

6th Student Conference on Conservation Science, Tihany 2020

*SCCS Europe - Connecting Eastern and Western Europe in conservation
biology*

*Tihany (Lake Balaton), Hungary
25 – 29 August 2020*

ABSTRACTS



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Background of the conference

The Student Conference on Conservation Science series started in Cambridge and has 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 began to organize the SCCS conference in Tihany, 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 2020

Dr. Andrew Hamer



Andrew Hamer is a Research Fellow at the Centre for Ecological Research in Tihany where he investigates the effects of urbanisation on freshwater biodiversity. He has a PhD on the applied ecology of endangered frog species. Previously, he worked as an Ecologist at the Australian Research Centre for Urban Ecology (ARCUE), where he conducted research into the impacts of urbanisation on terrestrial and aquatic ecosystems. He has also worked as an ecological consultant for over 25 years throughout south-eastern Australia. He is currently examining the effects of landscape fragmentation on amphibian communities in Hungary.

Andrew serves as an Associate Editor for the journal *Urban Ecosystems*, and is an Honorary Associate of the School of BioSciences, University of Melbourne. He has published widely on the topic of urbanisation, and has actively engaged environmental practitioners, management authorities and citizen scientists in his research.

Univ.Prof. Thomas Hein



Univ.Prof. Thomas Hein started as full professor at the Institute of Hydrobiology and Aquatic Ecosystem Management in 2017 and is managing director of WasserCluster Lunz since 2008. He successfully finished his PhD about river floodplain interactions, the importance of connectivity and the effects of restoration on fundamental ecosystem processes at the University of Vienna in 2000.

The research interests of Prof. Thomas Hein are aquatic ecosystem – human interactions in riverine landscapes, with a focus on water – sediment interactions, aquatic – terrestrial linkages, ecosystem restoration

and the coupling between society and ecosystems in riverine landscapes, viewing them as socio-ecological systems. Underlying principles of his research are connectivity, resilience and aspects of co-evolution of riverine landscapes. The investigations are ranging from the modification of nutrient and carbon dynamics, greenhouse gas production to changes in biodiversity in riverine landscapes and link these changes in ecosystem processes to ecosystem management, such as waterway management or river restoration measures. The Danube region is a key research area of Thomas Hein and the Danube River is one of his favorite rivers, especially the floodplains of the Nationalpark Donau-Auen. He is coordinating the Doctoral School HR21 at BOKU, a CEEPUS network about ecosystem research, and is actively involved in international teaching programs at the master and PhD level. He authored more than 90 publications in scientific journals and more than 70 conference proceedings, book chapters and other scientific articles.

[Webpage](#)

Dr. Julie Teresa Shapiro



Dr. Julie Teresa Shapiro is a postdoctoral researcher at the French National Institute of Health and Medical Research (Institut national de la santé et de la recherche médicale; Inserm) in Lyon, France. She is an expert in bat ecology. She first worked with bats as an intern at Mammoth Cave National Park in Kentucky 15 years ago and has been fascinated by them ever since!

Dr. Shapiro has a PhD from the University of Florida, where she studied the effects of land-use change on bats and their microbes in southern Africa and modeled the role of bat diversity and anthropogenic disturbance on Ebola virus spillover. In addition to her research on bats, she has also worked with small mammals, fungi, and Leishmania. Her current work at Inserm focuses on the ecology of antibiotic resistance in hospital networks, using metapopulation and community ecology models. Before beginning her PhD, she worked with András Báldi and Anikó Kovács-Hostyánszki at

the Hungarian Academy of Science's Center for Ecological Research on ecosystem services and the effects of invasive species. She is a member of the IUCN Bat Specialist Group.

[Webpage](#)

Twitter: @JulieTheBatgirl

Dr. hab. Hajnalka Szentgyörgyi



Dr. hab. Hajnalka Szentgyörgyi is working at the Jagiellonian University in Kraków in the Plant Ecology Group at the Institute of Botany. She holds her PhD and habilitation in biology, the latter on the effects of environmental pollution on bees. Her expertise includes bee biology, both honey bees and wild bees, pollination ecology and drivers of pollinator decline. She was involved in reports and meta-analyses concerning pollinator decline, pollination of crops, pollination ecology and lately the analysis of the EU CAP for pollinator preservation on farmlands. She is also an IPBES and EU expert on pollinators and pollination. Her research includes studies on the effects of environmental pollution and changes in landscape structure on bee abundance and health. Her latest project is dealing with the effects of industrial and urban pollutants on honey bees and solitary bees. As a university lecturer she teaches ecology, biodiversity, wild bee biology, but also research management, plant evolution and plant physiology.

[Webpage](#)

Awards SCCS Europe 2020

Best Talk Award went to *Edina Csákvári*, for the oral presentation entitled “The connection between environmental predictors and regeneration capacity of sandy habitats in Hungary“

Best Poster Award went to *Dávid Korányi*, for his poster entitled “Effect of urbanization on biological control of herbivorous insects”

The award for the best talk and poster comprised of a one-year membership of Fauna & Flora International, with a subscription to the journal *Oryx*, along with a book package offered by the Cambridge University Press.

The **Community Ecology Award** offered by the journal *Community Ecology* for the presentation mostly relevant to multi-species problems went to *Katalin Patonai*. Her presentation “Using food web topology indices and traits to describe aquatic ecosystems” was invited to the journal and she also received a one-year subscription to the journal.

The **Special Award** went to *Erika Nascimben Santos* for her talk entitled “TiO₂ and BiVO₄ nanomaterials and nanocomposites applied for advanced photocatalytic membranes to treat oil-in-water emulsions”.



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Conference Organizers

András Báldi - Head of the committee, Lendület Ecosystem Services Research Group, Centre for Ecological Research

Barbara Barta - Balaton Limnological Institute, Centre for Ecological Research

Anikó Kovács-Hostyánszki - Lendület Ecosystem Services Research Group, Centre for Ecological Research

Katalin Mázsa - Centre for Ecological Research

Barbara Mihók - University of Szeged, Faculty of Economics and Business Administration Research Centre

Brigitta Palotás - Centre for Ecological Research

Nóra Vili - University of Veterinary Medicine, Budapest

Talks and posters
of the
6th SCCS Europe

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Comparative study on hydrothermal carbonization as pre- and post-treatment of anaerobic digestion of dairy sludge

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How much biomass is lost in waste treatment and what is the most effective way to reduce this source of loss?

Hydrothermal carbonization (HTC),

Anaerobic Digestion (BMP Experimental and theoretical)

Steam gasification,

FTIR Data processing,

Anaerobic biodegradability (BD),

Statistical analysis

BMP assay revealed an enhancement in total methane production and chemical oxygen demand removal after HTC pretreatment prior to AD. However, applying HTC on AD digestate (HTC post-treatment) was more beneficial from energy point of view. Nonetheless, decompositions of the bioavailable nutrients in the aqueous phase were enhanced by HTC processing of the AD digestate suggesting its suitability as a liquid fertilizer.

Saving biomass is possible by utilisation of energy efficient techniques such as HTC and AD, but combining them was essential towards higher energy density. The higher the energy density of the biomass product used, the higher the outcome and the lower the mass of use for the same energy output.

Adsorption and recovery of phosphate ions from aqueous solution using activated pomegranate peel powder

Naoufal Bellahsen

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My talk will address the conservation of fresh water, phosphate and environment through the use of agricultural and food waste as bio-adsorbent for phosphate removal followed by the use of phosphate-loaded adsorbent as fertilizer.

This research focused on the activation of pomegranate peel powder to enhance its efficiency to adsorb phosphate ions. Characterization of adsorbent was done using Fourier transform infrared spectroscopy, Zeta potential and Scanning electron microscopy. Batch adsorption experiments were designed to study the effect of influencing factors on the process and to investigate isotherm and kinetics models. Finally, the use of phosphate-loaded pomegranate peel as fertilizer was investigated.

Pomegranate peel powder could achieve 97 % removal of phosphate and the phosphate-loaded pomegranate peel powder showed promising results as potential fertilizer, however, deep investigations are still running.

This green wastewater treatment method allows the establishment of a judicious management of water, phosphate and solid waste according to 3R principle (Reduce fresh water use and pollution by phosphate; Reuse agricultural and food waste, Recycle phosphate)

The connection between environmental predictors and regeneration capacity of sandy habitats in Hungary

Edina Csákvári

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European temperate grasslands are threatened due to the intensification of agricultural practices, the abandonment of traditional grazing and the use of non-native species in forest management. Understanding the factors that influence the regeneration capacity – an indicator of healthy ecosystems and their services – can facilitate the preservation as well as restoration of these habitats.

We investigated the regeneration capacity of Pannonian sandy habitat types at national scale: open and closed sand steppes, poplar-juniper sand dune forests and thickets. We used MÉTA database that includes estimates of regeneration capacity of semi-natural habitats based on expert judgments, and we have selected environmental predictors that could possibly influence regeneration, including proxies for habitat naturalness, landscape context and abiotic factors.

The local regeneration of open and closed sandy habitats is primarily determined by naturalness, supposedly providing a sufficient source of propagules. In case of poplar-juniper forests the seasonality of precipitation is the most important predictor and NCI of sandy habitats is the second. Regeneration of sandy habitats is also possible on neighbouring areas and in abandoned fields, grasslands and agricultural areas represent a potential for regeneration after abandonment.

The environmental predictors that influence the regeneration can vary. The success of spontaneous regeneration depends on the conservation of remnant natural and semi-natural areas, but active restoration must be an important nature conservation objective too, which can help to preserve and increase recovery of habitats.

New invader on Hungarian sandy grasslands: functional effects of *Sporobolus cryptandrus* on plant communities

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Invasive species cause severe ecological damages and their impact costs national economies billions of dollars every year. Instead of the expensive eradication and subsequent habitat restoration, prevention may be a more cost-effective solution, however, a crucial step before preventive measures is to assess the threat a newly colonizing non-native species may pose. In this study we evaluated native and non-native stands of a potentially invasive grass, *Sporobolus cryptandrus*.

Our aim was to reveal how its increasing cover affects the functional diversity and ecosystem service provisioning capacities of plant communities. We surveyed grassland patches in the Kiskunság, Hungary and in Montana, USA simultaneously, recording all vascular plant species and their relative abundances in 50 randomly placed quadrats in each 9 locations. In order to compare the plant communities of the two continents, we used a trait-based approach.

Increasing *Sporobolus* cover resulted in lower functional diversity, and reduced average specific leaf area and flowering period in Hungary but did not have these effects in the native stands. *Sporobolus* also negatively affected the cover of native perennials in Hungary, creating more space for annuals.

We conclude that the spread of *Sporobolus*, away from its native range, leads to the impoverishment of host communities and compromises the biomass and pollen provisioning capacity of the vegetation to higher trophic levels. Tackling the spread of this new invader should therefore be a priority task.

The efficacy of heat therapy in clearing *Batrachochytrium dendrobatidis* from newly metamorphosed common toads (*Bufo bufo*)

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The infectious disease chytridiomycosis, caused by *Batrachochytrium dendrobatidis* (Bd), is one of the major causes of the global decline of amphibians. Because the thermal tolerance of Bd is lower than that of many of its amphibian hosts, elevating temperature to 28-30 °C may be an effective treatment of Bd-infected amphibians. Our aim was to examine the effects of elevated ambient temperature on Bd-infection intensity of experimentally infected, newly metamorphosed common toads (*Bufo bufo*).

We exposed individually housed toadlets to 20 (control), 28 or 30 °C for 3 or 6 days. Half of the individuals we conserved in ethanol immediately after the temperature treatment and the other half 10 days later. When tested at the start of the temperature treatments, all experimentally infected toadlets were positive for Bd.

Our results demonstrate that the prevalence of Bd was reduced by 40 % in toadlets exposed to 30 °C for 6 days, and all individuals that were kept at room temperature for 10 days after the 6 days of 30 °C treatment cleared the Bd-infection. Surprisingly, in the control group Bd-prevalence was reduced by 70 % when the individuals were kept for additionally 10 days after the 6 days of 20 °C treatment.

Our results for the control group were perhaps due to resistance to Bd in the studied populations of the common toad, or to low pathogenicity of the Bd lineage we used. In summary, results of our experiment suggest that heat therapy can help amphibians to clear the Bd infection, but further studies are needed to understand the temperature-dependence of the interaction between Bd and newly metamorphosed amphibians.

Ecosystem engineers and human-induced landscape change: The beaver's impact in degraded alluvial forests

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The Eurasian beaver (*Castor fiber*) is a previously nearly extinct, reintroduced ecosystem engineer species, whose population increased thousandfold on the continent during the past decade, as a consequence of the conservation efforts. The species has been absent in the Carpathian Basin for more than 120 years. In this period the riverine landscape has changed drastically due to river regulation and rapid spread of invasive species. We examined the beaver's impact in this altered ecosystem.

A forage selection study was conducted between 2017 and 2020 at 20 study sites, based on 100 sampling circles (SC) per site. Half of the SCs were laid along the waterbank while the other half 10 meters further. In every SC, the number of available and utilized thin branches (0.8-5 cm in diameter) were counted, separately for every woody species or genus. Individual data were collected about the larger branches and trunks. Preference was calculated using Jacobs-index and Bonferroni Z-test.

Beavers utilized native and hybrid softwood species (SWS: *Salix* and *Populus* spp.) with higher ratio than the invasive alien species (IAS: *Acer negundo*, *Fraxinus pennsylvanica* and *Amorpha fruticosa*). Nonetheless, the number of utilized branches of IAS sometimes exceeded that of softwood species, in cases when the abundance of IAS was much higher. Along the waterbank, beavers significantly preferred SWS in the thin branch category in several cases: *Salix* at 10 sites and *Populus* at 5 sites.

Invasive species mean a serious threat to floodplain habitats. The beaver's activity is able to accelerate species-composition shift, and this phenomenon favours the invasive species. Both the Eurasian beaver and the alluvial forests are under

European-level protection (EU Habitats Directive), which will cause conservation conflicts in the future. The adverse impact of a native species indicates the urgent need for active floodplain management.

In vitro thermal tolerance of a hypervirulent lineage of the chytrid fungus, *Batrachochytrium dendrobatidis*

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Chytridiomycosis, caused by the chytrid fungus *Batrachochytrium dendrobatidis* (Bd) is an emerging infectious disease of amphibians. It poses serious threat to amphibian biodiversity, because it has caused the decline or even extinction of amphibian populations worldwide.

We incubated Bd cell cultures at five different temperatures (21, 25.5, 27, 29 and 30.5 °C) for one of six exposure durations (3, 4, 5, 6, 7 and 8 days) and subsequently counted the number of zoospores to assess the temperature dependence of Bd growth.

We observed intensive Bd-growth at 21 °C, which temperature was also found to be optimal for Bd in previous studies. At 25.5 °C the number of zoospores also increased over time, but the curve plateaued at about half height. At temperatures of 27 °C and above, the fungus showed no considerable growth.

The thermal optimum of Bd is lower than that of most amphibians, which provides an opportunity to cure infected individuals with elevated temperature. The application of elevated temperature, however, presupposes detailed knowledge about the thermal tolerance of the fungus. This study provides an upgraded starting point for in vivo studies targeting the development of new mitigation approaches that rely on elevated temperature.

Traditional grey cattle grazing does not have negative effect on arthropod biodiversity

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Semi-natural grasslands have a major part of maintaining the diversity of terrestrial arthropods, thus the changes in grassland managements have direct effects on arthropod communities. The nature conservation value of grasslands declines in Europe in the last decades, due to the abandonment or intensification of management. Extensive management is crucial for maintaining several types of grasslands, however the effect of management may vary between taxa. We aimed to find out how grazing affects arthropods on different types of grasslands. Our focal questions were (1) Does extensive management by grey cattle grazing maintain the grassland arthropod fauna? (2) Is the effect of grazing taxon specific? We carried out our study in saline grasslands of the Körös-Maros National Park, south part of Hungary. We established 12 sites, 6 in artemisia salt steppe and 6 in salt meadows, each with 0.5 ha area where we excluded grey cattle grazing. We sampled arthropods (1) in the centre of the grazing excluded sites, (2) non-grazed edge, (3) grazed edge and (4) grazed control site. We collected plant-dwelling arthropods by sweep netting and ground-dwelling arthropods by pitfall traps, in summer of 2018. We identified five taxa: spiders (81 species; 4874 individuals), carabids (61 species; 4243 individuals), planthoppers (54 species; 4603 individuals), true-bugs (64 species; 32487 individuals) and orthopterans (6050 individuals). In artemisia salt steppe, there was no significant effect of grazing on species richness of the studied arthropod taxa. However, the abundance of planthoppers and true-bugs were higher in the ungrazed area. In salt meadows,

species richness of true-bugs was higher in ungrazed than in grazed sites. Three out of five taxa (spiders, planthoppers and true-bugs) had higher abundance in ungrazed sites. Surprisingly, grazing had a positive effect on abundance of orthopterans. Abundance of planthoppers and true-bugs were higher in edges than in ungrazed and grazed sites in artemisia salt steppe and we found the same patterns for abundance of spiders, carabids, planthoppers and orthopterans in salt meadows. Spillover, mostly from grazed areas to ungrazed areas, is presumably considerable in saline pastures. Our findings confirm that extensive grazing is not harmful to the diversity of invertebrate fauna, however, it can have a negative effect on the quantity of biomass. Management methods need to be fine-tuned to make conservation efforts effective.

Avian functional traits under urbanization – a meta-analysis

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My current research topic address the biodiversity threatening effects of urbanization. This is one of the most crucial issue in conservation science. The terrestrial areas of the Earth have been immensely altered by urban expansion, which severely affects biodiversity and poses major challenges on its conservation. The problems caused by urbanisation are really diverse. My research examines the effect of urbanization on bird functional traits.

We examined the effects of urbanization on bird communities via their functional traits within the frame of a systematic review using hierarchical and categorical meta-analyses. We selected five functional traits: foraging technique, diet, nesting behaviour, migration status and body mass of the investigated bird species. Bird species were studied along an urbanization gradient. We only considered European countries, and we focused on passerine species.

Our study shows that urbanization has a positive effect on species considered as generalists, thus cities have a major filtering effect. Meanwhile specialists lose their habitat, leading to large scale homogenization and simplification of bird communities. Nevertheless, bird species traits have an important role in determining the occurrence of bird species in European cities

Our research can predict the effect of urbanization on different bird species. Their functional traits play an important role in the maintenance of healthy and functioning ecosystems. Understanding the drivers behind the changes in functional diversity, can provide valuable information for nature conservation and urban planning.

TiO₂ and BiVO₄ nanomaterials and nanocomposites applied for advanced photocatalytic membranes to treat oil-in-water emulsions

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Efficient treatment of oily wastewaters has become an urgent necessity since they are produced in high quantities and have harmful effects on environment and human population. For emulsified and dissolved oil, advanced methods must be used, such as membrane filtration which exhibits several advantages. Fouling is still the major limitation to the application of this technology. The fabrication of ultra-hydrophilic membranes may revolutionize the effective separation of oily wastewater.

TiO₂ and BiVO₄ photocatalysts were used to prepare photocatalytic PVDF ultrafilter membranes. The photocatalytic activities and the effects of coatings on the membrane filtration of oil-in-water emulsion were investigated. Fluxes, filtration resistances, purification efficiencies, fouling resistance abilities – like flux decay ratios (FDR) and flux recovery ratios (FRR) – were compared. Moreover, the solar light-induced photocatalytic decomposition of the foulants was also investigated

TiO₂, one of the BiVO₄ photocatalysts, and their composites were beneficial for filtration properties. Pure BiVO₄ coating was more beneficial in relation to filtration properties, while pure TiO₂ coating proved to be more beneficial concerning the photocatalytic regeneration of the membrane. The TiO₂(80%)/BiVO₄(20%) composite was estimated as a good combination of high photocatalytic activity and beneficial filtration properties.

Photocatalytic nanomaterials promise advantages for the preparation of highly hydrophilic, self-cleaning membranes, as these materials can decompose the organic pollutants from the surface when activated by artificial or solar irradiation, therefore reducing the pollution of oily contaminated waters.

The role of semi-intensively managed fishpond systems in the provision of water-related ecosystem services

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In the past few decades, a great variety of natural and artificial ecosystems have been studied to reveal their ecosystem service (ES) providing capabilities. Despite the continuous work of researchers around the world however, there are some habitat types that are still underrepresented in this topic. Fishpond systems used for freshwater aquaculture are good examples for them, which is in contrast with the growing number of multifunctional pond systems supporting conservational purposes.

Our goal was to reveal the ESs of multiple, semi-intensively managed fishpond systems in Hungary (e.g. in Biharugra, Szeged, Akasztó) and characterize them in an interdisciplinary way. ES collection and sociocultural valuation were conducted through structured interviews with local key-informants from major stakeholder sectors, while biophysical and monetary valuation was mainly based on indicator data or expert information. ESs were also mapped using a matrix model and hotspot-warmspot technic.

Between 2017-2019 we have conducted 22 interviews with local experts and revealed 16 different ES (Biharugra:12, Szeged: 12, Akasztó: 13) with their main trade-offs and synergies. In all cases, sociocultural valuation highlighted fish production as the most important ES, mostly followed by different cultural services. Biophysical and monetary results mostly supported these states. Mapping exercises confirmed that standing waters and reed beds are the sources of most ESs in the area.

Besides supporting biodiversity, semi-intensive fishpond systems in Hungary can provide a great variety of ESs. With these abilities and their stable water support, fishpond systems could play a very important role in the future as refugia for water-related species and services, if the area of our natural wetlands will

continue to shrink due to the effects of global warming. For this purpose, however practical studies are needed to ensure support for sustainable land-use planning activities.

Restoration of sand grasslands to replace invasive black locust plantation: effects of long-term mowing

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Alien species are among the major threats to biodiversity and to the self-recovery of natural habitats. Nature conservation seeks best methods to eliminate invasive species and to restore natural habitats. At present, ~50% of open sand grasslands are degraded and replaced by mainly black locust stands in the Pannonian region. We studied the long-term effect of mowing on the restoration of Pannonian sand grasslands, after elimination of black locust, in different landscape matrices.

Three stands (~1 ha) were chosen in different landscape matrices: closed forest, grassland-forest mosaic and open grassland within the sand dunes of Kiskunság, Hungary. Black locust stands were clear-cut (1994-1995) followed by GARLON application. Mowing was applied twice a year with hay removal (1995-2001) in six 10m x 10m parcels and it was compared to unmown control and semi-natural reference. Vegetation was sampled twice a year (1995-1999) in all sites and re-sampled six times in two of them.

Herbicide application with repeated mowing for 7 years eliminated Robinia at all sites. Significant woody cover developed in unmowed plots, but Robinia re-established only in Bugac. Vegetation trajectory of mowed plots approximates to the reference grasslands in sites with nearby open sand grasslands. In these sites, mowing resulted in higher cover of target species, but it is still significantly lower than in the reference. Mowed plots were more prone to secondary invasion than the unmowed.

My results draw the attention to the importance of long-term monitoring in restoration management, which demonstrated that initial mowing assisted the restoration of Pannonian sand grassland, but for complete recovery, other interventions (e.g. seeding) are needed.

Using food web topology indices and traits to describe aquatic ecosystems

Katalin Patonai

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Aquatic ecosystems are under increasing environmental and anthropogenic pressure therefore it is crucial to research them in an integrative manner. Food webs provide an abstract representation of trophic connections at the community level and they can be used to reconcile structure and function of ecosystems by incorporating multivariate functional traits with network analysis (Thompson et al., 2012).

In this study, we compared 92 Ecopath with Ecosim (EwE) aquatic food web models from 7 different ecosystems. We assigned various traits to the data and assessed if functional traits can determine food web position (topology) and functional importance within the different ecosystem types. We approached the analysis from both node-level (species or functional group) and network-level (community) analyses using multiple centrality, hierarchical and indirect network indices.

Our preliminary results show, that the mobility trait in aquatic EwE models can be useful in explaining topological importance. The relationship between different indices (correlation and redundancy) and their variation with ecosystems will be discussed.

Trait-based food web topology may help reveal general patterns of different ecosystems. Also, traits increase the interpretability and predictive power of food webs helping conservation biology practices.

The appearance and spread of invasive species during the restoration of Pannonic sand steppes

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The occurrence, spread and transformation impact of alien plants may lead to major ecological problems worldwide. Land use change and alien species cause much of the biodiversity shrinkage in terrestrial ecosystems. Habitat restoration aims to counteract land use change, but restorative interactions cause disturbance and invasive plants may be the first to colonize afterwards. Invasive species can alter ecosystem functions that can persist even after their removal.

We evaluated the changes in the abundance of invasive species in two long-term datasets related to open sand grassland restoration in the Kiskunság, Hungary. The first experiment included mowing as restorative intervention after removal of black locust (*Robinia pseudoacacia*), with carbon amendment in old-fields for the second. We identified all neophyte species from the two experiments and looked for long-term trends in their coverage depending on time and treatments.

We have found 21 different neophytes in 2 experiments. A very important alien species in the Kiskunság is black locust. This species was successfully controlled by initial chemical treatments and 7 years of mowing, but other neophytes could colonize and spread to mowed plots after the elimination of black locust. Carbon amendment had little effect on the total cover of neophyte species. We also found a decrease in annual species and an increase of perennial neophyte species with time.

The results show that direct restoration methods can successfully control target species, but can promote the spread of other neophytes. Whereas indirect methods, such as carbon amendment can be less successful in controlling neophytes. This implies that neophyte species, especially perennials require constant monitoring and regular management to prevent their return.

Trends of pastoral traditional ecological knowledge: a global review for scientists, policy makers and managers

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We conducted a systematic review to study global patterns of the state of traditional ecological knowledge as one of the main sources in biological and cultural diversity and its transitions in pastoral systems. We assessed causes and drivers of knowledge transitions and highlighted research gaps that stress the need for a global research agenda on pastoralism knowledge.

We used the systematic review approach. Using Web of Science database and other sources, we made a database including all the papers related to pastoral traditional ecological knowledge (382 papers). We reviewed all these papers from the beginning to the end looking for 13 nominal and categorical variables. We did the statistical analysis using different packages such as ggplot2, dplyr and rworldmap in Rstudio software.

41% of all the reviewed papers mentioned four types of knowledge transition including constancy, erosion, hybridization and adaptation from which 83% reported knowledge erosion. Examples of knowledge transition show that adaptation and hybridization of knowledge can efficiently help pastoralists to navigate social-ecological changes. Thirteen drivers were mentioned causing knowledge transition.

Currently, it is globally accepted that local ecological knowledge is a valuable component of biological and cultural diversity (IPBES, CBD, UNCED). As our result showed an abrupt erosion of this knowledge, this study highlights that how important it is to consider local ecological knowledge in risk of erosion and how necessary it is to conserve this knowledge.

Home range and movement patterns of Caspian Whipsnakes (*Dolichophis caspius*) in Vöröskővár, Hungary

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Conservation of protected species: Investigating the variability of HR sizes of individual snakes. How to the home ranges changes over time?

We collected localisation points on weekly (1 or 2 occasions per week) field visits using radio-telemetry. We investigated the home range sizes of 5 individuals from 2016 to 2019. We used 4 different methods of home range estimation: Minimum Convex Polygon (MCP), Adaptive and Fixed Kernel Density Estimation and Local Convex Hull (LoCoH-R). Daily movements were also evaluated from the localization data.

The snakes use much larger portion of the area as they require larger hunting ground.

The Caspian whip-snake is one of the strictly protected species of snakes in Hungary living near to urban areas, it is therefore important to understand their spatial movement patterns, home ranges and habitat use. This study will bring about proper management strategies which are favorable for the species in relation to its habitat.

Assessing freshwater ecosystem services for conservation

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The ecosystem services concept was developed in order to make conservation efforts more efficient, by connecting the good condition of ecosystems - in which basic functions can take place - with 'services' that people receive & enhance their well-being. Applying the ecosystem services approach to freshwater topics – which are among the most threatened ecosystems in the world - can assist in solving related conservation issues, but there are several points on which special attention is needed.

Main research methods: literature review (+ workshop output)

Due to their unique features, e.g. linearity, high connectedness, source-sink dynamics within a watershed, relatively small extent, freshwaters are more susceptible to a number of pressures than terrestrial ecosystems. Based on the same points, they need to be assessed, evaluated and protected in special, more complex and holistic ways than terrestrial habitats.

Some approaches needed for freshwater ecosystem services assessments can add to general conservation topics, like the holistic view, or the inclusion of cross-ecosystem dynamics.

Posters

Effects of an invasive plant, common milkweed (*Asclepias syriaca L.*) on native plants communities in sandy region

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In Hungary, one of the most important invasive plant is common milkweed (*Asclepias syriaca L.*). The quick expansion of common milkweed is a serious conservation problem mostly in the sandy region of Kiskunság, middle Hungary. Where milkweed becomes dominant, outcompete native plant species, thereby change the species composition of vegetation. The aim of the research is to study the impact of milkweed on vegetation in semi-natural, regenerating habitats, like old-fields.

We manipulated the aboveground density of common milkweed in small-scale (4x4m) plots by removing aboveground biomass in semi-natural, regenerating: old-field) in ten replicates. There are three levels of manipulation: total and partial eradication of invasive species and control. We use two types of controls: invaded and not invaded sites with similar environmental conditions. We detected the changes at of plant species compositions with permanent plots.

Data analysis and collection is still in progress. In the study we will get knowledge on how milkweed can affect the plants communities. We will be able to judge the role of milkweed in different situation and make a description about the impact of milkweed on the semi-natural habitats. We will explore the impact of an invasive plant species on species composition and functional diversity.

In our study we will get information about the native plants species composition of vegetation within the invaded areas and assess the changes of vegetation after removal of milkweed. Furthermore we will have an insight into the effects of milkweed invasion on native plants. Our results will be useful in planning nature conservation management against this and even against other invasive perennial herb species.

Reconsidering the regions of seed origin for ecological restoration by applying the Multiple Potential Natural Vegetation Model

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Native seed transfer should be spatially restricted to avoid the introduction of non-adapted species during restoration. In Hungary administrative borders are used for this purpose. The main aim of the study was the development of an evidence-based seed transfer zone map, applying the Multiple Potential Natural Vegetation model.

The analysis was based on three biogeographical knowledge-based maps: floristic, vegetation and landscape map of Hungary. Intersected polygons of the maps were filled with Multiple Potential Natural Vegetation data and clustered to produce seven contiguous units that can serve as seed transfer zones. Uncertainty analyses provided a numerical comparison between the two approaches and demonstrated the inadequacy of the currently used administrative regions as seed transfer zones.

The main result of the study was the development of an evidence-based seed transfer zone map that could replace the administrative map that is currently used for regulation in Hungary. The higher reliability of the output map compared to the current used administrative units supports the need for a change in the regulation. Seven regions proved to be the optimal number of zones. The results are accepted and published in *Restoration Ecology and Természetvédelmi Közlemények*.

The output map can be the basis for the development of native seed propagation and support the upscaling of ecological restoration. The applied methodology can be transferred to other countries in the lack of an evidence-based system for seed transfer is absent.

Effect of urbanization on biological control of herbivorous insects

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Urbanization can affect arthropods in different ways. Several studies have documented that modified habitats in cities alters patterns of species interactions by filtering species at higher trophic levels and the outbreaks of herbivorous pest insects is often attributed to this phenomenon.

To clarify the impact of urbanization on natural enemies, we performed a meta-analysis on predation and parasitism rates of herbivorous insects in rural vs. urban areas using 48 observations of 14 case studies.

We found that urbanization had an overall significant negative effect on biological control of herbivorous, mostly pest insects. Studies that examined predation were more likely to detect negative urbanization effect than studies that considered parasitism. In contrast, we found little evidence that the effect of urbanization on biological control was influenced by gradient length (short vs. long) or taxonomic level (species vs. community) of natural enemies.

Our results suggest that pest control services provided by arthropods decrease markedly with the increasing level of urbanization and this is more pronounced for predators and to a lesser extent for parasitoids.

The effects of different silvicultural treatments on the viability of saplings and its interplay with ungulate browsing in an oak-hornbeam forest

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The forestry sector is under pressure for two reasons: they should enlarge the ratio of forested lands and suit to the new conditions due to climate change. In addition, multiple-use forest management is a new requirement: besides the primary function of forest-timber production, recreation, protection, or conservation (Natura 2000)- they should provide ecosystem services, maintain biodiversity, and highly adapt to climate stochasticity. The importance of those forests is enhanced, which are less sensitive for severe disturbances, but more resilient against incoming species and tolerate more the variability of climate. Ecosystem processes function better in a healthy and more close-to-nature structure forest stand, so the role of continuous cover forestry (CCF) is more appreciated. Continuous cover forestry offers a base to establish such forests. However, it is controversial in the forestry sector, partly because of the high browsing pressure of ungulates which could hinder the successful regeneration in the used small intervention areas (e.g. gaps- 20 m diameter). Browsing behavior of wild game species is determined by many factors, such as stand structure, stand age, species composition, the height of saplings, or the vicinity of agricultural lands. Forestry treatment may also modify the effect of browsing.

Thus, we study the effects of different forestry treatments and the browsing pressure of ungulate species on the regeneration of an 80-year old stand that is dominated by sessile oak (*Quercus petraea*) and hornbeam (*Carpinus betulus*). The study site is situated in the Pilis Forestry System Experiment. Four types of forestry management and a control group are used: clear-cutting, retention tree group in the clear-cut, preparation-cutting (all are the part of rotation forestry system), and gap-cutting (representing CCF interventions).

Our question is whether the browsing pressure shows differences among tree species and between forestry treatments? We investigate the qualitative characteristics of browsing using a large sample of saplings to explore (1) the browsing preferences of ungulates to different species (oak, hornbeam, manna ash – *Fraxinus ornus*, and shrubs); and (2) the differences in browsing pressure and selectivity among the applied treatments.

We hypothesize that (1) between 50 cm-130 cm of saplings are suffered a more severe browsing, than in other height categories of saplings; (2) the negative effect of browsing is more pronounced on regeneration in gaps/clear-cutting than in other treatments (closed control, preparation cutting, retention tree group) because of the food availability; (3) the browsing pressure on hornbeam is higher than that on manna ash or sessile oak because of its faster growing; (4) the browsing pressure on sessile oak is higher than on manna ash, because of the nutritional need of ungulate species (roe deer is a concentrate selector, it prefers high protein content against fiber content); (5) the browsing pressure in clear-cuts is heavier than that in the gaps due to the higher food supply and larger size that results in a more permanent presence (live, not just cross it) of ungulates in clear-cuts; (6) in clear-cutting and in the gaps, the regeneration skill of saplings is hindered by the presence of concurrent woody species and higher browsing pressure.

Some results from the ecosystem condition assessment in the Hungarian MAES

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The EU Biodiversity Strategy 2020 required EU Member States to map and assess ecosystems, their condition and the status and economic value of the ecosystem services they provide. In Hungary this work has started in 2016 in the framework of the MAES-HU project. I would like to present some results of the ecosystem condition assessments of some major ecosystem types in Hungary.

We first defined different possible approaches of ecosystem condition. Then we shortlisted a series of ecosystem condition indicators based on literature and expert opinion of which national data were available. We created and mapped a series of different indicators - based entirely on existing databases. Finally we analysed the different patterns of the resulting indicator maps.

- there is a relationship between the condition of arable lands and soil quality but it is not linear, it's strength depends on soil quality
- the condition of wetlands affected their recognizability when creating the ecosystem type map, which serves as a basis of the ES assessments
- Hungarian forests are mostly plantations; however even the forests with natural tree species composition are have remarkable low values in terms of structure indicators

In terms of ecosystem condition, we have extensive information on a very small part of Hungary's area (usually the most valuable parts) whereas little is known about the rest of the country. This is a first attempt in Hungary to create countrywide condition maps so the results can be of interest to conservation policy.

