and taken between 2015 and 2018 with five different trap types. In 2025, we separated the bycatch from the original samples and sorted the following taxonomic groups: Arachnida, Heteroptera, Hymenoptera, and Lepidoptera. With respect to Arachnida, we identified a total of 327 bycatch individuals covering 56 Araneae (N=309) and four Opiliones (N=18) species. Interestingly, one of the most individual - rich spider species identified as *Episinus maculipes* Cavanna, 1876 (Theridiidae), is a first record for eastern Switzerland. Apart from the spiders, we found several highly interesting Hymenoptera species, among which some species are rarely found, and one has not been described for Switzerland so far. Here we show, that properly keeping and processing bycatch samples could illuminate hidden local diversity and distribution of so far understudied species. Based on our results, we will conduct a comprehensive study to fill gaps on species diversity and distribution of target arachnids and Hymenoptera by comparing historical Museum collection data and newly collected material of the Swiss alpine region.

P3.23.

Determinants of cave spider trophic interactions and competition

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Cave ecosystems are shaped by unique environmental constraints, influencing species distributions, trophic interactions, and competitive dynamics. This study explores the dietary composition and trophic interactions of cave-dwelling spiders across multiple geographically distinct caves using molecular gut content analysis. Through the integration of network analysis, MGLM, and NMDS, we assess variations in trophic interactions, hunting strategies, and spatial dynamics within cave zones. Our results reveal dietary variation among cave-dwelling spiders across different zones. Network analysis indicates that dietary composition differs by cave zone, with flying insects serving as the dominant shared food source. NMDS analyses suggest that, while individual spiders exhibit diverse diets, web-building spiders tend to have more similar dietary patterns compared to others within their guild, whereas actively hunting spiders display greater variability in their prey selection. An additional NMDS analysis highlights similarities in the average diet of spiders in caves without bats, contrasting with those in bat-inhabited caves, despite some degree of overlap. Future analyses will further explore differences in trophic affinities (troglobites vs. troglophiles), along with ecological interactions of different caves, hunting strategies, and the presence or absence of bats. As key predators in subterranean habitats, spiders provide an important ecological perspective on cave food webs.

P3.24.

Drying lands: spiders of the changing semi-desert lands of Armenia

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Armenia, characterized by its predominantly mountainous terrain and arid climatic conditions, has recently experienced a marked increase in the frequency and severity of extreme weather events and natural hazards. These climatic shifts—manifested through rising average air temperatures and declining precipitation levels—have led to the expansion of drought-affected zones from the lowlands and foothills into higher-altitude mountainous regions. Such environmental transformations exert considerable pressure on ecosystems, consequently threatening biodiversity integrity. This study presents an assessment of spider biodiversity within Armenia's most arid habitats. Our findings document a minimum of 255 species across 169 genera and 36 families, highlighting the region's substantial arachnofaunal diversity. In total, 6 species (2.3%) are endemic to Armenia, and an additional 22 species (8.6 %) are endemic to the broader Caucasus region. Notably, five species are recorded in Armenia for the first time, underscoring the need for continued taxonomic and ecological monitoring in the face of accelerating climate change.

P4.25.

Species distribution models, sampling bias, and country distribution maps: spider edition

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The distribution of many spider species is known at country level but not at finer scales, hindering conservation efforts and diversity research. Species distribution models (SDM) are used to infer where species are, but their application to studying arthropod distributions remains challenging due to sampling bias and finer scale habitat requirements. Sampling bias and treatments for its removal (such as thinning out observations close to roads and settlements) or environmental filtering, introduce new assumptions and distort model performance, the effect of which may be exacerbated by species' ecological characteristics like habitat preference or dispersal. We used species distribution modelling to create climate-based range maps for 95 spider species in Europe and analyzed how roadside bias removal and environmental filtering affect model performance for species with different habitats and ballooning frequency. Additionally, we compared the projected models against country checklists to investigate how well spider SDMs can predict species distribution at country level. We found that roadside bias removal and environmental filtering lead to generally lower model evaluation scores, while spider habitat preference and dispersal had no impact on model performance. Average model accuracy compared to country lists was about 69-70% regardless of sample bias treatment, SDMs predicted species' presences on average in about 8 more countries than known from country checklists, either signifying overprediction or implying potential new local records. When examined critically, SDMs are able to depict a more indepth distribution picture that may prove useful when estimating the distribution ranges of spiders across Europe.

P4.26.

Regards from the Miocene: *Ayyalonia*- a climatic relict Israeli endemic troglobitic pseudoscorpion genus

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The evolution of obligate cave-dwelling species can often be explained by the Climatic Relict Hypothesis (CRH), which suggests that climatic changes lead to vicariant speciation of subterranean populations. While the surface is susceptible to climatic and environmental changes, subterranean ecosystems can preserve stable conditions for very long periods, enabling a refugium for relict species while their epigean ancestor becomes extinct. Some species evolve morphological adaptations to the hypogean environment which increase reliance on the cave environment. These evolutionary processes lead to a loss of migration between epigean and hypogean populations and may result in high genetic partitioning, fragmented distributions and consequently multiple speciation events of separate subterranean troglobitic relictual populations restricted to their caves. Under CRH, troglobitic sister species can be found in remote caves, while their epigean ancestors underwent extinction. In a survey of the subterranean arachnid fauna in Israel, new species of *Ayyalonia* were discovered. Phylogeny based on the target enrichment of ultraconserved elements of the first DNA sequences of *Ayyalonia* revealed three new micro-endemic *Ayyalonia* species all of them sharing troglomorphic adaptations. *Ayyalonia dimentmani* Ćurčić, 2008 was found only in the unique, previously sealed, chemoautotrophic Ayyalon cave, which it probably invaded during the mid-Miocene ~14 Mya, when the Levant endured a dramatic aridification. All *Ayyalonia* species were found in deep, highly isolated, hypogene, phreatic caves with elongated tunnels, each in a single cave in a different region of Israel. The large geographic distance between closely related species is an indication of the evolutionary process explained by CRH.

P5.27.

Conservation Ecology of the Italian red devil spiders (Araneae, Dysderidae)

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Spiders of the family Dysderidae, also known as red devil spiders, primarily occur in Eurasia and Northern Africa. The core of their diversity is centered in the Mediterranean Basin, where they exhibit a very high rate of endemism, especially in Italy, Greece, and Spain. In Italy, Dysderidae are represented by 10 genera and 83 species, most of which (52) have a distribution restricted to the national territory ("Italian endemics"). This work aims to assess the conservation status of the 52 Italian endemic species of red devil spiders based on presence data available in the literature, which have been georeferenced and supplemented with information on species ecology, habitat preferences, occurrence within protected areas, and potential conservation threats. Each species was evaluated using the IUCN Red List criteria to determine its extinction risk category. Where data permitted, species distribution models were employed to estimate the effects of climate change on current ranges and to predict potential future contractions. The majority of species were classified as Endangered, followed by those listed as Critically Endangered and Vulnerable, primarily due to climate change impacts and habitat fragmentation resulting from anthropogenic pressures. Moreover, we also discuss the main threats, conservation challenges, and management implications necessary for safeguarding this unique group of endemic arachnids.

P5.28.

Landscape composition and vegetation structure in solar parks affect spider diversity

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The utilisation of solar energy is expected to accelerate in the near future. It is suggested that photovoltaic energy will account for over 50% of energy generation by 2050. However, ground-mounted solar panels require a lot of land, which can lead to conflicts with other types of land use, particularly agriculture and biodiversity conservation. To mitigate the decline of grassland biodiversity, solid conservation planning is required that focuses not only on protected areas, but also on all grassland habitats. This includes the increasingly widespread improved grasslands found in solar parks. The aim of our project was to gain a better understanding of the effects of former land use, landscape context, solar park size, and vegetation on spider diversity. We sampled spiders in 32 solar parks and 32 extensive reference grasslands using pitfall traps and sweep-netting. Vegetation structure positively affected the species richness of ground-dwelling spiders. Landscape composition also affected species richness, but this effect was modified by solar park size. The interaction between landscape composition and former land use had a significant impact on vegetation-dwelling spiders. Careful conservation management planning of solar parks could help to achieve nature conservation goals by maintaining vulnerable grassland spider diversity in Central Europe.

P5.29.

Island endemics under threat: monitoring, conservation, and recovery of Madeiran wolf spiders (Araneae, Lycosidae, *Hogna*)

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The Madeira Archipelago hosts many endemic species, including iconic wolf spiders such as *Hogna ingens*, the largest spider in Europe, as well as other members of the genus *Hogna*. *Hogna ingens* is found exclusively in the Vale de Castanheira, a small valley of about 0.83 km² in northern Deserta Grande, a tiny island near Madeira. By 2012, its population had declined, mainly due to the spread of the invasive grass *Phalaris aquatica*. As a result, *Hogna ingens* was classified as “Critically Endangered” on the IUCN Red List in 2014, prompting the development of a conservation plan that included the removal of invasive grass and the establishment of a conservation breeding program. Monitoring surveys were carried out in 2011, 2012, 2016, and May 2025. In 2025, we collected additionally prey remains from spider burrows. Preliminary analysis of monitoring data indicates that the population grew by 441% between 2012 and 2016, and by 2025, the population had increased by a further 101%. Analysis of the collected prey remains shows that *Hogna ingens* feeds predominantly on Coleoptera and Diplopoda. *Hogna nonannulata* is another very large wolf spider, endemic to Madeira, about which virtually nothing is known; only a single published locality exists. We have collected and surveyed unpublished localities where the species has been reportedly found. Twelve sites with reported sightings were examined. No live animals were found at any of the sites. Remains attributable with certainty to *Hogna nonannulata* were only found at one site.

P5.30.

How simple enrichment elements in non-production habitats in fields diversify the spider fauna

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In recent decades, there has been a drastic loss of biodiversity in agricultural landscapes in Central Europe. Together with the overuse of agrochemicals, the loss of habitat diversity is the cause of this decline. Non-production habitats play a key role here. From here, organisms can recolonise agroecosystems after disturbance of production areas, such as ploughing, harvesting or pesticide application. Increasing this potential can be achieved by diversifying microhabitats that provide a source of shelter or food. The aim of the study was to test the effects of incorporating grass strips into agroecosystems and the effects of diversifying these strips with simple types of structures or substrates on spider diversity and abundance. Seven-metre-wide grassed linear strips were incorporated into five fields using a uniform methodology. Two years later, the arachnofauna of the fields near and far from the strip were compared using pitfall traps and sweeping vegetation. After that, diversifying structures were built on the strips, which are easy to implement in an agricultural landscape. Specifically, these included excavations and mounds with exposed substrate, and accumulations of inorganic (stone walls) and organic material (straw bales, wood chips, lying logs). Each of the six treatments was built in five replicates on each strip. In the next year, monitoring of the arachnofauna surrounding these structures was conducted using pitfall traps and sweeping vegetation. The results show that incorporation of grassy strips has a positive effect on arachnofauna of adjacent fields and that construction of simple diversifying structures can promote spider diversity.

P6.31.

Shrub connectivity modulates spider-prey networks and plastic accumulation in cities

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Despite their ecological importance, little is known about spider prey composition and how land use change affects it—particularly in urban environments where predator-prey interactions remain understudied. We investigated these interactions along an urbanization gradient in Torino (NW Italy), focusing on web-weaving spiders inhabiting *Juniperus horizontalis* shrubs. In May and September 2024, we sampled 19 shrubs across the gradient, collecting 570 spiders and their webs using standardized protocols. Urbanization was quantified as the percentage of impervious surface around each site. Spiders were identified to species level; prey remains to order or family whenever possible. Spider abundance and species richness did not vary with urbanization, but prey communities were strongly shaped by shrub connectivity. In isolated shrubs, prey abundance and richness increased with urbanization, likely due to an island-like effect concentrating flying prey. In connected shrubs, prey richness decreased, possibly due to prey dispersal across the urban matrix. When examining the three most abundant spider species (*Frontinellina frutetorum*, *Mangora acalypha*, *Zilla diodia*), all showed similar prey profiles. However, only *M. acalypha* abundance increased with urbanization in isolated shrubs, mirroring prey trends. Spider webs also trapped microplastics, providing an unexpected proxy for environmental contamination. Plastic abundance correlated with spider and prey abundance, especially in isolated shrubs, but showed no direct relationship with urbanization itself. Future research combining food web network analysis and gut content metabarcoding will be crucial to clarify how urbanization shapes trophic interactions and to assess whether spiders act as entry points for microplastics into terrestrial food webs.

P6.32.

Taking care of the alien: parasitoids in the egg sacs of wolf spiders (Lycosidae)

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Female wolf spiders (Lycosidae) carry egg sacs attached to their spinnerets. Their maternal behaviour and the silk properties of the egg sac provide optimal conditions for the offspring's development. However, this active care of the egg sac is not always an effective defence against attack by parasitoids (including Darwin wasps), and the conditions in the egg sac necessary for the development of the spider offspring turn out to be equally ideal for the development of parasitoid larvae. It should be emphasized that very little is known about the biology of most of the parasitoids of the spider egg sacs. Our study aimed to determine the degree of infestation of wolf spider egg sacs in selected populations in Poland and to trace the development of parasitoids in the egg sacs. In 2023 and 2024, the contents of more than 1000 egg sacs of *Pardosa* and *Pirata* were checked, and 203 of them contained the larvae or pupae of the parasitoids, which were then reared in the laboratory. We obtained both solitary (*Hidryta* sp.) and gregarious (*Gelis* sp.) parasitoids. We demonstrated that egg sacs with pupae of *Hidryta* sp. have different shapes and weights in relation to egg sacs with eggs and the further developmental stages of spiders. However, these egg sacs were not rejected, although wolf spider females recognize their own egg sacs using information such as their mass, size, texture, and odour.

P7.33.

An evolutionary arms race: spider egg sac parasitoids and active maternal care by the spider

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Spider egg sacs contain valuable food resources, and many species specialize in feeding on spider egg masses. Parasitoids can lead to high mortality in spider egg sacs and in some cases the reproductive success of a spider female with a parasitized egg sac is reduced to zero. Thus, traits that enable avoidance or reduction of egg sac parasitisation are critical for increasing spider fitness. On the other hand, a species that develops within the spider's egg sac uses a limited resource derived from a single egg sac for its larval development. Therefore, the most important behaviour which increases the fitness of free-living female parasitoids is their oviposition decision, including the choice of host, which should be of high nutritional quality and sufficient food resources for their offspring. All these factors exert reciprocal selective pressures on spiders and parasitoids, resembling the concept of an arms race. Of especial interest is the case of egg sac parasitoids and spiders carrying egg sacs. We analysed various points of the aforementioned relationship, utilizing the ichneumonid *Hidryta fusciventris* and the wolf spider *Pardosa lugubris*. We showed the factors that influence the oviposition decision of parasitoid females and the behaviours of spiders that increase their fitness. Furthermore, we observed that *H. fusciventris* larvae feed not only on spider eggs but also on the later developmental stages of spiders, which may serve as a long-term food source. However, the quantity and quality of fatty acids for parasitoid larvae differ at successive stages of the spider's development.

P7.34.

Conservation genomics and eDNA monitoring of the Fen Raft Spider (*Dolomedes plantarius*) in England and Wales, UK

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The Fen Raft spider (*Dolomedes plantarius*) is a nationally and internationally Vulnerable semi-aquatic species found in fragmented wetlands in England and Wales. Conservation efforts in England have included translocations to new sites, and although these populations appear to be thriving, there is minimal information available on the genetic outcomes. To investigate this, the genetic health and population structure of *D. plantarius* will be examined, in addition to the development of environmental DNA (eDNA) tools to enhance detection. The central hypothesis is that smaller and more isolated populations could exhibit reduced genetic diversity or gene flow, which could limit long-term viability. Genome-wide single-nucleotide polymorphism (SNPs) data will be generated using low-coverage whole-genome sequencing (lcWGS) from all known British populations. These data will be used to assess heterozygosity, inbreeding, and gene flow between established, translocated, and satellite populations. This will help identify genetically vulnerable groups and inform future conservation strategies, such as targeted habitat management, augmentation, and potential future translocation planning. Improved monitoring tools such as eDNA will be incorporated into future conservation strategies. Therefore, species-specific primers will be developed to enable presence-absence detection in often hard-to-access wetland sites where conventional survey methods are often restricted by limited visual detection. This research integrates molecular techniques with improved genetic monitoring to support long-term recovery planning for *D. plantarius*, offering a broader framework for invertebrate conservation in wetland habitats.

P7.35.

Phylogenetic allometry in orb web size and performance

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Orb web building spiders rely on their aerial, sticky traps to catch prey. Their fitness is directly tied to the performance of their webs. Innovations in silk and web use were crucial in diversification of this large spider group. Spiders can alter web characteristics, as well as silk mechanical properties, which affect the performance of the webs. Orb webs likely represent a trade-off between catching efficiency and the energetic cost of producing them. However, these trade-offs are under-researched, and how web and silk characteristics scale to body size (their allometric patterns) remains mostly unknown. Here, we quantified the material investment into orb webs, and their total performance across species of diverse sizes. We estimated the volumes of the three silk types used in orb web building: radial silk, capture spiral silk, and glue. We then quantified web performance in terms of their interception, stopping and retention potentials. Using phylogenetic allometric analyses, we investigated general coevolutionary patterns and trade-offs among the investigated traits. Preliminary results show that, across orb weaving species, silk investment into webs scales negatively allometrically with body size. There is a general trend for larger species to produce tougher silk, while the quality of silks trades off with their total volumes. These findings indicate that evolutionary shifts to larger body sizes in orb weavers may come at the cost of reduced investment in certain aspects of web performance.

P8.36.

Halloween in February? Mass occurrence of the linyphiid *Oedothorax apicatus* in the fields

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Spider ballooning, or aerial dispersal, is a well-documented phenomenon in temperate ecosystems, often observed as gossamer threads in autumn during warm weather (“Indian summer”). However, a less recognized but ecologically significant dispersal behavior also occurs in spring. In this study, we report an unusually early mass colonization event by spiders in an agricultural landscape observed in February, before the typical onset of spring activity. At the first site near the village of Diviacka Nová Ves (Slovakia), horizontally oriented spider webs were found continuously covering grassland vegetation and tree rows along an area approximately 0.5 km long and 4 m wide. Tree trunks were covered with spider silk up to a minimum height of 4 meters. Across five study sites, we collected 981 individuals of *Oedothorax apicatus*, of which 913 individuals were adult females. Examination of the web structure suggested that the silk was composed primarily of accumulated draglines. In laboratory conditions, individuals of *O. apicatus* exhibited tip-toeing behavior indicative of pre-ballooning activity. Given that spiders are among the most abundant and diverse groups of predators in agroecosystems and semi-natural habitats and their vegetation provide refuge sites for them, with climate change driving an increase in mild winters, such early dispersal events are likely to become more frequent, potentially reshaping seasonal patterns of arthropod community assembly and pest control dynamics.

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P8.37.

One or eight legs? Spiders (Araneae) and harvestmen (Opiliones) collected during a malacological expedition to Ukraine

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During a malacological expedition to the western part of Ukraine in June 2017, material of spiders and harvestmen was also collected. The arachnids were obtained from various habitats, e.g. steppes, ruderals, riverbanks or forests, using standard arachnological techniques, i.e. sweeping from vegetation and shrubs (both during the day and night), sieving from soil and leaf litter, and hand collecting. The specimens were identified by the first author, preserved in either 80% denatured ethanol or 96% absolute ethanol and databased. The aim of this work is to provide further faunistic data on the spiders and harvestmen of Ukraine. Altogether, the material was gathered from 31 localities and contains 134 specimens identifiable to the species level. Among them, 64 spider species (from 20 families) and six harvestmen species (from three families - Nemastomatidae, Dicranolasmatidae and Phalangiidae) were identified. *Pardosa alacris* was the most numerous (15 individuals) and the most frequent (six localities) species, followed by *Evarcha arcuata* and *Neriene radiata* (both from three localities). Some rare and zoogeographically or ecologically remarkable species were also recorded: *Agyneta subtilis*, *Amaurobius pallidus*, *Araniella proxima*, *Pardosa agricola*, *P. fulvipes*, *P. wagleri*, *Philaeus chrysops*, *Syedra gracilis*, *Thomisus onustus*, *Titanoeca schineri*, *Dicranolasma scabrum* and *Paranemastoma kochii*. The most important finding is that of *Centromerus albidus* (Linyphiidae), being a species new to Ukraine.

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P8.38.

Araneofauna of Posidonia Oceanica banquette of Sant'Agostino (Civitavecchia, Italy): an ecosystem between land and sea

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Banquettes are an important coastal ecosystem. They are formed from the accumulation on the coast of plant biomass, mainly represented by the dead leaves of the marine phanerogamous plant *Posidonia oceanica* (L.) Delile. These environments are still poorly studied from an ecological and faunistic point of view. In Latium, near the locality of Sant'Agostino, there is one of the Region's best-preserved banquettes. In particular, spiders are an under-studied group in this type of environment and there is few data available in Italy. This ecosystem may host rare or poorly studied species that are strongly adapted to the banquette. Eight sampling points were selected in a portion of beach and for each replicate, two pitfall traps were set and remained active for 7 days, the first set at the surface level and the second at a depth of 50 cm. Two 0.5kg samples of banquette were taken for analysis, one sample by visual census and the other by Berlese-Tullgren funnel extraction. The sampling sessions were carried out 40 days apart from January 2024 to November 2024. A total of 187 individuals were collected, belonging to 10 families, 14 genera and 16 species. Dictynidae (59 individuals) and Gnaphosidae (54 individuals), constitute the majority, together accounting for about 72.4% of the total. *Chaerea maritimus* Simon, 1884 is the most abundant species with 44 individuals sampled. Three species are new for the Italian fauna. The results obtained increase a still limited literature, helping to highlight the biological importance of these environments.

P8.39.

Araneae.it version 2.0: a new updated version of the digital catalogue of the Italian Spiders

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We present Araneae.it 2.0, the updated and expanded digital platform for documenting the Italian spider fauna. The catalogue includes 1,735 valid taxa, with taxonomic data aligned with the World Spider Catalogue (v.25.5). Distribution maps are now available at regional and provincial levels for all species, and at point-based resolution for endemics, aliens and other relevant species with an indication of the coordinate precision. The current version of the database includes 216 Italian endemic taxa (~13% of the fauna) and features photographic documentation for several species. Moreover, with the support of specialists who provide regular updates, Araneae.it 2.0 includes curated species lists for other arachnid orders occurring in Italy - Opiliones, Scorpiones, Pseudoscorpiones, Palpigradi, and Solifugae - ensuring taxonomic accuracy and data currency, though without the detailed information available for spiders. This online resource provides a solid foundation for future assessments of extinction risk, as well as for evaluating biodiversity and knowledge levels of spiders—and to a lesser extent, other arachnids - in Italy, with particular emphasis on Italian endemic spider species. Moreover, it supports the ongoing development of a comprehensive trait database, which will enable ecological and conservation-focused studies on Italian spiders. These efforts will enhance our capacity to assess species vulnerability, analyze functional diversity, and guide evidence-based conservation strategies for the Italian spider fauna.

P8.40.

Spiders of Zadar County, an endemic species and new records within the MEDITRATRI project

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Zadar County, located within the biodiversity-rich Mediterranean and Dinaric Arc regions, supports a diverse spider fauna (Araneae), including endemic and rare species. As part of the MEDITRATRI project the first Croatian project that comprehensively assess spider diversity in Mediterranean agricultural landscapes a standardized field survey was conducted in olive groves and vineyards under ecological (EMS) and integrated (IMS) management systems. Funded by the Croatian Science Foundation, the project integrates ecological, genetic, and taxonomic approaches to develop sustainable models of natural resource management. Sampling was carried out in 2018 and 2019 across five agricultural sites and one natural habitat, using pitfall traps, sweep netting, and hand collection. A total of 116 spider species from 27 families were recorded, including endemic taxa (e.g., *Urocoras munieri*, *Xysticus apricus*, *Bassaniodes bufo*), rare species (*Attulus penicillatus*, *Zelotes hermani*), and *Ceratinella brevipes* a new to the Croatian fauna. Notably, *U. munieri* was found on both EMS and IMS plots, *X. apricus* in EMS sites, and *B. bufo* only in olive groves. Rare species distribution varied: *A. penicillatus* was exclusive to vineyards, *Z. hermani* occurred in garrigue, olive groves, and EMS vineyards, while *C. brevipes* was recorded in IMS plots. Additionally, the functional role of spiders was evaluated through gut-content DNA metabarcoding and the construction of the first trophic network, confirming their importance in biological pest control. The study underscores ecologically managed olive groves, especially those adjacent to natural habitats, as biodiversity hotspots, demonstrating a strong link between agroecology and nature conservation.

P8.41.

Spider diversity and conservation in the Tuscan Archipelago: insights from a biogeographic and taxonomic survey

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The spider fauna (Araneae) of the Tuscan Archipelago has historically received limited and uneven attention, with previous literature reporting a total of 283 species across the islands, including 22 Mediterranean endemics—9 of which are strictly Italian. Building upon this fragmented baseline, our study applied standardized pitfall trapping and sweep-net sampling between March 2023 and March 2024 on seven islands (Elba, Giglio, Montecristo, Capraia, Pianosa, Giannutri, Gorgona), identifying 149 species from 3,353 specimens. This work revealed 66 new records for the archipelago, two species previously unknown to Italy, and five likely undescribed taxa. Notably, 21 endemics were identified, including 12 Italian narrow endemics, underscoring the high conservation value of these insular habitats. Substantial increases in species richness were recorded compared to prior knowledge: +81% in Capraia, +63% in Elba, +216% in Giannutri, +15% in Giglio, +371% in Gorgona, +45% in Montecristo, and +17% in Pianosa. Several of the endemics, such as *Harpactea oglasana*, *Nemesia ilvae*, and *N. pavani* were assessed using IUCN criteria and preliminarily proposed for the Critically Endangered category due to their restricted ranges and ongoing habitat threats. These results substantially refine the known araneofauna of the archipelago and contribute to a biogeographic synthesis essential for conservation planning.

P8.42.

New records and rare species of spiders in the reed beds of Danube Delta

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Wetlands are very important ecosystems that provide numerous environmental benefits. Among them, reed beds play a crucial role in maintaining water quality by filtering pollutants and trapping sediments. They also serve as critical refuges for many habitat specialist species, contributing significantly to the conservation of biodiversity. The Danube Delta, located in Romania and partly in Ukraine, is one of the most important wetland ecosystems on Earth, with the largest continuous natural reed bed in the world (over 1,500 square kilometers). We studied the spider fauna of this reed bed in April and May of 2023 and 2025, using reed traps, sweep net and hand collection. The samples were preserved in a 70% ethanol solution. The dominant species was the typical reed bed habitat-specialists: *Clubiona phragmitis* C. L. Koch, 1843, *Donacochara speciosa* (Thorell, 1875), *Hypsosinga heri* (Hahn, 1831), *Singa nitidula* C. L. Koch, 1844, *Tetragnatha striata* L. Koch, 1862 and *Mendoza canestrinii* (Ninni, 1868). In addition, a few interesting, rare species were found, of which *Larinia elegans* Spassky, 1939, *Larinia bonneti* Spassky, 1939, *Haplodrassus ivlievi* Ponomarev, 2015, *Helicius chikunii* (Logunov & Marusik, 1999) were new records for the Romanian arachnofauna. Previously, the genus *Helicius* Żabka, 1981 was known only from Asia. We have also successfully collected specimens of *Ozyptila danubiana* Weiss, 1998, previously collected only from the Danube Delta and Lake Kerkini (north-eastern Greece). These current results justify the need for a more detailed study of reed bed spider faunas.

P8.43.

Overlooked? Spreading? A contribution to the distribution of *Cortestina thaleri* in central Europe

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The goblin spiders (Oonopidae) are one of the three Palaearctic families of Dysderoidea superfamily. Their natural occurrence in warmer regions of the world, small size, usually not exceeding 3 mm, tendency to colonize anthropogenic sites, and frequent ability to parthenogenesis predispose many species to common colonization of synanthropic habitats. About a third of their species diversity is therefore non-native to Europe. The Czech Arachnological Society records 4 strictly synanthropic species in the Czech Republic and a single free-living species *Cortestina thaleri* Knoflach, 2009, which was first recorded in the country five years ago. In relatively high abundances, *C. thaleri* is now known from all regions of the Czech Republic, and therefore speculations about its expansive distribution are in place. The presented species distribution modelling (SDM) model assumes suitable conditions for the occurrence of *C. thaleri* in most of the Czech Republic and at the same time deals with the main climatic parameters that, based on the available data, may be limiting for the species' distribution. However, the cryptic ecology of the species, associated with its morphological or physiological adaptations to a corticolous bionomy and its remarkable tolerance to cold conditions, also opens up a discussion on its potential to occur in Central Europe in the long term. In addition to the faunistic results, we discuss new observations on the ecology of the species related, for example, to its preference for different tree species. The main purpose of the contribution is to raise awareness about the very existence of the species.

P8.44.

New faunistic, taxonomic and molecular data on Salticidae of Madagascar

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The knowledge on Salticidae of Madagascar is rudimental. However, numerous jumping spiders were sampled during two excursions to the rainforests of Ivohiboro Protected Area (November 2023) and the Ranomafana National Park (November 2024). The spiders were collected with almost identical sets of methods. The majority of specimens were sampled with a sweep net and sheet beating; however, litter sifting was efficient in obtaining unique species. Most of the specimens were sampled during the day. From the Ivohiboro Protected Area 17 species could be identified, from which 7 are described for the first time. Only one species was not an endemic for Madagascar or islands of the Indian Ocean. Numerous were the representatives of some basal salticid groups and ant-mimics. There were clear differences in dominance between the Ivohiboro and Ranomafana forests, but also between different parts of each of these sites. The taxonomic study was supported with barcode analysis. The observed specimens were attributed to 25 BIN. As a result of using the molecular methods: almost all juveniles were segregated to species, two names were synonymized for species described only from one sex, a wide distribution of some newly described species was confirmed, an identity of an expansive species was supported, a hidden genetic diversity within some taxa described based on morphology was noted, some sibling species could be separated. Furthermore, the barcodes that we have obtained from the juveniles that could not be attributed to any described taxon, might serve in the future to analyse distribution of these species.

P9.45.

Fine structure of egg sac walls in *Latrodectus* species: A comparative SEM study

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Several *Latrodectus* species (widow spiders) inhabit the Negev desert of Israel, and all share a common wasp egg sac parasitoid. The invasive Brown Widow*, L. geometricus*, however, experiences lower rates of parasitism. This species' egg sacs are characterized by a distinctive spiky surface that apparently deters parasitoid attacks. Another protective device of the brown widow might be the presence of sticky silk threads with glue droplets on the surface of its egg sacs, which might deter parasitoids or predators. In this study we examined in detail the egg sac walls of three *Latrodectus* species in the Negev desert: *L. geometricus, L. pallidus and L. tredecimguttatus*, with the scanning electron microscope (SEM), noting especially the presence of sticky threads. Surprisingly, threads with glue droplets were found on egg sacs of all species examined. Moreover, the general architecture of the egg sac wall was similar across the three species: tightly woven silk threads in crosswise orientation with a network of fine fibers interconnecting layers both horizontally and vertically. The brown widow egg sac, however, had a thinner wall and the characteristic silk spikes, which are absent in the other species. We suggest that while the overall structure is conserved among species, variation in glue droplet density and location may influence parasitoid deterrence. Notably, small sticky threads also appeared within the egg sac wall itself, hinting at an internal structural role. Further behavioral and mechanical studies are required to clarify the functional significance of these structures.

P9.46.

Morphology and function of female genital damage in the orb-weaving spider *Larinioides cornutus*

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Sexual selection and conflict shape the evolution of mating strategies and genital morphology in many species. In polygamous species, adaptations have evolved that mitigate sperm competition, affecting both behaviour and functional morphology of the males, including interactions with the female reproductive anatomy. In the orb-weaving spider *Larinoides cornutus,* females were observed with or without scapus in the field, suggesting that males may remove the scapus during mating, as documented in other orb-weavers. We investigated the causes, mechanisms, and consequences of female genital damage in *Larinioides cornutus* using field surveys, staged mating experiments, and high-resolution imaging (SEM and μCT). Field observations revealed that most females encountered lacked a scapus. Controlled mating observations demonstrated that males are responsible for inflicting damage on the female external genitalia (epigyne). Remating trials revealed that the functioning of female genitalia was impaired, and receptivity of the female reduced. SEM imaging was used to compare the intact genital structure of virgin females with those of mated females who exhibited loss, fractures, or partial loss of the scapus and the collar-shaped part of the epigynum from which the scapus protrudes. We elucidated the mechanical complexity of genital interlocking and the structural basis for male-induced damage in female genital structures through micro-CT reconstruction of pairs fixed in copula. This study contributes to the understanding of harmful mating in arthropods, highlighting the frequent occurrence and independent evolution of harmful mating strategies in spiders.

P9.47.

Encapsulated prosoma and the consequences for haemolymph pressure generation in *Perania nasuta* (Pacullidae)

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In the spider locomotor system, an increase in haemolymph pressure is crucial in causing hydraulic extension of two leg joints that lack extensor muscles. The origin of haemolymph pressure generation is generally located in the prosoma, where contraction of dorso-ventral muscles leads to prosomal compression in the region of the flexible pleural membrane. However, some araneaen taxa are characterised by an entirely encapsulated prosoma with fully sclerotised pleurae, making prosomal compression impossible. This raises the question of the position and morphological components of the hydraulic pressure pump in these spider groups. The species *Perania nasuta* (Pacullidae) was chosen to investigate the skeletomuscular system and identify potential candidates of haemolymph pressure generation in a morpho-functional approach. Additionally, we examined modifications of the prosomal musculature, which is not involved in pressure generation in these spiders. Using high-resolution micro-computed tomography and 3D reconstruction, we provide detailed visualisations of the prosomal and opisthosomal morphology in *P. nasuta*. The prosomal musculature is largely unsuspicious, but the lateral muscles are completely absent. The opisthosoma shows distinct modifications. Externally, extensively sclerotised plates are present in the dorsal and ventral regions. The lateral areas of the soft cuticle are folded and contain longitudinal rows of smaller sclerites. Internally, these sclerotised areas are connected by a distinct subepidermal sheath of muscles, i.e. the opisthosomal muscle sac. Additionally, the opisthosoma lacks dorso-ventral muscles found in many other spiders. Based on our morphological findings, we conclude that the opisthosomal muscle sac is responsible for haemolymph pressure generation in *P. nasuta*.

P9.48.

Functional implications of pleural sclerotization for the prosomal haemolymph pressure pump in Dysderidae

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The increase of haemolymph pressure is fundamental for the locomotor system of spiders, as it induces hydraulic extension in two leg joints where extensor muscles are absent. Generally, the increase in haemolymph pressure is achieved through compression of the prosoma by dorso-ventral suspensor muscles. This requires a flexible pleural membrane that movably connects the tergum and sternum. The pleural membrane itself is stabilized by the lateral muscles. However, there are several araneaen taxa that have deviated from this mechanism of pressure generation as they have considerable sclerotized pleurae, leading to an incompressible, encapsulated prosoma. One of these groups are the Dysderidae, for which extensive, sclerotized pleurae have been reported. However, the different descriptions on the pleural sclerotization in Dysderidae differ regarding the extent and therefore the prosomal encapsulation. With the aim to better understand this central part of the prosomal haemolymph pressure pump in Dysderidae, high-resolution 3-dimensional micro-computed tomography scans were conducted on three representatives (*Dysdera adriatica*, *Harpactea lepida*, *Stalagtia hercegovinensis*) to visualize and elaborate the morphological modifications. A narrow band of non-sclerotized pleural membrane was identified at the edge of the tergum distinct from the extensive sclerotization. This incomplete prosomal encapsulation therefore allows pressure generation through prosomal compression. Due to the rigid connection between the sclerotised pleura and sternum, the lateral muscles could be involved directly in prosomal haemolymph pressure generation. This modified morphology needs to be considered in functional investigations of the hydraulic pressure pump in Dysderidae.

P10.49.

Effect of autumn temperature on development, survival and cold tolerance on spiderlings of the wasp spider, *Argiope bruennichi* (Scopoli, 1772)

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A consequence of climate change is the increased fluctuation in temperatures. Understanding the extent that species are affected by temperature during early development, and subsequent impacts on survival and physiology, will help assess vulnerability to climate change. The wasp spider *Argiope bruennichi* has rapidly expanded its range in Europe northward, suggesting resilience to varying temperatures. Spiderlings hatch from the eggs in autumn and remain in the egg sac until spring. This study investigated the effects of post-oviposition temperature on *A. bruennichi*. Over five weeks post-oviposition, we monitored early development under three temperature regimes: control: regional autumn temperature; warm: 4 °C above control; cold: 4 °C below control. Subsequently, egg sacs that had experienced the three autumn temperature regimes were transferred to a common regime simulating the regional winter climate. Survival proportions of spiderlings and their supercooling point (SCP), an indicator of cold tolerance, were assessed in late autumn, winter, and spring. Survival proportions did not differ between autumn and winter; however, in spring, the warm treatment showed higher mortality (25 %) compared to the control (8 %) and cold (5 %) treatments. The SCP of spiderlings averaged -28 °C across groups, suggesting that their cold tolerance was unaffected by early temperature exposure. Our study indicates that warmer autumn temperatures reduce the probability of spiderlings surviving the winter, and that diminished energy reserves in survivors might further compromise performance in spring. Consequently, even brief periods of warmer temperatures can impact seemingly resilient species such as the wasp spider.

P10.50

Adaptations to matrotrophy in the female reproductive system of neobisiid pseudoscorpions (Pseudoscorpiones: Neobisiidae)

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Pseudoscorpions are matrotrophic chelicerates, feeding their embryos on a nutritive fluid produced in the female reproductive system. Comparative studies have shown that the structure of the ovary and oviducts differs between families. Using light, fluorescence and transmission electron microscopy dozens of ovaries of four *Neobisium* species (*N. carcinoides, N. crassifemoratum, N. erythrodactylum, N.* sp.) were examined. The reproductive system of the Neobisiidae is typical of pseudoscorpions and consists of a single ovary and paired oviducts. The ovary and oviducts function in two phases: the oogenetic phase and the secretory phase. The structure and functioning of the female reproductive system in neobisiids differ from that in highly specialized matrotrophic cheliferoids. The oocyte stalks are short and composed of very few cells. During the late oogenetic phase, the stalk cells show no signs of hypertrophy or polyploidization and do not participate in the synthesis of nutrients during the secretory phase. Only the epithelial cells of the ovarian wall and oviducts become highly polyploid and hypertrophied and are involved in the secretion of the nutritive fluid during the secretory phase. We found that oocytes accumulate a significant quantity of yolk spheres, which, in addition to numerous lipid droplets, constitute the main component of vitellogenic oocytes. In Neobisiidae, the quantity of nutrients required for the development of embryos is compensated by the significant amount of reserve materials deposited in the ooplasm. This supports our hypothesis that adaptations to matrotrophy are less advanced in representatives of Neobisiidae than in Cheliferidae and Chernetidae.

P11.51.

Insights into the systematics and phylogeny of Argyrodine spiders focussing on the fauna of the Western Indian Ocean Islands

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Madagascar is one of the world's greatest biodiversity hotspots, and the Western Indian Ocean Islands (Mascarenes, including Mauritius, Seychelles, Comoros and La Reunion) contain one of the world's most unique and highly endemic faunas. Despite this, taxonomic and biogeographic knowledge is generally depauperate for arthropods. Theridiidae is one of the most speciose families of spiders worldwide, and a good example of a poorly known megadiverse group that is expected to contain hundreds of Malagasy and Mascarene endemics. The kleptoparasitic members of the subfamily Argyrodinae are a case in point, only six species are recorded from Madagascar and no new species described in the last 140 years. The fauna of the Mascarenes is somewhat better known, alluding to unknown genera of uncertain origin. We report taxonomic and behavioural information primarily from a well- sampled community from fieldwork to the Analamazaotra rainforest reserve, recording nine species, of which eight were new, including two new genera. One of those genera, *Lokitandroka* gen. nov. is a Malagasy and Mascarene endemic with high diversity and high species turnover between forests. *Famakytta* gen. nov. are larger species with typically contrasting wasp- like patterns and are found across the landmasses of the Indian Ocean and possibly further. A preliminary behaviour study revealed high host specificity in some species, and more general habits in others. Finally, we utilise genetic data of species from the region to provide an updated phylogeny of Argyrodinae and discuss what this might mean for global understanding of the group.

P11.52.

Spiders as hosts of wasp parasitoids

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The phenomenon known as parasitoidism is widespread among many groups of animals. The most numerous groups of parasitoids is undoubtedly the order Hymenoptera (Insecta; Hymenoptera), whose representatives attack not only plants but also other insects and spiders. The most specialized spider parasitoids are wasps from the Polysphincta clade (Ichneumonidae: Pimplinae), whose larvae, attached to the bodies of spiders, can be found worldwide. These wasps primarily specialize in parasitizing spiders living on vegetation or in trees (families Dictynidae, Tetragnathidae, Theridiidae, Araneidae, and Linyphiidae). While the evolutionary relationships among spiders are already relatively well understood, the phylogenetic lines of the wasps themselves remain less clearly resolved. Additionally, questions arise regarding differences in host range among individual species—some wasp species parasitize only a single spider host, while others show broader specialization across multiple genera of spider hosts. Our research provides an overview of current findings on the parasitism of European spiders by these wasps. Furthermore, we focus on the host preferences of the generalist wasps, the degree of host specificity, factors influencing speciation like altitude and geographic range, and finally, we present a new phylogenetic tree based on the *COI* gene of more than 300 parasitoid specimens in relation to their spider hosts.

P12.53

A new species of *Tegeneria* Latreille, 1805 in the Republic of Kosovo (Araneae: Agelenidae)

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We describe a new species of *Tegenaria* Latreille, 1805 from Korishë, Prizren, Republic of Kosovo, based on a holotype male exhibiting distinctive palpal morphology. The new species, *Tegenaria*, is characterised by a uniquely shaped tegulum and conductor, as well as a long, curved embolus that clearly distinguishes it from congeners occurring in the Balkans.

P12.54.

Treasure island: the exploration of the salticid fauna of Batanta (Indonesia)

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Our planet is viewed as geographically explored since 1650, but the knowledge of the fauna and flora remains uneven. There are still many “white spots”, last untouched wildernesses on Earth. The Indonesian Island Batanta is such a “white spot” regarding its salticid fauna, there are no published records from here at all. Recently 212 specimens were collected providing a solid foundation to its faunal exploration. So far 33 species have been photographed with digital cameras of which nine are new to science. The classic morphological taxonomy was complemented with barcoding data to match up sexes of similar looking species, and a *28S+16S* phylogeny to aid generic placement of the new species.

P12.55.

Revision of *Harpactea* spiders (Araneae: Dysderidae) of the western Balkan countries

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We revised the western Balkans spiders of the genus *Harpactea* (Araneae: Dysderidae). Majority of the material is deposited in collections of Museum Naturalis in Leiden, Netherlands, and Croatian Biospeleological Society in Zagreb, Croatia. They belong to four species groups: *rubicunda, corticalis, hombergii,* and *lepida*. Nine new species belonging to *lepida* group are in the process of description, along with four new species from *rubicunda*, and one from *hombergii* group. Based on a careful morphological inspection, and backed up with molecular data, we plan to establish new genus for the *lepida* species group. It will be named after Christa Deeleman-Reinhold, the author of the current supraspecific taxonomy of the family Dysderidae, who first distinguished this group. Some of the morphological characters distinguishing the new genus are relatively wide cephalic part of prosoma and sclerotized posterior lip of the epigastric furrow. In the western Balkans the majority of *Harpactea* species are found under woody plants that produce slowly decomposing leaf litter, usually *Fagus sylvatica*, *Quercus* spp. or *Pinus* spp. These spiders, especially the representatives of the *lepida* group, require at least slightly humid substratum. They were collected mainly in spring and autumn months, which are rich in rainfall in this region. Studied species are endemics of small areas within the Balkan region, the exceptions being relatively widely distributed species *H. rubicunda*, *H. hombergii*, *H. saeva* and *H. lepida*.

P12.56.

Systematic revision of the European species of *Buthus* leach, 1815 (Scorpiones: Buthidae)

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The Palearctic scorpion genus *Buthus* Leach, 1815, ranges from southwestern Europe (southern France and the Iberian Peninsula) across North Africa to the Levant and Arabian Peninsula. Despite extensive taxonomic revisions over the past two decades, its classification remains unclear, especially in the Iberian Peninsula, where 20 species have been proposed. Limited molecular studies, mainly based on mitochondrial DNA, suggest a monophyletic European clade and several distinct Iberian lineages, though relationships with North African species remain unresolved. Morphological descriptions, often lacking robust diagnoses and ignoring geographical variation, have contributed to such taxonomical confusion. This study presents a comprehensive, integrative revision of *Buthus* in Europe, using specimens, including topotypes, from across its range. It combines morphology, nuclear and mitochondrial DNA, morphometric, and ecological data. Nine valid species are confirmed across France, Portugal, and Spain. Ten new synonymies are proposed, including: *Buthus delafuentei* = *B. gonzalezdelavegai*; *B. halius* = *Androctonus ajax* = *B. gabani* = *B. castellano*; *B. ibericus* = *B. baeticus*; *B. manchego* = *B. alacanti* = *B. serrano* = *B. pedrosousai*; *B. occitanus* = *B. pyrenaeus* = *B. balmensis*. Revised diagnoses, illustrations, a distribution map, and an identification key are provided.

P12.57.

French Guiana's spider fauna: what we know and what we could know, with some new additions

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The araneofauna of French Guiana, a South American country with neotropical climate, remains as of today surprisingly understudied, with only sparse reviews that certainly underestimated the large diversity of spiders potentially occurring in the area. Among them, Vedel et al. (2013) currently is the most complete and detailed taxonomic checklist available in literature. Field trips done between 2013 and 2015 within three of the country's national parks, namely the Réserve Naturelle Nationale des Nouragues, la Trinité and the Réserve Naturelle Régionale Trésor (with some iconic inselbergs) allowed for the collection and identification of a vast array of specimens, a process that is still ongoing, but already adds to the ever-growing species checklist for French Guiana. At this point of the identification process, the following species, among others, can be added to the well documented biodiversity baseline checklist by Vedel et al. (2013): *Aspidolasius branicki* (Taczanowski, 1879), *Deinopis longipes* (F. O. Pickard-Cambridge, 1902), *Thaumasia xingu* (Silva & Carico, 2012), *Synotaxus waiwai* (Agnarsson, 2003), *Ariamnes attenuatus* (O. Pickard-Cambridge, 1881), *Helvibis monticola* (Keyserling, 1891), *Helvibis thorelli* (Keyserling, 1884), *Rhomphaea metaltissima* (Soares & Camargo, 1948), *Thwaitesia simoni* (Keyserling, 1884), *Kryptochroma hilaris* (Machado & Teixeira, 2021), *Tmarus bucculentus* (Chickering, 1950), *Aphantochilus* sp. (O. Pickard-Cambridge, 1871). In addition, we also report the finding of a specimen of the family Palpimanidae (Thorell, 1869), originally missing from Vedel's checklist, awaiting currently formal description. Other unidentified specimens for which no match was found in literature will likely lead to the description of new species, especially in the genus *Synotaxus* (Simon, 1895).

P12.58.

A game of thorns: cheliceral ornaments of *Bathippus* and *Canama* as species limitation characters

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Male chelicerae are regarded important in pre-copulatory behaviour of spiders. Examples like *Tetragnatha* or jumping spiders, like *Salticus*, *Myrmarachne* and *Lyssomanes* are subject to several studies. This weaponry is usually under strong sexual selection, thus show a larger diversity. Sexual selection is one of the leading forces in salticid diversification thus such character systems could be used in differentiating species. As in *Tetragnatha* the cheliceral characters ensure the interlock and therefore the matching of males and females during courtship, its use to delimit species is well justified. In jumping spiders, only males have modified chelicerae, probably used in male-male combat by interlocking. These chelicerae not only extra-long or extra-large, but possess often composite teeth, which are additional ornaments to the usual number of teeth. Since they show a huge variety in shape and number my first aim is to describe and classify this diversity. I also will try to establish a nomenclature that can be useful in further studies. My study aims to find a good compromise of size and shape of the cheliceral morphology comparative to palpal character species delimitation. Here I focus three genera: the closely related (but distinct cheliceral morphology) *Canama* and *Bathippus* and the distant, but similar *Parabathippus* to spot parallel evolutionary processes. Preliminary results already showed several cheliceral morpho-lineages, and several species with distinct palp morphology, so a reorganization of these genera seems necessary.

P12.59.

Huntsman spiders (Sparassidae) from the Ivohiboro Protected Area (Madagascar)

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Sparassidae are one of the most species-rich spider families, found around the world, including Madagascar. This island is distinguished by an exceptionally high level of endemism — not only among representatives of Sparassidae, but also many other spider families. The first descriptions of Malagasy representatives date back to the 19th century and were primarily done by E. Simon and E. Strand. It was only recently, in the 21st century, that revisions and descriptions of a larger number of species were published. A total of 17 adult specimens sampled in October 2023 in the Ivohiboro Protected Area (south-central Madagascar) were analyzed. Most representatives of Sparassidae were found in various rainforest habitats; this forest complex is highly isolated from similar environments. The research followed a strict protocol, involving several standard methods commonly used in spider collection. Twelve species of Sparassidae were identified, of which ten are new to science. These belong to *Martensikara* and *Thunberga* — genera endemic to Madagascar — as well as to the cosmopolitan genus *Olios* and the African-Malagasy genus *Damastes*. As part of this research, a male of the genus *Martensikara* was discovered for the first time. Almost all the recorded spiders were collected at night, in a variety of microhabitats (low vegetation, tree trunks and leaf litter). This short-term study presented here shows that our knowledge on Sparassidae of Madagascar remains fragmentary. The island's fauna continues to represent an unexplored field for faunistic, taxonomic, phylogenetic, and biogeographic research.

P13.60.

Editing the Web: establishing CRISPR-Cas9 in Spiders

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CRISPR-Cas9 is revolutionizing functional genomics, yet its application in spiders remains limited. In this study, I successfully established a gene editing protocol in the common house spider *Parasteatoda tepidariorum*, demonstrating both knock-out (KO) and knock-in (KI) capabilities. I performed two independent experiments by microinjecting CRISPR components into the ovaries of adult spiders. In the first, I targeted the *sine oculis* gene, resulting in eye development defects. In the second, I co-injected CRISPR reagents with a donor plasmid encoding red fluorescent protein (RFP), flanked by sequences homologous to the target region, to generate a KI in a silk gene. The spiders produced red fluorescent silk, and RFP expression was confirmed at both the DNA and RNA levels. These results provide clear proof-of-concept that CRISPR-Cas9 can induce heritable genome modifications in spiders. I now aim to optimize this protocol to improve its efficiency and reproducibility across laboratories. This poster will present my findings and encourage discussion on adapting this approach to other spider species and research models.

P13.61.

EvoNEST, a modular application for comprehensive species-based sampling and data management in arachnology

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Organism-based research often faces challenges in data management, due to its commonly nested metadata structure (e.g. phylogenetic, species, samples, subsamples and traits), fragmented data formats and limited accessibility, tractability and interoperability. To mitigate these problems, we designed EvoNEST (Evolutionary, ecological and biological Nexus of Experiments, Samples and Traits), a modular data management application to minimize data handling and conversions by integrating all stages of arachnological research—from specimen sourcing to animal husbandry, data recording, analysis and publication—into a unified platform. Key features include intuitive graphical user interfaces, digital lab books, automated data import and export, integrated visualisation tools and unique identifiers with QR codes for the seamless integration with physical objects (specimens, samples and subsamples). EvoNEST can be run from a server, which permits data entry both from mobile devices and computers within or outside the home institution, and by multiple users simultaneously - be it in the field, the lab, mobile workplaces, or the office. A logbook system assures that all changes to data and metadata are traceable. As a proof of concept, we demonstrate an implementation, dedicated to the comparative study of spider silk properties across spider species. By providing a centralised, server-based and user-friendly system for organism-based data management, EvoNEST aims to accelerate the digitisation and dissemination of species trait data, improving the traceability, documentation and reuse of research data in arachnological research and beyond.

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