7th Student Conference on Conservation Science, Balatonvilágos 2022

SCCS Europe - Connecting Eastern and Western Europe in conservation biology

Balatonvilágos (Lake Balaton), Hungary
14 – 17 September 2022

ABSTRACTS

Eds: B. Zsinka, N. Vili, A. Báldi, A. Kovács-Hostyánszki, K. Mázsa
Centre for Ecological Research
https://sccs.ecolres.hu/

Background of the conference

The Student Conference on Conservation Science series started in Cambridge and have expanded with Brisbane, Beijing, Bangalore and New York.

SCCS is the largest international conference in conservation science, where students and early career scientists are welcomed and have the chance to present their research, learn from each other and meet with experts of the field who can offer them guidance in their future careers.

In 2015, Hungary joined this inspiring event and organizes a conference, especially for young scientists from all around Europe to build a network among the presented parts of the continent.

Plenary speakers at the SCCS Europe 2022

Prof. Ingo Grass

Ingo Grass is a Professor of Agroecology at the University of Hohenheim, Germany, where he runs the Ecology of Tropical Agricultural Systems group (https://agroecology.uni-hohenheim.de/en/home). His group's research focuses on patterns and dynamics of biodiversity and associated ecosystem services in agricultural landscapes. A key motivation is how to balance agricultural land use with biodiversity conservation. His research in Indonesia, South Africa, India, and Germany focuses on the importance of agricultural practices for multitrophic interactions, crop pollination and biological control, and conservation of insect, bird, and bat diversity. Many research projects are interdisciplinary and consider not only the environmental but also the social and economic pillars of sustainability.

Prof. Tibor Hartel

Tibor Hartel is an Associate Professor at the Faculty of Environmental Science and Engineering, Babeș-Bolyai University, Cluj-Napoca. His background is in animal ecology and for a decade he studied amphibians and the possibilities for their conservation in the traditional farming landscapes of Central Romania. Since 2012 Tibor is increasingly interested in social-ecological systems, ecosystem services and human-nature connections and closely work with decision makers and the civil society to protect ancient wood-pastures, large carnivores and urban biodiversity. Tibor`s academic path is this: 11 years high school teacher and researcher in Sighisoara (amphibian research), two years of postdoctoral fellowship at Leuphana University, Germany (with an Alexander von Humboldt Fellowship – 2012-2013), then back to Transylvania where he was Associate Professor at Sapientia University (2014-2018) then at Babeș-Bolyai University, where he is based at the Faculty of Environmental Science and Engineering. In his talk Tibor will highlight his transdisciplinary experience for nature conservation in Romania.

Prof. Aveliina Helm

Aveliina Helm is a Professor of Restoration Ecology at the University of Tartu, Estonia. Her work focuses on the conservation, management and restoration of multifunctional landscapes, with a special focus on grassland ecosystems and agricultural landscapes. She runs the Landscape Biodiversity group (landscape.ut.ee) at the University of Tartu, where the research focuses on spatial and temporal dynamics of biodiversity, and on conservation and restoration of biodiversity and related ecosystem services. She actively participates in the initiation and implementation of restoration and conservation projects in Estonia and abroad, and runs multiple research projects focusing on biodiversity, landscape restoration, sustainable agriculture and ecosystem services. In Estonia, Aveliina promotes 'Everyone's Nature Conservation' concept, an approach of biodiversity conservation outside protected areas. She is an author of Greenmeter (www.greenmeter.eu), an application providing location-based recommendations for landscape-scale conservation action, as well as HeaPõld (GoodField; www.heapold.ee), a platform that focuses on introduction of efficient agroecological practices to farmers.

Prof. Lorenzo Marini

Lorenzo Marini is Associate Professor at the University of Padova. He has developed wide and diversified research interests in the conservation of biodiversity and ecosystem services, global change biology, and invasion biology. His overarching research aim is to understand the impact of multiple human-induced pressures on populations, species, communities and ecosystem services and to provide management solutions to mitigate their negative effects. He addresses pressing environmental questions in both agricultural and natural ecosystems using arthropods and plants as model organisms. He mainly works on four research areas: i) landscape ecology in agricultural landscapes, ii) species diversity and conservation, iii) impact of climate change, and iv) invasion ecology, using multiple methodological approaches including manipulative experiments, observational studies, and macro-ecological analyses. He serves as associate editor for Journal of Applied Ecology and Basic and Applied Ecology.

Awards SCCS Europe 2022

Best Talk Award went to *Olivia Bernhardsson*, for the oral presentation entitled "The competitive impact of managed honey bees on wild bee reproductive success"

Best Talk Award went to *Matthew Taylor*, for the oral presentation entitled "The Impact of Leaky Barriers on In-Channel Hydrology, Geomorphology, Ecology and Wider Biodiversity"

Best Poster Award went to *Kata Pásztor*, for his poster entitled " Change of body mass and thorax width with age in a natural butterfly population"

The awards comprised of book prizes from Cambridge University Press and personalized support from the Oryx team to the best talk award winners, to help them publish their work.

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Talks and posters

of the

7th SCCS Europe

Balatonvilágos, Hungary
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Talks

A rapid method to identify and map the presence of endangered and invasive Greek freshwater fish using environmental DNA

Abi Mackay[1], Mark Steer[1], Eleni Kalogianni[2]

1 University of the West of England – UWE; 2 Hellenic Centre for Marine Research – HCMR

Accurate assessment of low fish populations can be a challenge using standard sampling methods such as fishing. A new monitoring method that can detect low density fish populations such as endangered species or provide early identification of invasive species would be beneficial. Environmental DNA (eDNA) methods can be a reliable survey tool for low population aquatic species and are non-invasive, less labour intensive and often cheaper than traditional survey methods.

In this study, eDNA protocols were developed that target six threatened fish species (*Alburnus macedonicus, Alburnus vistonicus, Knipowitschia thessala, Telestes beoticus, Salmo peristericus, Phoxinus strymonicus*) and two invasive fish (*Carassius gibelio, Lepomis gibbosus*). Species specific primers were designed that detect eDNA from the eight target fish species. Water samples were collected and filtered from streams and lakes across Greece. DNA was extracted from the filters and analysed using real-time qPCR.

The qPCR results were first used to create presence/absence maps for each species and then analysed in a species distribution model. This will be used to determine if the presence of either of the invasive species is having an effect on the presence and relative abundance of the threatened species.

Changes in urban bee-plant networks over the vegetation season

Aleksandra Żmuda[1], Magdalena Lenda[2], Justyna Kierat, Agnieszka Nobis[1], Michał Kolasa[3], Matthias Albrecht[4], Anna Gajda[5], Peter Neumann[6], Robert J. Paxton[7], Oliver Schweiger[8], Josef Settele[8], Hajnalka Szentgyörgyi[1], Adam Vanbergen[9]

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3 Institute of Environmental Sciences, Jagiellonian University, Cracow, Poland
4 Agroscope, Agroecology and Environment, Zürich, Switzerland; 5 Warsaw University of Life Science, Warsaw, Poland
6 Institute of Bee Health, University of Bern, Bern, Switzerland
7 Institute for Biology, Martin-Luther University, Halle-Wittenberg, Germany
8 Helmholtz Centre for Environmental Research - UFZ, Halle, Germany
9 INRAE, National Research Institute for Agriculture, Food and Environment, France

Relations between bee and plant species can be described as metrics of pollination networks – connectance, modularity or nestedness. Those seem to help predict the effects of including in a network a third part – pathogen. In the bee decline, it is crucial to investigate possible ways of pathogen spread. However, we still lack knowledge about urban bee-plant networks. This study aimed to compare bee-plant networks in urban sites over the vegetation season.

We sampled in July 2020 and May-July 2021 in four study plots in Cracow, Poland, along 1 km transects for 2 hours once a month. We collected bees with the flowers on which they were foraging, to create bee-plant networks.

We sampled a total of 1817 bee-flower pairs (2020: 447 July; 2021: 375 May; 390 June, 605 July), representing 89 bee species and 91 plant species. We calculated the bee-plant networks separately for each sampling and study plot. The sampling month significantly affected network connectance and nestedness. The connectance was higher in May than in July 2021 and the nestedness was also higher in June. This suggests that pathogens present in flowers in spring should be more common in bees and more diluted later in the season.

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Pollinator networks in sown wildflower fields in agricultural landscapes in Hungary

Áron Domonkos Bihaly[1,2], András Báldi[1], Miklós Sárospataki[2], Imre Sándor Piross[2], Raoul Pellaton[2], Anikó Kovács-Hostyánszki[2]

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Pollination crisis is a global issue. The decline of managed and wild pollinators causes crop safety and ecological problems. To study possible solutions to this decline, we set up 8 pairs of landscape plots with diverse wildflower fields or strips (0.5 hectares, sown with 33 native plant species) in different agricultural landscapes in Hungary in 2020. We sampled flower visitor insects by transect sampling method, simultaneously with assessing flower resources twice per year in 2020-21. We recorded the most important flower visitor insect groups (honeybees, wild bees, hoverflies) and the visited plants at the species level, but we noted all other flower visitor insect groups too.

We analysed the abundance and species richness of the flower visitors and the flowering plants and their changes during the years in the function of treatment and landscape complexity, and we studied the plant-pollinator networks.

Our results showed that these sown parcels improved some pollinator groups' abundance and species number. The non-sown plant species from the soil seed bank providedalso important flower resources beside the

sown plant species. We found that some of the sown and non-sown flowering plant species were favoured in the plant-pollinator networks.

Effects of fragment size and connectivity on arthropod functional composition

Dávid Korányi, Róbert Gallé, Attila Torma, Péter Batáry

Centre for Ecological Research, Institute of Ecology and Botany, "Lendület" Landscape and Conservation Ecology

Habitat loss and fragmentation are considered among the most threatening factors for arthropod communities, leading to their altered functional composition and thus reduced ecosystem functions and services.

We assessed the effect of local and landscape-scale environmental variables (fragment size and connectivity) on functional diversity (CWM and RaoQ) of five traits of spider and true bug communities. We surveyed 60 grassland fragments in Hungary belonging to two different grassland types: forest-steppes and kurgans.

We found higher functional diversity in better-connected habitats for spiders and in small fragments for both groups. Spiders were small, humidity-preferring web-builders in small habitat patches. We collected more ballooning species with moist habitat preferences in well-connected fragments (forest-steppes). In addition, increasing connectivity resulted in a significantly higher proportion of polyphagous and humidity-preferring species in the true bug communities (kurgans).

Our results suggest that small grassland fragments can increase the functional richness even though these habitats may contribute to the shift in arthropod communities towards certain trait variations.

Recovery of plant and pollinator communities after severe wind disturbance in Alpine forests

Elena Gazzea, Lorenzo Marini

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Natural disturbances are important drivers of forest dynamics, and with climate change they are expected to increase in frequency and intensity. Windthrows are recognized as the most important abiotic disturbances affecting European forests. The early stand development after the disturbance is pivotal for defining the structure and the composition of future forests, and the recovery of biotic communities inhabiting them. While windthrow impacts on ecosystem services are generally negative, the enhancement of the forest structural heterogeneity seems to benefit biodiversity. However, the mechanisms influencing the recolonization dynamics of biotic communities still remain unclear. Here, we focused on exploring the recovery of plants and of pollinators after a large-scale windthrow event in Alpine forests. To study the response of target communities, we sampled 35 salvaged areas 3 years after the event. Preliminary results suggest that topographical and landscape variables play a key role in determining the recovery of the herbaceous layer, and subsequently the presence and abundance of pollinators. Understanding the recovery mechanisms of biodiversity can provide important insights on the post disturbance forest management strategies balancing the provision of ecosystem services.

Jaguars in the borderlands: Multinatural conservation for coexistence in the Anthropocene

Erin Connolly[1,2], Howard Nelson[2,3]

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Conservation in the human-dominated Anthropocene involves negotiations amongst diverse stakeholders. However, these efforts are often superficial, leading to unsuccessful interventions. Here we apply the theory of multinaturalism as an operational starting point for stakeholder engagement efforts, to deepen local involvement and create sustainable coexistence. Multinaturalism posits that natures are multiple and can be known in many ways, and that many natures can coexist in the same geographical space. Using the northern jaguar population in the US-Mexico borderlands as a case study, we investigate, through semi-structured interviews, the natural realities ('natures') of various stakeholders involved in borderland jaguar conservation. We show that investigating each stakeholder's 'nature' through the aspects of knowledge, perception, value, attitude, and action provides a greater understanding of differences that may cause conflicts over wildlife-related decisions. In light of recent calls for jaguar reintroduction, this information can facilitate collaboration in a complex transboundary region. This interdisciplinary study highlights the importance of investigating the human dimensions of conservation completely, while treating all forms of knowledge seriously and equally.

Spillover of plants from sown wild flower fields and road edges into intensive crop fields

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The EU Showcase Project aims to integrate biodiversity and farming practices, showcasing it with 10 European Experimental Biodiversity Areas (EBA).

On the Kiskunság Wild Flower Field EBA we have sown eight 0.5 ha parcels of land with wild flower seed mixture from 32 native plants in intensively managed agricultural landscapes in 2020. The fields are creating resources and habitats for insect pollinators and pests' natural enemies. But WFF may have a spillover effect on the crop fields annoying farmers and our aim was to identify this effect. We sampled bees, hoverflies, spiders, and vascular plants in and from WFFs to the crop, and had the same sampling in nearby road edges as control. Yield was also measured to provide information to farmers. We show preliminary results on the plant study.

We found the most plant species in the WFFs, significantly fewer plant species on the road edges, and only a few in the crop fields. The number of plant species observed in the crop fields was not different from the wild flower field or from the road edge.

Our results indicate that WFFs are important hot spots for plants, and that there is no significant spill over effect from the newly established WFFs into the crop in the case of plants, thus "weeds" wont harm crop field.

Safeguarding pollinators: creating urban bee pastures by extensive mowing benefits pollinators and wildflowers

Gabriella Süle[1], Anikó Kovács-Hostyánszki[1], Tünde Ilona Kelemen[1], Anna Horváth[2], Péter Bakonyi[3], Orsolya Kovács[4], Zoltán Bajor[5], András Báldi[1], Viktor Szigeti[1]

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4 Capital City of Budapest, Budavár City Government
5 Budapest Public Utilities Ltd., Horticultural Division

Within the "Wildflower Budapest" project, an extensive grassland management program started in 2021. We selected ten pairs of extensively (bee pasture) and intensively mown (control) sites to study the effectiveness of the program from the pollinators' perspective. We visually recorded pollinators and flower units at morphospecies level in 5 circular 2 m2 plots/site during 5 minutes/plot, 3 times (June-September) in 2021, and 5 occasions (April-September) in 2022. We measured average vegetation height and estimated green plant cover.

The vegetation was higher in the bee pastures, but the proportion of green cover did not always differ between bee pastures and controls. The differences in the abundance and number of morphospecies of flowers and pollinators varied from month to month between the bee pastures and controls that can be explained by the seasonality of pollinators' activity, but also by the timing of management. The abundance and morphospecies number of flowers and pollinators showed a positive correlation with each

other and also with vegetation height and green cover. Overall, our results suggest a positive impact of extensive mowing on the abundance and diversity of pollinators in urban areas.

The influence of bioturbation activity of *Chironomus riparius* on vertical transfer of microplastic particles

Khouloud Sebteoui[1], Djuradj Milošević[2], Jelena Stanković[2], Victor Baranov[3], Boris Jovanović[4], Zoltan Csabai[1]

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The effects of bioturbation on the bioavailability of toxic particles in marine ecosystems were studied extensively, yet the effect of their distribution and bioaccumulation of it in freshwater ecosystems is still relatively unknown. It is primordial to understand the behaviour of microplastics in the water-sediment realm to assess their impact on the ecosystem. Therefore, our research aims to understand and quantify the mechanisms of bioturbation by *Chironomus riparius* larvae. We followed the process of bioturbation in an indoor experimental setup exposing larvae to an environmentally high concentration (according to OECD) of regular shaped high-density polyethylene microplastics (80g/m2). We estimated a general pattern of the bioturbation using sediment profile imaging using luminophores tracers. The distribution of particles in different sediment layers proved that the presence of toxic agent (polyethylene) has a significant effect on the bioturbation activity of the larvae. This study demonstrated that regular shaped microplastic particles are vertically

transferred in the sediment due to the bioturbation activity of *Chironomus riparius* larvae.

Mapping the distribution and decline of ponds at catchment scale in the UK.

Lucy P Smith[1,2], Hannah Robson[1], Lucy Clarke[2], Laura Weldon[1]

1 Wildfowl and Wetlands Trust
2 University of Gloucestershire

Freshwater ponds are important biodiversity hotspots in homogeneous landscapes, but changing practices in land use has led to a steady decline in the number of ponds in the UK. Pond loss since 1900 was calculated across a catchment in the southwest of England and will be presented. By identifying precise pond location and surrounding land use on historic and contemporary maps a comparison was made of total number, density and distance between present day and historic ponds. The data found 57.7% of ponds present in 1900 were lost, a net loss of 38.8%.

These results demonstrate an accurate method to create baseline data sets of pond numbers at a landscape scale that is superior to estimates of pond numbers. However, this method of mapping takes time and relies upon accurate maps. For that reason a rapid technique to identify ponds using remote sensing and image classification methods is explored. Automated (Normalised Difference Water Index) and supervised classification is applied to different resolution remotely sensed images to identify ponds within a large landscape. The initial findings from this work will be presented and will evaluate the performance of an automated approach to pond classification.

The Impact of Leaky Barriers on In-Channel Hydrology, Geomorphology, Ecology and Wider Biodiversity

Matthew Taylor[1], Lucy Clarke[2], Anne Harrison[3], Hannah Robson[3]

1 Wildfowl & Wetlands Trust; University of Gloucestershire
2 University of Gloucestershire
3 Wildfowl & Wetlands Trust

As high-magnitude flood events occur more frequently, Natural Flood Management (NFM) measures can mitigate their effect. NFM works with natural processes to slow water flow, provide attenuation and encourage infiltration, and can provide ecological and geomorphological benefits.

The Stroud Frome and Twyver catchments in Gloucestershire, UK have implemented multiple NFM interventions since 2012, including leaky barriers. Geomorphology, hydrology, water quality and instream invertebrate composition are monitored at three sites with similar environmental characteristics. This includes sites with: no leaky barriers (control); new leaky barriers installed in 2019; and established leaky barriers installed in 2015.

The results found that there has been a continuous positive improvement in water quality that is associated with the length of time a leaky barrier has been installed. There are reductions in channel velocity and increases in macroinvertebrate diversity. In addition bed sediment material changes have provided a broader range of in-channel habitats. Current research is being undertaken to assess the benefits an increase in macroinvertebrate diversity has on the wider biodiversity, with data on bats, birds, mammals, emergent insects and riparian vegetation being studied.

Biocontrol mediated by flower strips in a conventional farming system

Nathalie Rodenwald[1], Laura Sutcliffe[1], Christoph Leuschner[1], Péter Batáry[2]

1 Universität Göttingen
2 Institute of Ecology and Botany - Centre for Ecological Research

The recent decline of semi-natural habitats in European agricultural landscapes has led to a tremendous biodiversity loss. A widespread tool to halt any further decline are flower strips.

To date, the potential beneficial effect of flower strips on biocontrol has predominantly been studied in comparison with crop-crop margins but not with naturally occurring grassy margins.

Therefore, we investigated the potential of through flower strips ameliorated margins (compared to grassy field margins) to enhance spill-over of natural enemies into adjacent conventionally-managed cereals. We used cereal tiller counts to quantify aphids, cereal leaf beetles and their natural enemies at increasing distances from each margin type.

Our results suggest a contrasting effect of habitat type on the two investigated pest species at peak infestation point. However, the ratio of enemies to pest individuals tends to be slightly higher with adjacent flower strips compared to grass strips.

We conclude that perennial flower strips have weak beneficial effects on biocontrol at peak infestation, even in conventionally-managed agricultural systems. This effect may vary during the course of infestation. Therefore, we propose that future investigations consider temporal pest-enemy dynamics.

The competitive impact of managed honey bees on wild bee reproductive success

Olivia Bernhardsson[1], Liam Kendall

1 Centre for Environmental and Climate Science, Lund University, Lund Sweden

The competition between Sweden's wild bee species and managed honey bees is inevitable, as they share pollen and nectar resources where around half of the flowering plants visited by honey bees are also visited by wild bees. When the density of honey bee communities in an area is high, it can lead to negative competitive impact on wild bees survival and reproduction. However, there is a lack of scientific evidence to assess the extent to which and under what circumstances honey bees can adversely affect Swedish wild bees. This replicated experimental landscape ecology study is investigating how the reproductive success of *Bombus terrestris* colonies are affected by different densities of honey bee, *Apis mellifera*, colonies together with the distance between these. Furthermore, the study analyses potential pollen resource overlaps between the two groups and foraging behavioural changes on *B. terrestris* as an effect of honey bee density and in relation to landscape-level floral resource availability. The field work is ongoing and preliminary results are expected by the end of Summer 2022. This research aims to aid in efforts to conserve Swedish wild bee species by determining recommended safe distances between managed honey bee colonies and important conservation areas.

Douglas-fir promotes diversity, but alters species composition of groundbeetles in temperate Forests

Peter Kriegel[1], Dragan Matevski[2], Andreas Schuldt[2]

1 University of Wuerzburg
2 University of Goettingen

Planting non-native tree species, like Douglas fir in temperate European forest systems, is encouraged to mitigate effects of climate change. However, Douglas fir monocultures often revealed negative effects on forest biota, while effects of mixtures with native tree species on forest ecosystems are less well understood. We investigated effects of three tree species (Douglas fir, Norway spruce, native European beech), on ground beetles in temperate forests of Germany. Beetles were sampled in monocultures of each tree species and broadleaf- conifer mixtures with pitfall traps, and environmental variables were assessed around each trap. We used linear mixed models in a two-step procedure to disentangle effects of environment and tree species identity on ground beetle abundance, species richness, functional diversity and species assemblage structure. Contradictory to our expectations, ground beetle abundance and functional diversity was highest in pure Douglas fir stands, while tree mixtures showed intermediate values between pure coniferous and pure beech stands. The main drivers of these patterns were only partially dependent on tree species identity, which highlights the importance of structural features in forest stands. However, our study revealed distinct shifts in assemblage structure between pure beech and pure Douglas fir stands, which were only partially eased through mixture planting. Our findings suggest that effects of planting non-native trees on associated biodiversity can be actively modified by promoting beneficial forest

structures. Nevertheless, integrating non-native tree species, even in mixtures with native trees, will invariably alter assemblage structures of associated biota, which can compromise conservation efforts targeted at typical species composition.

Assessing and mapping socio-cultural values in Natura 2000 sites

Simona-Diana Morariu, Tiberiu R. Hartel, Vlad Macicasan

Babeș-Bolyai University, Faculty of Environment Science and Engineering

Understanding human-nature connections in the cultural landscapes protected as N2000 sites is key for developing and sustaining an efficient management of the biodiversity of these sites.

Here I present our research results regarding the biodiversity, human-nature connections and the social-ecological dynamics shaping these in time, from a cultural landscape protected nowadays as Natura 2000 site in Transylvania (Romania).

Our research is the first in Romania which explicitly links ecological and biological data (and ecosystem characterization based on these) with the social system through the social-ecological systems and ecosystem services frameworks. We show that human-nature connections in this study area were historically shaped by three key interacting drivers: institutional, economic and environmental. The most important institutional drivers were the forestry and the nature conservation. The most important economic drivers were the decreased profitability of subsistence farming and wine making while the most important environmental drivers were the geomorphology and the dry character of the site.

Location and host species affects microbial community in solitary bees on a continental scale

Tina Tuerlings[1], Gowri Amanda Hettiarachchi[2], Timothy Weekers[3], Marie Joossens[2], Nicolas J. Vereecken[3], Denis Michez[4], Peter Vandamme[2], Guy Smagghe[1]

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The current Anthropocene is characterized by an ongoing sixth mass extinction. More than 40% of insect species are threatened with extinction, among which Hymenoptera is the most affected.

Bee communities are known to be shaped by environmental conditions. Wild bee diversity specifically is sensitive to ecosystem changes, due to the spectrum of specialism and lack of support systems in agriculture. Gut health is known to impact plasticity and resilience in the changing conditions of the Anthropocene, but is understudied in solitary bees.

In this talk, the microbial community of eight key solitary bee species in fruit pollination is characterized, and influences of anthropogenic filters are identified. Considering different environmental variables, the differential microbial community was mostly explained by sampling location and host species, for all types of microbial groups. Despite the

environmental variation, solitary bee species seem to have characteristic core microbiota.

This talk further untangles the complex wild bee ecosystem and the immense effect of the environment on presence and prevalence of microbial species, and shows the need to fill the immense knowledge gap to sustain the undervalued role of wild bees for agriculture and biodiversity.

Livestock density affects species richness and ecological traits of butterflies at the national scale

Toni Kasiske[1,6], Sebastian Klimek[1], Jens Dauber[1,6], Alexander Harpke[2,3], Elisabeth Kühn[3], Martin Musche[3], Josef Settele[3,4,5]

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5 Institute of Biological Sciences, University of the Philippines Los Baños, College, Laguna, Philippines
6 Biodiversity of Agricultural Landscapes, Institute of Geoecology, Technische Universität Braunschweig, Germany

Over the past century land-use change and deterioration in habitat quality through agricultural intensification have led to a loss and degradation of grassland habitats in Europe. As a consequence, numerous groups of insects have suffered from these processes. Using nation-wide butterfly data from the German Butterfly Monitoring Scheme, we investigated the effects of three indicators related to land cover and agricultural land-use intensity based on agricultural census data at municipality scale. We found a negative relationship of butterfly species richness to the indicator related to the herbivore livestock density. Further, our results indicate a shift in butterfly communities towards mobile habitat generalists with increasing herbivore stocking rate. Accordingly, our findings highlight the importance of low herbivore livestock densities to halting the loss of pollinating insects

and safeguard biodiversity as well as associated ecosystem services. We here demonstrate that indicators related to grassland management intensity based on livestock distribution data can provide inside into spatial diversity patterns of butterflies at the national scale and we make recommendations for further research needs.

Posters

A meta-analysis on the effect of invasive plants and their traits on the diversity of pollinators

Ágota Réka Szabó, Péter Batáry

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Flowering alien invasive plants can affect the interactions between native plants and their pollinators. The studies conducted so far have reported negative but also positive and neutral effects on the presence of an invasive species on the pollinator visitation rates of native species. In order to study the invasion effects on pollinator communities, we conducted a systematic review using meta-analysis. The publications were extracted from the Web of Science database. Searching resulted in a total of 1487 publications (search terms: pollinat* OR "flower visit*" OR bee OR hoverfly OR syrphidae OR "hover fly" OR butterfly OR moth OR bumblebee) AND ((invasi* NEAR plant) OR (alien NEAR plant) OR (exotic NEAR plant) OR (adventive NEAR plant)). The title filtering resulted in 653 publications. A total of 150 publications relevant to the topic were analysed by the review of the abstract. The last step was the full filtering, 87 publications included relevant data. Data extraction is still ongoing, our aim is to examine the functional characteristics of invasive plants on the pollination networks of native plants.

The effect of linear structures on spatial turnover of pollinator communities in a landscape scale

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Landscape composition and spatial configuration of habitat patches are important determinants of biodiversity in fragmented semi-natural habitats spread across landscapes. However, little attention has been paid to man-made structures that can moderate spatial processes affecting pollinator communities. In a large-scale study, we explored the importance of railway embankments and levees for the turnover of pollinator species and plants in a landscape scale. We sampled pollinating insects and plants, at 55 study sites located along railway lines and levees. Control grasslands included 39 patches in which pollinators and plants were sampled. We assessed the relationships between dissimilarity and distance for pollinators and plants using Moran's Eigenvector Maps. The dissimilarity for pollinators on railway embankments was spatially structured: sites that were closer together were also less dissimilar in their community composition than more distant ones. Dissimilarity was also spatially aligned for pants on levees. The species dissimilarity of pollinators and plants was not spatially structured on grasslands. Our study highlights the potential function of linear structures as corridors for pollinator and plant populations.

Effects on natural and forestry caused disturbances on plant communities in European beech forests.

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Many empirical studies have found positive effects of forestry on plant alpha diversity in temperate deciduous forests, reflecting a positive response to soil and canopy disturbances caused by forestry operations. The level to which this positive response to artificial disturbances mimics processes in natural forests is less clear, and hence effects of forest management on the ground floral communities remain obscure.

We studied communities of ground-dwelling bryophytes and vascular plants in four classes of forest management intensity, while recording the incidence of a diverse array of microhabitats related to hydrology, canopy and soil disturbance.

We found positive effects of forest management on alpha diversity of both plant groups. In contrast, the uniqueness of assemblages decreased with forest management intensity. Canopy gaps created by thinning had a similar effect on alpha diversity to natural tree-fall gaps, but supported a different set of species. Similarly, natural watercourses supported more species of bryophytes and more unique floras of both groups than did artificial ditches.

While managed stands support higher alpha diversity of ground vegetation, long unmanaged forest reserves are essential to providing habitat to forest specialist species.

Lagomorpha evolutionary puzzle: what novel mitogenomes reveal?

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Globally distributed Lagomorpha has two extant families: Leporidae (hares and rabbits) with 11 genera (seven of them monospecific) and Ochotonidae (pikas) with one genus. One in every four lagomorph species are threatened and their taxonomy is vastly debated. A comprehensive

family- and genus-level Lagomorph phylogeny is lacking due to a high degree of homoplasy in their morphological characters and dearth of genomic data for several genera (e.g., Sylvilagus, Brachylagus, Caprolagus). We used 10–100 years old muscle and skin tissues from museum collections to sequence (Illumina) complete mitochondrial genomes with custom-designed mRNA probes. Firstly, we report novel mitogenomes of Lepus alleni (Mexico), Ochotona rufescens (Afghanistan), Sylvilagus aquaticus, and Brachylagus idahoensis (USA) and unidentified Lepus sp. from northeast Iran confirming the occurrence of Lepus tibetanus. Secondly, assembled mitogenomes of several Lepus sp. from Xinjiang (China), Iraq, North Yemen, Egypt, India indicates possible cryptic diversity within the genera. Thirdly, Ochotona rufescens from Afghanistan and several regions of Iran are distinct sub-populations. These lineages were trapped in separate sky islands since the Pleistocene, awaiting conservation attention.

Effects of forest management on flowering herbaceous plant abundance and diversity in a private reserve in Kenya

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Managing a forest in a way that benefits both people and all the species residing in it is a tall order. Some forest management techniques mainly focus on the welfare of only a set of target species, leading to the neglect of other species. Therefore, it is important for comparative studies to be done on managed and unmanaged forests so that forest management can make better informed decisions that will benefit as many forest dwelling species as possible. In our study we examined how management affects flowering herbaceous plant abundance and diversity in different forest types at a private conservation area in Kenya. This included collecting data on the forest itself (canopy cover, dominant undergrowth species, undergrowth composition etc.) and on the number of flowers and flower species. We also examined butterfly and moth abundance and diversity in the same areas.

Do railway embankments and levees support biodiversity in a human-modified landscape?

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Valuable habitats in various spatial configurations are essential for maintaining biodiversity across highly fragmented landscapes. In a large-scale study, we explored the value of human-made linear structures– railway embankments and river levees – as valuable habitats that support large populations of pollinators and plants. The most significant spatial variables affecting pollinator and plant populations on embankments and levees were also examined. Species richness and abundance of bees and butterflies were about 40% higher for railway embankments than for control grasslands. The richness of native plant species was about 25% greater on levees than on control grasslands. The most important landscape factor affecting pollinators was high shrub density which decreases the richness and abundance of pollinator species on linear structures. Specific conservation strategies involving linear structures should focus mainly on preventing habitat deterioration due to encroachment of dense shrubs. Thus, linear structures and their correct management may be a good example of man-made alterations in the environment that meet the demands of both civilization and biodiversity conservation.

Change of body mass and thorax width with age in a natural butterfly population

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The condition of animals is a widely used proxy to assess potential reproduction and survival. Standardized condition estimates are regularly measured in natural populations of vertebrate taxa. Much fewer condition proxies, e.g. measurements of body size, are used in invertebrates which are mostly examined under laboratory conditions.

Here we aimed to investigate how body mass and thorax width change with age in a population of the univoltine Clouded Apollo butterfly (*Parnassius mnemosyne*). The study was conducted in Hungary 2014-2020 using mark-recapture during the whole flight period. Repeated measurements on body mass and thorax width were performed on individually marked butterflies.

Both body mass and thorax width declined significantly with age in all years. Sexual dimorphism was detected in each year with higher initial body sizes in females. Initial thorax width showed higher interannual variation than initial body mass.

Our study is among the first with repeated measurements on temporarily changing body sizes in a wild butterfly population. Our results imply that both body mass and thorax width may be suitable condition estimates. Uncovering variation in body size in natural populations may enable us to reveal potential pathways of adaptation to environmental changes.

Meta-analysis on the effects of uncut refuge strips on grassland arthropods

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Natural and semi-natural grasslands are declining in an unprecedented scale. Invertebrates associated with them are among the most threatened species across Europe. Conservation managements aim to maintain the quality of semi-natural grasslands by modification of management regimes such as changing spatial or temporal extent of mowing. As experimental studies show contrasting results, we performed a systematic review of studies on the effect of uncut refuge strips as a local conservation action on different arthropod taxa, whether this method is effective globally. We looked for potential studies in the Web of Science and Scopus databases. Searching resulted in a total of 2465 publications with population, intervention and outcome search terms. The title filtering resulted in 474 publications, abstract filtering resulted 36 publications. We found a total of 25 publications relevant to the topic of which 16 ones contained usable dataset, with various data. We expect (1) higher abundance in the refuge strips than in the mowed area, (2) higher species richness in meadows with refuge strips than without and (3) these effects to differ among taxa. After extracting the data, we will calculate Pearson r effect sizes and test the moderators of sampling design in explaining heterogeneity.

Give a name to give a chance: taxonomy and conservation

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We experience the 6th mass extinction event, and due to many undescribed species and too few taxonomists, it is likely that species go extinct before being recognized. Also, only a few diverse tropical areas are remains, most of which are barely explored. Despite the need for species discovery, it is extremely hard to obtain specimens these places.

Our research focuses on the exploration of the jumping spider fauna of New Guinea, by revising Bathippus, which is easy to recognize due to the large chelicerae of the males. We discovered a high number of species. However, specimens have the similar genitalia, making "classic" diagnoses impossible. Moreover, our specimens are some 70+ years old thus a molecular study is not possible. We either wait with their formal descriptions until molecular data becomes available. However, here we argue that describing and naming them would be the first step to protect them. Species boundaries can be subsequently tested later.

Bathippus spiders, due to their extreme, "charismatic" morphology, are candidates to become flagship species for nature protection. Short- and long-term goals of both taxonomy and conservation biology will be compared to highlight possible conflict areas, lowering the effectiveness of the cooperation of these two sciences.

Bird communities at the interface of nature- and human-dominated landscapes

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Urbanization and agricultural intensification pose extreme challenges to global biodiversity. At the same time, biodiversity conservation cannot rely on protected areas only, thus human-dominated landscapes have a significant role in the development of sustainable conservation strategies. Our aim was to understand how the complexity of landscape structure shapes bird diversity and ecosystem functions/services at the interface of nature- and human-dominated landscapes. We selected four villages around 18 mid-sized cities in the Carpathian Basin. Our study design focused on landscape composition (semi-natural vs. agricultural areas), landscape configuration (contrasting distance from the focal cities) and within village sampling sites (centre vs. edge). Our hypotheses: (1) We expect higher bird diversity and ecosystem functions/services in villages with higher extent of semi-natural areas vs. intensive agricultural land. (2) We expect higher bird diversity and ecosystem functions/services in villages outside of city agglomerations. (3) We expect higher bird diversity and ecosystem functions/services in the edges than in the centre of villages. The surveys were successfully carried out in the villages, and currently we perform the statistical evaluation of the collected data.

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