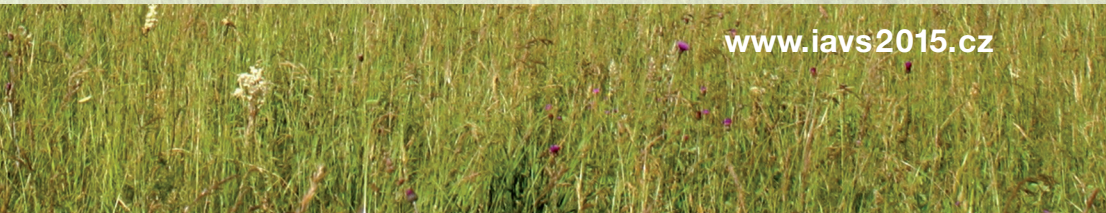
58th Annual Symposium of the International Association for Vegetation Science:

Understanding broad-scale vegetation patterns

19 – 24 July 2015, Brno, Czech Republic

Abstracts



www.iavs2015.cz

58th Annual Symposium of the International Association for Vegetation Science

Abstracts

muni PRESS

58th Annual Symposium of the International Association for Vegetation Science:

Understanding broad-scale vegetation patterns

19 – 24 July 2015, Brno, Czech Republic

Abstracts

Edited by
Milan Chytrý, David Zelený & Eva Hettenbergerová

Masaryk University, Brno, 2015

Local Organizing Committee

Milan Chytrý
Michal Hájek
Radim Hédl
Tomáš Herben
Eva Hettenbergerová
Soňa Hroudová
Jan Lepš
Zdeňka Lososová
Jan Roleček
Lubomír Tichý
David Zelený

IAVS Advisory Committee

Martin Diekmann (Germany) – IAVS President
Robert K. Peet (USA) – IAVS Vice President and Chair of the Publications Committee
Michael Palmer (USA) – IAVS Vice President and Chair of the Membership Committee
Javier Loidi (Spain) – IAVS Vice President and Chair of the Meetings Committee
Alicia Acosta (Italy) – IAVS Vice President
Valério Pillar (Brazil) – IAVS Vice President
Susan Wiser (New Zealand) – IAVS Secretary
Stefan Bradham (USA) – IAVS Administrator
Meelis Pärtel (Estonia) – Chair of the Chief Editors of the IAVS Journals
Alessandra Fidelis (Brazil) – Chair of the IAVS Global Sponsorship Committee
Joop H.J. Schaminée (The Netherlands) – Chair of the IAVS Awards Committee
Kerry Woods (USA) – Chair of the IAVS Ethics Committee
Ladislav Mucina (Australia) – Organizer of the IAVS Annual Symposium 2014
John Du Vall Hay (Brazil) – Organizer of the IAVS Annual Symposium 2016
Anne Bonis (France) – Organizer of the European Vegetation Survey Meeting 2015

Organized by

Vegetation Science Group and Mire Ecology Group
Department of Botany and Zoology
Masaryk University, Brno, Czech Republic
in cooperation with Ta-Service, Brno, Czech Republic

The abstracts were evaluated by

Alicia Acosta, Milan Chytrý, Michal Hájek, John Du Vall Hay, Radim Hédl, Tomáš Herben, Jan Lepš, Zdeňka Lososová, Ladislav Mucina, Michael Palmer, Meelis Pärtel, Lubomír Tichý & David Zelený

www.iavs2015.cz
www.sci.muni.cz/botany/vegsci/index.php?lang=en
www.sci.muni.cz/botany/mirecol/index.php?lang=en
www.ta-service.cz

ISBN 978-80-210-7860-4

Dedicated to the memory of J. Bastow Wilson (1944–2015)

Welcome to the Czech Republic!

It is my great honour and pleasure to host the 58th Annual Symposium of the International Association for Vegetation Science (IAVS). The IAVS is the world's leading scientific society of plant community ecologists and promotes research in all aspects of vegetation science and its application. It holds meetings and excursions, publishes scientific journals (Journal of Vegetation Science and Applied Vegetation Science) and provides other mechanisms to facilitate communication among vegetation scientists worldwide.

The Czech Republic, located in the heart of Europe, has a long tradition of vegetation research. Names such as Karel Domin, Jaromír Klika, Vladimír Krajina, Emil Hadač, Slavomil Hejný, Jaroslav Moravec and Robert Neuhäusl are well known for their landmark contributions to understanding vegetation patterns and processes in Europe and beyond. Czech vegetation scientists have also played an important role in shaping the IAVS as a scientific society and IAVS symposia in particular. From 1953 to 1981, the IAVS Annual Symposia were held in the German cities of Stolzenau and Rinteln, hosted by Professor Reinhold Tüxen. After he passed away in 1980, a new series of symposia began, held at a different venue every year. The first symposium of this new series was held in Prague in 1982, organised by Robert Neuhäusl and his colleagues from the Institute of Botany in Průhonice. The symposium topic was Chorological Phenomena in Plant Communities. The transformation process initiated in Prague resulted in the development of a new face of the IAVS as a truly global community of vegetation scientists focusing on a broad range of topics from community ecology theory to the application of vegetation science in nature management, conservation and restoration. This fundamental change was clearly evident at the second IAVS Symposium hosted in the Czech Republic, which was organised by Jan Lepš and Tomáš Herben at the University of South Bohemia, České Budějovice, in 1997.

Now the main annual event of the IAVS is returning to the Czech Republic for the third time, and I am pleased to host it in Brno, the home town of Johann Gregor Mendel, the founder of genetics, Georg Joseph Camellus, a 17th century botanist who gave his name to Camellia, and Leoš Janáček, a famous Czech composer. Today, Brno is the second largest city in the Czech Republic and the administrative, cultural and scientific centre of the South Moravian Region. Masaryk University in Brno, the second largest university in the country, has a strong tradition of teaching and research in natural sciences, including vegetation science as a highly successful field.

The Czech Republic is a small country. In spite of this, or perhaps because of this, many Czech ecologists are interested in broad-scale patterns and processes. Broad-scale phenomena were the focus of the Prague Symposium in 1982, and we are returning to this topic thirty-three years later to explore how our knowledge has improved over the last third of a century. Nevertheless, we will be looking primarily to the future: the Brno Symposium should provide us with new scientific ideas and opportunities to make new friends and establish exciting new collaboration in vegetation studies.

In addition to scientific sessions, we also want to use the IAVS Symposium to make you familiar with the vegetation, flora, nature and culture of the Czech Republic and Central Europe. We have prepared several excursions in the eastern part of the Czech Republic, a region on the boundary between the biomes of the European temperate deciduous forest and the Eastern European forest-steppe, and a post-symposium excursion to the Western Carpathians in Slovakia, where our Slovak colleagues will guide us across an altitudinal gradient from the Pannonian steppes in the foothills to the mountain summits. I am convinced you will enjoy both the scientific sessions and the field trips we have prepared!

Welcome to the Czech Republic and welcome to Brno, the world capital of vegetation science in 2015.

Milan Chytrý

Award lectures and keynote talks

Lavorel S.

Alexander von Humboldt Award lecture

On the track of the Holy Grail for plant functional ecology: from plant functional traits, to biotic interactions and to ecosystem functioning and services

Sandra Lavorel

Alpine Ecology Laboratory, CNRS – Grenoble – Alps University, Grenoble, France

sandra.lavorel@ujf-grenoble.fr

Linking global change impacts on biodiversity to changes in ecosystem functioning, and especially in biogeochemical cycling has stood as a Holy Grail for functional ecology for over two decades. Plant functional trait research was born to address this grand challenge.

First, there is now solid evidence that functional properties of vegetation such as community mean leaf nitrogen or fibre content or properties as simple as mean plant height control a series of processes involved in carbon and nitrogen cycling. Therefore, when environmental change modifies plant community composition as a result of plant response traits, these effects flow on to biogeochemical cycling. In 2002, we called this the response-effect framework.

Second, recent research has highlighted how plant functional traits impact biogeochemical cycling not only through plant-level processes, but also by driving interactions with other trophic levels including herbivores, soil detritivores and mineralising soil microbial communities. An audacious conceptualisation of these interactions extends the response-effect framework by portraying not only the effects of plant traits on abiotic processes, but also their effects on other biota they interact with. The consideration of not only plant traits, but also of the traits of these other organisms uncovers response – effect linkages across trophic levels. Such novel understanding increases our ability to predict biotic and biogeochemical changes along gradients of environmental change resulting from management, climate change or invasions.

Third, these insights provide a powerful means to incorporate our best ecological knowledge for quantifying ecosystem services and their variations in space and time. Trait-based models can hence be developed to map the distribution of provisioning and regulating services across landscapes, and offers great promises for scaling up to larger regions, especially by linking with remote sensing of vegetation spectral properties. Trait-based understanding of ecological trade-offs and synergies is also powerful to highlight the opportunities and limits for the provision of multiple ecosystem services, and to ground management in sound understanding of ecological constraints.

Fujiwara K.

Honorary Membership lecture

What situations in the world have drier forests?

Kazue Fujiwara

Graduate School in Nanobioscience, Yokohama City University, Yokohama, Japan

kazue@ynu.ac.jp

What types of forest are drier? There are many types of drier forest in the Northern Hemisphere, including warm-temperate deciduous forests and monsoon forests. These forests are unique regionally. In particular, warm-temperate deciduous forests (WTDF), especially deciduous *Quercus* forests, occur in Asia, Europe and eastern North America (Box & Fujiwara 2014). *Quercus* species differ in the WTDF, typical temperate forests (TTF) and cool-temperate forests (CTF) of different regions. WTDF are drier (on an annual basis) because winters are warmer than in temperate and cool-temperate forests; WTDF have colder winters than warm-temperate evergreen forests. Sometimes, however, the forest type is related to substrate, especially in Mediterranean areas and eastern North America. Values for the annual Moisture Index (MI = P/PET) are 0.7–1.9 for WTF in Asia, 1.0 (0.68)–1.45 in eastern North America and 0.66–1.35 in Europe. Asia has the widest range, from insular Japan to mainland China and Korea. Moisture Index values for WTDF are relatively lower than for TTF and CTF, and higher than for evergreen broad-leaved forests in Europe. Moisture Index values of WTDF in eastern North America are similar to values for warm-temperate evergreen broad-leaved forests in general. Similar tropical dry forest types include monsoon dry dipterocarp forests in Southeast Asia and dry tropical forests in Kenya. These forests are relatively simple but expand into evergreen broad-leaved forest areas as secondary forests. WTDF expand also, into typical-temperate areas as secondary forests after disturbance. Then the number of species increases in the tree and herb layers, especially in Asian forests. Another characteristic is that WTDF around lakes already show vegetation shifts under global warming. The lowest winter temperatures increase, permitting the germination and growth of evergreen broad-leaved species. This phenomenon was called “laurophyllization” (Kloetzli & Walther 1999) and can also be seen in Asia (Fujiwara & Box 1999; Fujiwara & Harada 2014), as well as in southern Europe. This is not seen at drier sites.

Díaz S.

Keynote talk

From Theophrastus to TRY: a plant functional trait journey

Sandra Díaz

Instituto Multidisciplinario de Biología Vegetal (CONICET-UNC) and FCEFyN, Universidad Nacional de Córdoba, Córdoba, Argentina

sdiaz@efn.uncor.edu

The past few years have witnessed an increasing interest in functional trait diversity (the kind, range, distribution and relative abundance of the functional traits of the organisms present in a system). This is because, being functional traits of organisms at the core of their responses to the environment and their effects on ecosystem properties, there is a hope that they could help understanding and predicting changes in the biota and their derived social benefits in the face of a rapidly changing environment. Accordingly, the plant functional trait research programme has expanded dramatically. But the quest for finding recurrent patterns of plant trait specialization is ancient, as is the tension between describing the intricate variety of plant form and function and searching for a small number of fundamental syndromes of adaptive specialization. The functional trait approach can serve these two approaches to plant diversity. The development of global-level communal databases and “big-data” tools now allows the empirical testing of some of their long-standing questions, as well as new questions that emerge from the growing interface between functional ecology, evolutionary biology and ecosystem science.

Huston M.A.

Keynote talk

Contributions of vegetation science to ecological theory: major concepts and misconceptions

Michael A. Huston

Department of Biology, Texas State University, San Marcos, TX, USA

hustonma@txstate.edu

Animal science often gets credit for inspiring the major concepts and theoretical models in ecology, and the importance of early laboratory experiments with microorganism and small insects should not be underestimated. However, the facts that most of the living biomass on the planet is in the form of plants, and that plants are much easier to capture and measure and re-measure than animals, has made vegetation science essential for developing and testing the relevance and operation of major ecological theories under the huge range of natural conditions across the surface of the earth. Classical competition theory, and the coexistence criteria used to predict species diversity, are based on the mathematical concept of equilibrium under constant or consistently varying conditions. Our understanding of plant succession, which was one of the first major contributions of vegetation science, demonstrates the irrelevance of competitive equilibrium to most of the patterns of life on Earth at any given time. The ability of vegetation scientists to measure plant properties and processes across the full range of natural conditions has led to a conclusion that contradicts the beliefs of many animal ecologists and ecologists in general: plant diversity is usually highest under unproductive conditions where plants can survive, but not thrive, and tends to be low under the most favorable conditions where plants grow rapidly. The strong co-evolutionary dynamic between plants and animals has the inevitable consequence that where plant diversity is high, the diversity of most types of animals is also high. While many of the early plant scientists and foresters who explored the tropics quickly perceived the limitations that cause most lowland tropical rainforests to have low net primary productivity, subsequent ecosystem scientists, perhaps biased by simplistic models, have promoted the opposite conclusion, namely that tropical rainforests have the highest productivity of any terrestrial ecosystem on the planet. Until this controversy is resolved, there can be little further progress toward developing an integrated theory of how environmental conditions influence ecological and evolutionary processes.

Rejmánek M.

Keynote talk

Impacts of plant invasions on ecosystems and biodiversity: What we know and what we want to know

Marcel Rejmánek

Department of Evolution and Ecology, University of California, Davis, USA

mrejmanek@ucdavis.edu

While there has been substantial progress in understanding plant attributes responsible for or, at least, correlated with successful reproduction and spread of invasive plant species, our ability to predict their impacts, or even measure their impact using standardized methods, is still very rudimentary. Several meta-analyses of published data on ecological impacts of invasive plant species have been published recently. In general, they conclude that many alien plants have a statistically significant negative effect on native plant abundance, fitness, and diversity. At least 80% of over 1000 field studies included in these meta-analyses were based on a "space-for-time-substitution" approach. However, without pre-invasion data from the invaded and non-invaded sites, conclusions may be misleading and one cannot conclusively determine whether non-native species really had a negative impact on diversity of native species. Although the time approach (comparisons of permanent plots in pre- and post-invasion situations) is apparently the only option for resolving the above limitations and serves the purpose of measuring the real impact of non-native species, it can nonetheless produce mistaken conclusions as well. Without data from equivalent non-invaded habitats in pre- and post-invasion situations, one may not estimate the direction of the effects of non-native species, nor their magnitudes. Competition experiments that are usually limited just to pairs of species represent one option. Responses to invaders in multispecies communities can be evaluated in invader addition experiments, invader removal experiments, and experiments where passive colonization of invader monocultures is analyzed. Preferably, in all situations multiple mechanisms of impacts of invasive species should be anticipated and systematically tested. Demographic matrix models are an increasingly standard method for quantitative evaluation of invader's impacts on endangered plant species.

Storch D.

Keynote talk

Do we understand spatial diversity patterns? The origin of universal laws in macroecology

David Storch

Center for Theoretical Study, Prague, Czech Republic; Department of Ecology, Faculty of Science, Charles University in Prague, Prague, Czech Republic

storch@cts.cuni.cz

Variation of biological diversity on Earth's surface has attracted the attention of ecologists for centuries. Species richness scales with area and various environmental variables, and while some of these patterns are well understood, other remain mysterious. I will show how spatial scaling of diversity (the species-area relationship) can be explained on the basis of relatively simple geometrical principles. However, similar principles cannot be easily applied on other macroecological scaling patterns, namely the increase of species richness with environmental productivity and temperature, which lies behind the most prominent biodiversity pattern, the latitudinal diversity gradient (LDG). Although current mainstream explanation of LDG is historical, I will argue that spatial diversity patterns are largely independent of history, and rather reflect different climate-related diversity limits. Several lines of evidence indicate the existence of such limits or equilibrium diversity states, but these limits do not seem to be given by simple amount of resources neither by total volume of niche space. Apparently, we need an equilibrium theory of diversity dynamics which would not be confined to island situation. I will show possible components of such a theory, potentially able to resolve many seemingly conflicting observations.

van der Maarel E.

Keynote talk

Species diversity, a personal retrospect

Eddy van der Maarel

Institute for Evolutionary Life Sciences, University of Groningen, The Netherlands

eddy.arteco@planet.nl

This essay attempts to follow the development of the concept of species diversity from the time before the concept was coined up to the present. The emphasis will be on plant species diversity, part of our core business in vegetation science. Some old and some partly newly found literature back to the 1830s will be included, notably of H.C. Watson, who also coined the the term floral diversity. An original table of Watson with species-area data is shown. Finally, the choice and subsequent use of diversity indices will be briefly discussed as to their usefulness for vegetation ecology. It has been an honour and pleasure to also summarize my own involvement in this theme, which spans almost exactly 50 years now.

The first modern notions of species diversity are linked to C.B. Williams. Among the many indices which have been developed during the 20th century the following have my preference:

1. The main species diversity index is species richness S on standardized areas including 1 m^2, 10 m^2 and 100 m^2 for small-scale analyses and 0.1 ha and 1 ha for larger-scale analyses. Ideally richness data for small plots should be extended by repeated inventories.

2. Species-area curves can be determined in a simple way and result in a species diversity index.

3. Dominance-diversity curves are a useful combined approach, particularly for temporal series.

4. The Simpson index is a good dominance index which can be used to indicate structural differences in space and time.

The use of species diversity indices in ecological research is briefly discussed with attention for Patterns in space and time, Disturbance and diversity, Diversity experiments, Diversity and ecosystem function, Diversity and species pool, Species diversity and nature conservation, From species diversity to biodiversity. Three figures from own hardly known research are shown: (1) Species-area relations from the Frisian Wadden Islands, (2) Distribution of species richness in relation to local height and pH, (3) Species-area relation for the entire flora of the Netherlands and the positions of species-rich nature reserves and island versus species-poor areas. This approach was successfully used in the struggle against the deterioration of the famous Voorne Dunes in the “Dutch Delta”.

Willis K.J.

Keynote talk

Palaeoecological insights on biodiversity as prerequisites for planning a “Green Economy”

Kathy J. Willis

Oxford Long-term Ecology Laboratory, University of Oxford, Oxford, United Kingdom; Royal Botanic Gardens, Kew, United Kingdom

kathy.willis@zoo.ox.ac.uk

Green economy is a word that has become much favoured by politicians, businesses and policy makers alike. It follows on from publication of the landmark works of the Millennium Ecosystem Assessment (2005) and The Economics of Ecosystems and Biodiversity (2010). The clearest definition of the term is probably that provided by UNEP where a green economy is described as “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (*http://www.unep.org/greeneconomy/aboutgei/whatisgei/tabid/29784/default.aspx*).
Inherent in this definition, is that a green economy is something that both enhances and benefits biodiversity, and conversely “nature” is a pre-requisite for good business. An increasing number of case studies support the notion that the goods and services provided by a biodiverse environment can offer better financial returns in the long-term that those to be gained by uncontrolled exploitation. However, what biodiversity do we actually need in order to map and understand a green economy? What datasets should we be using, for example, to assess the potential of biodiversity for maintaining a green economy despite climate or other perturbations (e.g. disease)? This talk will focus on the important role that palaeoecological records can play, spanning from decades to millennia to address these questions including assessing changes in ecosystem structure and function over time in response to external drivers of change – and their potential use in the determination of provision of ecosystem services and planning for a greener economy.

Wiser S.K.

Keynote talk

How can we meet “big data” aspirations in vegetation informatics?

Susan K. Wiser

Landcare Research, Lincoln, New Zealand
wisers@landcareresearch.co.nz

The availability of large vegetation-plot databases provides powerful capacity for addressing fundamental questions concerning plant community composition, diversity and distribution. The unprecedented geographic coverage has made possible global tests of allometric scaling theory and continental-scale analyses of plant range size, wood density, carbon storage and community assembly. At the 2003 symposium, IAVS held its first special session on databases and information systems and the Ecoinformatics working group was formed. Since then there has been a proliferation of vegetation-plot databases. Creation of the Global Index of Vegetation-Plot Databases has been a major achievement; it contains metadata on over 230 databases containing more than 3.5 million plots. There have been major achievements in collating diverse datasets into common platforms at continental, hemispheric and global scales including the VegBank project (North America), the European Vegetation Archive, the Botanical Information and Ecology Network (New World) and the sPlot initiative (global). Despite these efforts major barriers to the integration of vegetation plot data remain. The most significant are (1) the lack of standardised taxonomy, nomenclature and bad names; (2) lack of or inaccurate georeferences; (3) disparate storage formats for primary data and the lack of standardized database schemas; (4) uneven sampling across source datasets along temporal and geographic gradients creating multiple sources of error in synthetic data analyses. That the data-sharing landscape is changing rapidly generates new issues. There is no consensus of whether publications resulting from “Big Data” synthetic analyses should result in co-authorship for data contributors. Data accumulators are developing methods to include fine-scale authorship and attribution of the primary data sources they on-supply, but there may be no mechanisms to guarantee that data users include this attribution in publications. Many scientific journals now require data supporting publications to be made available. Few, however, either recognise the issues arising from use of data sourced from data accumulators or promote the use of repositories that store data in rigorous, standardised ways that facilitate reuse. Produces, users and accumulators of vegetation plot data all have a role to play in influencing and contributing to policies that ensure the best outcome for the ongoing “Big Data” developments in our field.

Oral presentations and posters

Abrahamyan A.

Poster with lightning talk D-01 (young scientist)

Wild medicinal plants' diversity impact on ecosystem functioning and stability in Armenia

Session: Vegetation science serving nature conservation

Armine Abrahamyan [1,*], Andreas Melikyan [2], Syuzanna Hovsepyan [2] & Arvids Barsevskis [3]

[1]Institute of Systematic Biology, Daugavpils University, Daugavpils, Latvia; [2]Plant Cultivation and Vegetable growing Department, Armenian National Agrarian University, Yerevan, Armenia; [3]Institute of Systematic Biology, Daugavpils University, Daugavpils, Latvia

* Presenting author: arm_abrahamyan@yahoo.com

This paper examines the wild medicinal plants' diversity dynamics and reflects on ecosystem functions and stability as well as on their interactions within and across broader ecological functions. It also explores their resilience to both natural changes and human impacts in Armenia. As one of the first countries to join the Convention on Biological Diversity (CBD), Armenia has a strong interest in assessing biodiversity within its native flora and identifying threats to the conservation of these species, particularly within the ecosystem. This paper reports the results of seven consecutive years of field studies conducted in Armenia in 2007–2014 to (1) identify abundance and diversity of wild medicinal plants across the different ecosystem types in Armenia, (2) observe the medicinal plants' diversity impact on ecosystem functioning and stability, (3) assess the current threats and resilience of ecosystems across the different regions of Armenia. The eco-geographic survey gathered and synthesized ecological, geographic and taxonomic information on the wild medicinal plants in accordance to Maxted et al. (1995) methodology. The quadrat sampling technique was used to identify key elements that determined species diversity and abundance. Species diversity and abundance were identified as crucial for the ecosystem properties and stability. The insurance and negative covariance effects due to higher diversity of medicinal plants were observed to increase the ecosystem stability and resilience. Ecosystems bearing higher diversity of species were mostly observed in the southern regions of Armenia. This research provides a baseline dataset that can be used to support biodiversity conservation and sustainable use of ecosystem in Armenia.

Adámek M.

Oral presentation

Long-term effect of wildfire on temperate Scots pine forests: vegetation dynamics and ecosystem resilience

Special session: Long-term perspectives on vegetation change

Martin Adámek [1,2,*] & Věroslava Hadincová [1]

[1]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [2]Department of Botany, Faculty of Science, Charles University, Prague, Czech Republic

* Presenting author: martin.adamek@ibot.cas.cz

In European context, the majority of studies on forest fire ecology come from the Mediterranean and Fennoscandian regions where fire is considered to be an integral part of forest dynamics. In temperate forests of the Central Europe, ecological role of fire has been largely neglected despite documented high fire frequency and occurrence of forests prone to fire. In our study, we focused on semi-natural *Pinus sylvestris* dominated forests of Central European sandstone regions resembling the boreo-continental pinewoods that are claimed to be fire-adapted. To assess forests fire adaptation, we studied forest ability to recover after the fire events. Specifically, we observed the long-term forest development at the plots affected by fire of different intensity to find out (i) the rate of forest recovery, (ii) forest development trajectory and (iii) whether and when the forests develop into the stands with structure and function similar to unburned stand. We also assessed ability of the tree species to survive the fire events. The forest vegetation development was observed by vegetation sampling of different post-fire succession stages and at unburned plots for the comparison. We recorded 102 fire plots of the successional age of 1–192 years and 55 unburned plots. We evaluated post-fire temporal species composition changes, differences in tree survival ability, compared successional trajectories under different fire intensities and compared the final development stages with the unburned plots of the same age. Our results revealed that fire affected the forest species composition mainly in early successional phases, but the effect of fire was still detectable even after several decades. It stimulated tree species regeneration and increased species diversity for several decades. However, after more than 100 years of the succession, the forest developed in the stand undistinguishable from the unburned vegetation. We conclude that Central European Scots pine forests are highly resilient to fire events as the succession on the burned plots results in the pine forests typical for the area. Considering the positive effect of wildfire on the tree species regeneration and overall biodiversity, the fire can be used as a management tool for ecological restoration also in the temperate pine-dominated forests.

Akbarlou M.

Poster with lightning talk P-01

Impact of topographic factors on the abundance of grasses in a semi-steppe (case study: north of Iran)

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Mousa Akbarlou [1,*], Fazeleh Mortazavi [1], Adel Sepehry [1] & Seid Ali Hosseini [2]

[1]Department of Rangeland Science, Goran University of Agricultural Sciences and Natural Resources, Gorgan, Iran; [2]Department of Agricultural and Natural Resources Research Center, Gorgan, Iran

* Presenting author: makbarlo@yahoo.com

Presence and distribution of plant communities in ecosystems is not random. Climate, soil, topographic and human factors have basic role in species distribution. Therefore, because of the key role of plants in ecosystem it is necessary to study relationships between plants and environmental factors. In this study effect of latitude factors on grasses abundant in dry grassland of the north of Iran were investigated. Chaharbagh Gorgan is located between latitude of 36°38'27" to 36°40'30"N and longitude 54°31'48" to 54°33'36"E. The elevation ranges between 2100–3150 m and the environment is a cold semi-steppe. The dominant plants are *Agropyron intermedium* Host, *Festuca ovina* L., *Bromus tomentellus* Boiss. and *Onobrychis cornuta* L. 36 study units were selected from a topographic map. Sampling points in the field were found by GPS. Canopy and species density was measured in 1 m^2 plots at full flowering stage of growth during summer 2014. Analysis of variance (one-way ANOVA) was done using a random design method with unequal replications. Statistical analysis shows that grass abundance was significantly different between the elevation levels ($P < 0.05$). The abundance of grasses depending on the topography of the area is different. Therefore the abundance of grasses increased with increasing altitude. Grasses were most abundant at 2400 to 2800 m a.s.l., on north-facing and west-facing slopes of 12–45%. Overgrazing and rangeland degradation can be a major cause of turbulence is the local ecosystems.

Alatar A.

Poster D-02

Taxonomy, distribution and ecology of two newly recorded genera in Saudi Arabia

Session: Vegetation science serving nature conservation

Abdulrahman Alatar [1,*], Jacob Thomas [1], Ahmed Alfarhan [1] & Mohamed A. El-Sheikh [1,2]

[1]Botany and Microbiology Department, College of Science, King Saud University, Riyadh, Saudi Arabia; [2]Botany Department, Faculty of Science, Damanhour University, Damanhour, Egypt

* Presenting author: aalatar@ksu.edu.sa

Countries in the Arabian Peninsula have undergone strenuous plant collections during the past two decades as part of enriching various herbaria in the region or producing and updating the flora of the region. Recent botanical explorations in the southwestern parts of Saudi Arabia have yielded some interesting specimens. Critical study of these specimens revealed that they belong to two genera previously not reported for the flora of Saudi Arabia. Descriptions and photographs of the newly reported taxa, *Galinsoga* Ruiz & Pavon and *Encelia* Adanson (*Asteraceae*), are provided for easy identification. A brief knowledge about the distribution and ecology of the two genera in Saudi Arabia is also provided.

Aleksanyan A.

Poster with lightning talk P-02 (young scientist)

Adaptation of EUNIS habitats classification for vegetation of Armenia (example of vegetation of deciduous arid woodlands of Armenia)

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Alla Aleksanyan

Department of Geo-botany and Ecological Physiology, Institute of Botany, National Academy of Sciences of Republic of Armenia, Yerevan, Armenia

alla.alexanyan@gmail.com

The problems of classification of vegetation are discussed and solved by phytosociologists for many decades. The complexity of this problem is caused by a low level of integration of plant communities and continuity of vegetation cover, as well as large differences in the composition and community structure of different types of vegetation. The disagreement on the classification of vegetation is even more amplified when trying to classify vegetation in mountain areas, like Armenia, where on small territory and amazing landscape, ecosystem and biological diversity is represented. All main ecosystems of the Caucasus (except humid subtropical) – deserts and semi-deserts, steppes, meadow-steppes, forests and woodlands, subalpine and alpine vegetation one can found here. As an initial step to combine the genetic classification and habitat classification EUNIS, as well as the adaptation and development of EUNIS habitats classification for conditions of Armenia, we selected deciduous arid woodlands of Armenia. The complexity of developing classification of plant communities in arid woodlands is caused by a wide range of life forms of plants within them, as well as by large differences in size of edificators of synusias – from large trees to small annual grasses. Based on the objectives of our work and agreeing with many researchers, we accept deciduous arid woodlands of Armenia as a separate type of vegetation. From all habitats of EUNIS classification deciduous arid woodlands of Armenia are included in group F (2004). In third level of hierarchy they belong to F5 (pseudomaquis – F5.3). We combined principles of EUNIS classification with phytosociological classification and based on descriptions of phytocenoses we have identified associations that unite in group of associations, and the last – in the formations. Separating these syntaxa we used environmental and phytosociological criteria. Since arid woodlands of Armenia are quite different from suitable small units in EUNIS classification, we have constructed a new scheme for arid woodlands as subunits of F5.3. These subunits coincide with the groups of associations of phytosociological classification. According to this classification, deciduous arid woodlands include 24 associations combined in 7 formations (*Pistacieta*, *Amygdaleta*, *Celtideta*, *Querceta*, *Ceraseta*, *Paliureta*, *Pyreta*).

Alonso M.Á.

Poster with lightning talk B-01

An approach to distribution patterns and ecology of saltcedar woodlands in the Iberian Peninsula (Spain)

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

María Ángeles Alonso *, Joaquín Moreno, Alejandro Terrones & Ana Juan

Department of Environmental Sciences and Natural Resources, University of Alicante, Alicante, Spain

* Presenting author: ma.alonso@ua.es

The aim of this study is to determine the distribution patterns and ecology of the Spanish saltcedar (*Tamarix* sp.) populations. Our purpose is to carry out a comparative study between different saltcedar populations throughout the Iberian Peninsula related to environmental gradients. Saltcedar woodlands are a complex formation that appears in watercourses, saltmarshes, wetlands, freshwater habitats and seasonal rivers with brackish water. These ecosystems undergo extreme changes in moisture and salinity during the year, which creates ecological soil gradients along these wetland landscapes. Due to the variability in saltcedar habitats, we analyzed different soils, climate seasonal changes and vegetation relationships. Ten populations were chosen throughout Spain. Three sampling populations were chosen at the central zone of Spain, within the Spanish National Park “Tablas de Daimiel”; three were picked at the surroundings of the National Park; and four were selected among different saltcedar woodlands near the coast of southeast Spain. In each population, a vegetation relevé was taken and three soil samples were collected. This fieldwork was repeated every three months during a year to cover the complete seasonal variation. The edaphic variables measured were moisture, electrical conductivity, pH, texture and field capacity. Our data were analyzed using multivariate analysis. We believe our research will generate information about distribution patterns and ecology of saltcedar woodlands, which will improve the management and conservation of *Tamarix* ecosystems in Spain.

Alvarado S.T.

Oral presentation

Tracking long-term fire disturbances on Brazilian savanna and mountain grasslands by remote sensing

Special session: Remote sensing for vegetation science

Swanni T. Alvarado [1,2,*], Thiago S.F. Silva [1] & L. Patricia C. Morellato [2]

[1]Departamento de Geografia, Ecosystem Dynamics Observatory, Instituto de Geociências e Ciências Exatas, UNESP – Universidade Estadual Paulista, Rio Claro, Brazil; [2]Departamento de Botânica, Phenology Laboratory, Instituto de Biociências, UNESP – Universidade Estadual Paulista, Rio Claro, Brazil

* Presenting author: swanni_ta@yahoo.es

The Brazilian Cerrado savanna domain holds some of the largest biodiversity in South America and includes vegetation ranging from grasslands to woodland and mountain grasslands (campos rupestres). Fire is a natural disturbance that affects Cerrado vegetation physiognomy and community assembly, directly influencing plant diversity. The Cerrado has faced dramatic changes in land use over the last decades, and human induced fire is one of the most significant threats. Therefore, studies about fire and its impact on the ecosystem are very important to understand vegetation dynamics and predict the trajectory of plant communities after its occurrence. We are currently reconstructing fire occurrence and frequency over Cerrado savanna and campos rupestres physiognomies in the Serra do Cipó National Park and enclosing Morro da Pedreira Environmental Protection Area (Minas Gerais, Southeastern Brazil) using remote sensing methods. The reconstruction is based on an extensive series of Landsat 5 TM, Landsat 7 ETM and Landsat 8 OLI imagery, used to produce maps of fire frequency and time elapsed since the last fire, for the period between 1984 and 2014. The Enhanced Vegetation Index (EVI) product, derived from the Terra/MODIS sensor, is being used to monitor plant dynamics and the rate of vegetation recovery after fire occurrence. Based on fire history, we will assess changes in plant biomass and phenological responses as a function of fire recurrence and time since the last fire, derived from the time series of EVI data using the TIMESAT algorithm. We found fire season to occur mainly between July and November, with a peak between September and October, corresponding to the transition between the end of the dry season and the start of the rainy season. In total, 74% of the protected area has been burned at least once. Out of that, 16% of the protected area was burned once, 34% was burned between two and four times, 21% between five and nine times, and 2.14% ten times or more. These differences in fire frequency should be taken into account to determine plant community responses to fire, as well as vegetation resilience. Phenology and biomass indexes are currently been processed for each of the different fire frequency classes. Our study will contribute to future predictions of vegetation recovery dynamics, and guide management practices and restoration strategies in this fire-prone landscapes, accelerating the recovery of vegetation degraded by frequent fires.

Alvarez M.

Poster with lightning talk O-01

Prosopis juliflora invasion in Kenya (East Africa): empty niche or opportunistic establishment?

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Miguel Alvarez [1,*], Gereon Heller [1], Kennedy Matheka [2], Itambo Malombe [2], Simon Choge [3] & Mathias Becker [1]

[1]INRES, Plant Nutrition, University of Bonn, Bonn, Germany; [2]East African Herbarium, National Museums of Kenya, Nairobi, Kenya; [3]Kenya Forestry Research Institute, Marigat, Kenya

* Presenting author: malvarez@uni-bonn.de

Prosopis juliflora is a woody species native from South America and has been introduced worldwide among the tropics and subtropics for afforestation purposes. As in the most of these cases, in Kenya *P. juliflora* became invasive, affecting pastoralist people by encroaching former pastures. In the plains located at the southern chores of Lake Baringo and in the northern of Lake Bogoria, a massive invasion of *Prosopis* has been observed since the 1990s. For the moment it is not clearly elucidated which factors promote the establishment and invasivity of *Prosopis* in Kenya. In order to investigate possible driving forces of *Prosopis* invasivity around Lake Baringo, we attempted to quantify the invasion degree in woody stands. In some 72 plots we assessed different structure parameters of *Prosopis* populations such as average height, abundance estimated as percentage cover (canopy cover) and distribution of *Prosopis* individuals among vegetation layers. In each plot we recorded all present vascular plant species and estimated their abundance. We also recorded ground variables such as cover of rocky outcrops, gravels and litter. By hierarchical clustering we determined four classes of stands ranging from non-invaded to strongly invaded plots. The absolute cover is clearly discriminating those four population classes and emerged as a stand-alone variable to quantify *Prosopis* invasivity. The degree of invasion by *Prosopis* is negatively correlated with the species diversity of stands suggesting its high competition ability. A low prevalence of *Prosopis* in places with shallow soils and high cover of rocky outcrops confirms the preference of this species for deep soils and soils with access to ground water table. Field observations of signs for strong soil erosion and literature review suggest an early degradation of the area after clear-cutting of former woods. This could be the main factor providing the opportunity for the establishment of *Prosopis* around Lake Baringo. Observations in neighbouring valleys suggest the occurrence of *Acacia tortilis* forests in the studied plains, which represents a riparian forest type forming gallery forest along rivers and in lake shores. We also discuss preliminary results on remote sensing of the defined invasivity classes and comparisons with other localities affected by this species in Kenya and Ethiopia.

Álvarez-Martínez J.M.

Oral presentation

Habitat mapping and ecological niche theory: from potential distributions of vegetation types to realized niches based on remote-sensing

Special session: Remote sensing for vegetation science

Jose Manuel Álvarez-Martínez [1,*], Borja Jiménez-Alfaro [2], Ana Silió-Calzada [1], María Recio [1], José Barquín [1], Bárbara Ondiviela [1] & Jose Antonio Juanes [1]

[1]Environmental Hydraulics Institute IH Cantabria, Parque Científico y Tecnológico de Cantabria, Santander, Spain; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: jm.alvarez@unican.es

European policies such as the Habitats Directive (92/43/EEC) aim to protect natural areas in the Natura 2000 network. Since the initial steps of implementation, habitat mapping for these areas has been linked to field-based vegetation surveys. Alternatively, landscape monitoring is addressed through Ecological Modelling (EM) techniques using GIS and Remote Sensing. These methods offer multiple advantages over traditional field mapping such as fast map production, insight into inaccessible terrain and repeatability of the mapping process in different scenarios, providing an opportunity for harmonizing Natura 2000 map legends throughout Europe. However, the majority of applications have been focused on vegetation physiognomy units such as forests, shrub and grass, more than identifying habitat types. Using as case study five Sites of Community Importance in the Cantabrian range, NW Spain, we propose an integrative approach to combine the information on traditional vegetation mapping with Ecological Modelling for assessing the real distribution of habitats over space and time. Using occurrence data from vegetation maps collected in nearby regions, we compute community distribution models to move from potential areas of occupancy based on niche theory to realized distributions of community assemblages based on Remote Sensing sources, such as multispectral imagery and 3D LiDAR data, coetaneous to occurrence records. Therefore, we take into account the limiting factors of each habitat type together with its current pattern of occupancy under human and biotic constrains, obtaining realized niches instead of potential distributions.

Andrade B.

Poster with lightning talk G-01

Abundances of life forms in grassland are mediated by soil chemical and physical features

Special session: Species and plant community responses along soil gradients

Bianca Andrade [1,*], Gerhard E. Overbeck [1,2], Monica Cadenazzi [3] & Ilsi Boldrini [1,2]

[1]Graduate Program in Botany, Federal University of Rio Grande do Sul, Porto Alegre, Brazil; [2]Department of Botany, Federal University of Rio Grande do Sul, Porto Alegre, Brazil; [3]Department of Statistics, University of the Republic, Montevideo, Uruguay

* Presenting author: andradebo@gmail.com

Extended grassland areas are found in Southeastern South America. In Brazil's Rio Grande do Sul state, grasslands structure varies in a northeast-southeast gradient coincident with variations in geology, climate and soil fertility, resulting in two types of grasslands: Highlands and Lowlands (Pampa). This has resulted in the hypothesis that soil fertility and water holding are crucial in explaining vegetation patterns. We collected soil samples and estimated cover of the plant community in six areas (three per region) with three plots per site and nine sample units (SU) per plot, in total 162 1-m^2 SU. Historical management is similar among areas within the same region. In order to compare floristically distinct sites, we grouped species into life forms. Our large sampling efforts allow us to discuss patterns found within the studied sites in each region. Pearson correlations and linear regressions were carried out to identify associations between soil and vegetation variables. The sites in the Highlands are located at high elevations, leading to high precipitation and high soil organic matter content. Thus, soils show low base content and high aluminium (Al) saturation. The grasslands are dominated by solitary evergreen tussocks (Te; 63 spp.; e.g. *Andropogon lateralis*, *Schizachyrium tenerum*) and evergreen forbs (37 spp.; e.g. *Sisyrinchium palmifolium*) in terms of species number and cover. In these areas, the different life forms show same relative abundance values in response to soil gradient, with exception of decumbent evergreen species (e.g. *Macroptilium prostatum*) which demand more resources and are more limited by Al than other life forms. The Pampa sites face summer periods of low rain and high temperatures. They show higher soil pH and base saturation than Highland sites. The vegetation is dominated by Te (51 spp.; e.g. *Piptochaetium montevidensis*) and rhizomatous evergreens (Rh; 5 spp.; e.g. *Paspalum notatum*). Higher correlation between soil factors and life form abundances were found, indicating more divergent plant strategies. We found clear correlations between soil features and abundance of life forms, such as a relation of evergreen forbs and Te to good availability of water and nutrients, of subshrubs (e.g. *Baccharis crispa*) to high Al content, and of Rh to low-nutrient situations. The absence of common patterns in both regions is probably due to the different environmental and historical conditions that affect the plant-soil relationship.

Asadi H.

Poster with lightning talk P-03 (young scientist)

Total Phi Fidelity Index (TPFI) as a new algorithm in plant community analysis

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Omid Esmailzadeh & Hamed Asadi *

Department of Forest Ecology, Faculty of Natural Resources, Tarbiat Modares University, Tehran, Iran

* Presenting author: h_asadi@modares.ac.ir

The aim of this study is to determine diagnostic species of plant communities of Khybus protected forest based on statistical analysis of phytosociological data. The affinity of vascular plants for six vegetation types was calculated using a statistically defined coefficient of fidelity. Additionally, we used Total Phi Fidelity Index (TPFI) for reassignment of relevés to the groups which works based on the Phi fidelity values and species cover as a new criterion in fidelity assessment. Each relevé was assigned to a particular group which had the higher TPFI. Also, sharpness and uniqueness indices were used to evaluate and compare new groups. We determined 33 diagnostic species based on Φ coefficient in plant communities without box tree (*Buxus hyrcana* Pojark.) in which the contribution of herbaceous species were 76.7% (22 species) and the contribution of woody species were 33.3% (11 species), while in the list of diagnostic species in the box tree plant communities (with 7 species) the herbaceous species were never presented. Conformity and correlation between TPFI and TWINSPAN methods were 78.9% (Kappa index) and 93.5% (Spearman correlation). Also, quality assessment of TPFI and TWINSPAN results based on sharpness and uniqueness showed that the mean values of these two indices in the vegetation units provided by the TPFI method (Sh = 33.76, U = 88.74) are consistently higher than in the plant communities provided by TWINSPAN (Sh = 29.98, U = 71.51). Overall, we conclude that the TPFI method can be used as a new approach to improve TWINSPAN results in plant community classification.

Attorre F.

Poster with lightning talk D-03

Investigating the effect of selective logging on biodiversity and structure of the tropical forests of Papua New Guinea

Session: Vegetation science serving nature conservation

Fabio Attorre [1,*], Riccardo Testolin [2], Simon Saulei [3], Alessio Farcomeni [1], Giorgio Grussu [2], Cossey Yosi [3] & Michele De Sanctis [1]

[1]Department of Environmental Biology, Sapienza University of Rome, Roma, Italy; [2]Food and Agriculture Organization of the United Nations, Roma, Italy; [3]Papua New Guinea Forest Research Institute, Lae, Morobe Province, Papua New Guinea

* Presenting author: fabio.attorre@uniroma1.it

Questions: Is selective logging responsible for changes in biodiversity and structure of the tropical forests of Papua New Guinea (PNG)? Do these forests recover in the years following logging?

Location: 101 one-hectare permanent sample plots (PSPs) belonging to two lowland forest types (low altitude forest on plains and fans – type P, and low altitude forest on uplands – type H) widely distributed throughout PNG.

Methods: Significant differences in taxonomical composition between plots of different vegetation types and disturbance regimes were tested using multivariate techniques, identifying the tree taxa to which these differences could be ascribed. ANOVA was used to test for differences between logged-over and primary forest PSPs with respect to biodiversity (richness, Shannon diversity, Pielou's evenness) and stand structure (stem density, basal area). Temporal trends forest features were analyzed using linear regression.

Results: Significant differences were found between plots of the two forest types ($p = 0.01$) and the two disturbance regimes ($p = 0.01$), although only unlogged and logged-over forests of the H type showed a significant difference ($p = 0.04$). No significant differences were found in richness, diversity and evenness between logged-over and unlogged forest plots, while stem density was higher in the latter (421 ± 153 stems/ha). Greater basal area was found in unlogged forests (30.28 ± 4.45 m^2/ha) of the H type when compared to logged-over ones (15.52 ± 4.04 m^2/ha). We detected positive trends in richness (0.55 ± 0.19 taxa/(ha.year)) and diversity after logging. Furthermore, H type forest exhibited positive trends in stem density (9 ± 1 stems/(ha.year)) and basal area (0.42 ± 0.06 m^2/(ha.year)) with elapsed time since harvesting.

Discussion: Our analysis highlighted some significant effects of logging activities on biodiversity and structure of PNG forests. Moreover, forests exhibited a significant recovery with respect to richness, diversity and stand structure. These preliminary results will be compared with data collected by the forthcoming National Forest Inventory in order to assess and monitor the effects of human activities and ecological factors on PNG forests biodiversity and elaborate appropriate conservation and management strategies for their sustainable use.

Auffret A.G.

Oral presentation

Functional connectivity for vegetation scientists

Alistair G. Auffret [1,*], James M. Bullock [2], Danny A.P. Hooftman [2], Robin J. Pakeman [3], Yessica Rico [4], Merel B. Soons [5], Alberto Suárez-Esteban [6], Anna Traveset [7], Helene H. Wagner [8] & Sara A.O. Cousins [1]

[1]Stockholm University, Stockholm, Sweden; [2]NERC Centre for Ecology and Hydrology, Wallingford, United Kingdom; [3]James Hutton Institute, Aberdeen, United Kingdom; [4]Royal Ontario Museum, Toronto, Canada; [5]Utrecht University, Utrecht, The Netherlands; [6]University of Alberta, Edmonton, Canada; [7]Mediterranean Institute of Advanced Studies, Esporles, Balearic Islands, Spain; [8]University of Toronto, Toronto, Canada

* Presenting author: alistair.auffret@natgeo.su.se

Understanding how organisms respond to the threats of habitat destruction and climate change remains a vitally important topic in ecology and evolution. By addressing both the spatial configuration of suitable habitat and presumed dispersal ability, the concept of connectivity has been extremely popular with researchers investigating the spatial structure of populations, and is used to guide management decisions at a range of spatial scales. The realized movement of species in space is known as functional connectivity, traditionally defined as an organism's behavioral response to (changes in) the physical landscape. This definition was originally developed for animals and is difficult to apply to plants, which are mostly sessile and cannot selectively disperse to different areas of the landscape. As is common in academia, the lack of a clear definition of this concept has led to confusion and dispute in the literature. For plants, connectivity can occur through the biotic or abiotic movement of seeds or pollen in space, but in contrast to how the term is traditionally defined, functional connectivity for plants can be affected by factors both dependent on and independent of landscape structure. In keeping with the traditional definition, biotic seed and pollen dispersal can be affected by the spatial configuration of habitat within a landscape and the behavior of animal dispersers within that landscape. However, fluctuations in disperser populations, the direct transportation of animals across the landscape and the introduction of invasive species can also affect dispersal, and as a result functional connectivity. Landscape structure can also affect abiotic dispersal, and at longer time-scales, changes in wind speeds are expected to affect dispersal independent of landscape change. Vegetation science requires an accurate definition of functional connectivity for plants. We hope that this will help to improve understanding of plant responses to environmental change, and that considering the different aspects and stages of plant functional connectivity will result in successful conservation strategies at landscape and regional scales.

Bagaria G.

Oral presentation (young scientist)

Extinction debt and colonization credit coexist in a forestation gradient on Mediterranean grasslands

Guillem Bagaria [1,2,*], Aveliina Helm [3], Ferran Rodà [1,2] & Joan Pino [1,2]

[1]CREAF, Cerdanyola del Vallès, Spain; [2]Universitat Autònoma de Barcelona, Cerdanyola del Vallès, Spain; [3]Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: g.bagaria@creaf.uab.cat

Habitat loss, fragmentation and transformation are expected to cause both species extinctions and colonizations. Small and isolated habitats usually result in the decline or local extinction of species, while the formation of new habitat types creates opportunities for colonization of other species. But since processes involved in both species extinction and colonization are numerous and sometimes they are slow, time lags of several decades have been identified. However, the magnitude of extinction debts and colonization credits coexisting along ecological succession and their causes remain largely unknown. We explored time lags in extinction and colonization of grassland and forest specialist plants, respectively, and the local and landscape drivers of richness change in a 50-year forest encroachment process into semi-natural Mediterranean calcareous grasslands. A set of sampling plots of persistent grasslands and forests and their transitional habitat (wooded grasslands) were selected within fixed-area sites distributed across the landscape. Both extinction debt and colonization credit of more than 50% were identified in wooded grasslands, indicating that the extinction of more than half of the grassland species and the colonization of a number of forest species higher than the half of those already present in wooded grasslands are expected, despite wooded grasslands and persistent forests having similar tree cover. Light availability and soil pH were the main drivers of grassland specialists' richness, suggesting that habitat deterioration could have already caused local extinctions. In addition, extinction debt in transient habitats was enhanced by a rescue effect from surrounding grasslands, which may act as propagule sources. On the other hand, forest specialists' richness was enhanced by shadow, which might facilitate the establishment of new forest species. Moreover, a historical connectivity effect suggests that colonization credit is maintained by dispersal limitation and the lack of seed sources of young forests. After more than 50 years of habitat change, extinction debt and colonization credit still coexist, being contrastingly affected by local and landscape factors. These findings highlight the importance of documenting biodiversity time lags following habitat change for both the species of the former and the new habitat, in order to timely and adequately manage habitats of high conservation value as the studied grasslands.

Baggio R.

Poster B-02

Changes in community assembly over different patches and effects of grazing system

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Rodrigo Baggio * & Valério D. Pillar

Department of Ecology and Graduate Program in Ecology, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

* Presenting author: meinkebaggio@gmail.com

Identifying the mechanisms generating species richness and relative abundances within communities remains a central question in ecology. In grassland, the effects of grazing on plant communities will likely have complex interactions with site factors determining productivity and species composition, and with the behaviour of grazing animals. In this work we studied native grassland that has been managed under moderate grazing with free-range cattle, which created heterogeneity in community structure, with some patches more intensively grazed than others. The latter are characterized by the development of the thorny *Eryngium horridum*. Further, heterogeneity in community structure is linked to site elevation (permanently flooded, temporarily wet and dry areas). Here we ask how species composition and diversity is related to the dominance of *E. horridum*. The study area has 165 ha and is located in a subtropical native grassland (Campos), south Brazil, 31°39'9.8"S, 54°9'59.9"W. We sampled 254 plots of 1.6 × 0.2 m, which were systematically marked on a grid with nodes at each 70 m. Each plot was divided into eight contiguous subplots where we recorded the presence of vascular plant species. We compared the larger plots in terms of species frequency, richness and diversity in relation to site elevation and dominance of *E. horridum*. For this we applied analysis of variance and regression combined with permutation testing, and to further analyse community composition we used PCoA based on chord distances. We found significant differences in species richness between flooded (17.8) and dry (31.1) or temporarily wet areas (29.8 species), and between those with (20.1) or without (23.2) the presence of *E. horridum* on dry patches.

Bang J.H.

Poster F-01 (young scientist)

Effects of burrowing activity of crabs on soil environment in the halophyte *Suaeda japonica*

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Jeong Hwan Bang * & Eun Ju Lee

School of Biological Sciences, Seoul National University, Seoul, Korea

* Presenting author: hwany0909@gmail.com

Siheung wetland is a unique tidal mudflat region covered twice a day by the West Sea's high tides. It makes various halophytes widely distributed throughout several regions of mudflat area in Korea. This wetland was already declared the national wetland reserve in 2012 because of its importance as habitat for various aquatic organisms including endangered species. Despite the important ecological role of mudflat in Korea, very limited research is conducted in this region. We investigated the soil environmental characteristics of *Suaeda japonica* habitats dominated by crabs of the families *Ocypodidae* and *Grapsidae*. The objective of this study was to examine the relationships between burrowing activity of crabs and soil environmental factors in *S. japonica*. We established 0.5 × 0.5 m plots in *S. japonica* population and measured density and height during the growing season in 2014. To elucidate the effect of crabs, soil samples were collected from three treatment sites: burrowing soil, burrowing soil in plant and control (without burrowing soil). Soil water content (WC) and organic matter (OM) were significantly higher in the burrowing soil compared to control soil ($p < 0.01$). The electric conductivity increased significantly as the pH was decreased in the burrowing soil compared to the control ($p < 0.01$). There were significant differences in soil carbon content for all treatment sites, while soil nitrogen content differed significantly between burrowing and burrowing soil with plant ($p < 0.01$). These results indicate that soil carbon and nitrogen content are related to growth and productivity of *S. japonica*. No significant differences were observed for phosphate and nitrogen content in borrowing soil. Overall, this study shows that burrowing activity is an important process in *S. japonica* population in Siheung wetland, Korea. It appears that burrowing by crab changes soil physical and chemical properties that may influence *S. japonica*. Our study could be used as a method to understand the occupational strategy of *S. japonica* population under the bio-disturbance conditions and to seek a management strategy for conservation and restoration of the *S. japonica* habitat.

Bartha S.

Poster C-01

Relationship between diversity components in dry grasslands

Session: Patterns and drivers of alpha and beta diversity in plant communities

Sándor Bartha [1,*], Sándor Csete [2], Ladislav Mucina [3], Eszter Ruprecht [4], Klára Virágh [1], András Horváth [1], Anna Szabó [4], Judit Házi [1], Zita Zimmermann [1], Gábor Szabó [1], András Kun [5] & Zsolt Molnár [1]

[1]Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary; [2]Institute of Botany and Nature Conservation, University of West Hungary, Sopron, Hungary; [3]School of Plant Biology, The University of Western Australia, Crawley, Australia; [4]Hungarian Department of Biology and Ecology, Babeș-Bolyai University, Cluj Napoca, Romania; [5]Kolostor str. 2. 1/C, Budapest, Hungary

* Presenting author: bartha.sandor@okologia.mta.hu

Fine scale diversity patterns are important indicators of grassland dynamics. Short-term consequences of land use changes or climate extremities appear at very fine spatial scales. However, little is known about patterns at these scales, because most grassland databases contain plots larger than 1 m^2. We developed a sampling protocol (with high spatial resolution and relatively large spatial extent: 52 m long transects of 1040 contagious 5 × 5 cm microquadrats were sampled in each stand). 54 stands representing high quality meadow steppes, dolomite rock grasslands, sand and salt steppes were sampled in Hungary, Romania and Slovakia. Correlations between alpha, beta and gamma diversities were analysed. Beta diversity (within-stand compositional variability) was expressed as the number and diversity of realized species combinations estimated at multiple scales. The maximum of beta diversity and the related spatial scale were accepted as characteristic parameters of the vegetation pattern. Steppe meadows had the highest diversity, while the lowest values were detected in sand steppes. The maximum beta diversities appeared at very fine spatial scales mostly between 0.1 m and 1 m. There was an overall positive correlation between diversity components. For disentangling diversity components communities were subdivided into dominant and subordinate species and beta diversity of dominant species was tested against alpha diversity of subordinate species. The correlations found suggest that fine-scale structural complexity (beta diversity) of dominant species is important in meadow steppes and sand steppes for maintaining diversity of the subordinate species. We demonstrated that beta diversity of dominant matrix species is a sensitive indicator of potential future increase of alpha and gamma diversity in properly managed grasslands.

Bede-Fazekas Á.

Poster H-01 (young scientist)

Development of fine-scale ecological database for the National Adaptation Geoinformatic System (NAGIS), Hungary

Session: Data sources for broad-scale vegetation studies

Ákos Bede-Fazekas [1,2,*], Bálint Czúcz [3] & Imelda Somodi [3]

[1]National Adaptation Centre, Geological and Geophysical Institute of Hungary, Budapest, Hungary; [2]Department of Garden and Open Space Design, Corvinus University of Budapest, Budapest, Hungary; [3]Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary

* Presenting author: bfakos@gmail.com

National Adaptation Geoinformatic System (NAGIS) is a Hungarian GIS-based Decision Support System (DSS) under development. NAGIS will serve as data hub for structured information about the changing climate, its sectoral impacts and the associated hazards in Hungary, as well as the possibilities of adaptation to these. The potential future natural vegetation (PFV) of Hungary will be one of the first major data layers of NAGIS. PFV needs fine-scale input data that have strong predictive power. At present, such data are not freely available or do not exist in a well documented and homogeneous format for the Hungarian domain: data are typically obtained at a too coarse (i.e. about 25 km, e.g. in case of climate) or a too fine resolution (i.e. about 100 m, e.g. in case of topography). Modeling PFV requires three independent databases. One of them includes the response variables, e.g. presence/absence data of different habitats. The other two contain the environmental variables (predictors) of the observed "current" (i.e. of the reference period) and the predicted future data. All of these three databases are developed in a horizontal resolution of about 300 m. The grid is based on the hexagonal grid system of the GIS Database of the Hungarian Habitats (MÉTA). All "current" and future predictors used for PFV modeling (climatic, edaphic, topographical, hydrogeological, and hydrological raw and derived variables) should be presented in a homogeneous system. The NAGIS framework currently developed hosts physical predictions/scenarios for two major groups of predictors (climate and ground water table), whereas other predictors are assumed to be constant in time. The future climatic variables are obtained from two regional climate models (ALADIN and RegCM). After bias correction, these are going to be downscaled with regression kriging using geographical data as predictors. The climatic database will contain monthly mean, minimum and maximum temperature, precipitation sum, and derived moisture and bioclimatic predictors, averaged for 30-years periods. The data structure of NAGIS enables modelers to deal with the research questions directly (e.g. development of detailed models and evaluating the results), rather than being absorbed in data obtaining, preprocessing, and arranging. The datasets presented here will not only be useful for ecologists, but also scientists in a broad range of other disciplines, including foresters, agriculturists, and landscape architects.

Bennett J.A.

Oral presentation (young scientist)

Using traits to predict establishment: the importance of absent species

Special session: The relevance of “dark diversity” for theoretical and applied ecology

Jonathan A. Bennett * & Meelis Pärtel

Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: jon.a.bennett@gmail.com

Establishment of new species into existing communities is fundamental to ecology, affecting multiple processes including invasion and succession. Consequently, predicting which species will be able to establish is a primary goal of both basic and applied ecology. However, the factors influencing establishment are complex, depending on environmental suitability and the many biotic interactions within communities. Comparison of trait dissimilarity between establishing species and the resident community can potentially help understand differential establishment among species, yet environmental and biotic processes can have contrasting patterns on trait patterns within communities, potentially obscuring any signal. Moreover, such approaches cannot define the range of trait values that lead to establishment without extensive data on successful and failed attempts at establishment, reducing their predictive power. However, the traits of species found within the region but absent from the community can be compared with observed species to model how trait dissimilarity relates to establishment. Additionally, classifying absent species into those that can colonize the habitat (dark diversity) and those that cannot, can help separate the conflicting effects of the environment and biotic interactions on trait structure. We tested this framework in calcareous Estonian grasslands using data from two published experiments where seed of 21 species were added to two adjacent sites. To predict environmental filtering, we modeled differences in the trait distributions between the regional species list and the habitat-specific species pool for seven individual traits. Using these same traits, we compared the trait distributions between observed and dark diversity to model biotic interactions. Using these comparisons in a logistic modelling framework, we developed predictions of which trait states should lead to successful establishment. Comparing our predictions to the actual establishment from added seed, we were able to predict the majority of the variation in seedling establishment both between sites and among species within site. However, the accuracy of these predictions depended on understanding relative seed viability among species, reinforcing the importance of quantifying potential dispersal limitation when predicting species establishment.

Berg C.

Poster with lightning talk N-01

The application of eHOF-models to the investigation of regional global warming effects on vegetation

Session: Vegetation in macroecological modelling

Christian Berg * & Barbara Wurm

Institute of Plant Science, University of Graz, Graz, Austria

* Presenting author: christian.berg@uni-graz.at

In the Styrian alpine foreland (SE Austria), the rapid spread of alien thermophilous weeds including *Abutilon theophrasti*, *Cyperus esculentus*, *Nicandra physalodes*, *Panicum dichotomiflorum*, *Setaria faberi* and *Sorghum halepense*, has been detected. The area is known for an exceptionally dramatic rise in temperature during the past century. Temperature rise of 1.19 K over the year and 1.49 K over the summer (global: 0.7 K) have been recorded and further increases have been predicted. Our research has addressed the following questions: to what extent does the regional distribution of short-living ruderal and segetal communities correspond with current temperature data, what temperature values have the greatest impact on the regional distribution of short-living ruderal and segetal communities, and can the spatial development of those communities be predicted? We sampled more than 400 vegetation plots of 6 m² using the to the abundance-dominance estimation method along a temperature gradient at altitudes between 220 to 1440 m. The plots were classified into phytosociological units. We calculated the unweighted mean temperature indicator value (Ellenberg) for each plot. We stratified the dataset using tests for normal distribution and spatial autocorrelation. We checked correlations between the mean temperature indicator values of different data subsets with temperature measurement data (annual average, monthly values, growing season, winter, spring and summer season). We calculated community temperature optima (averaged and weighted minima and maxima of the community) using eHOF-models for the characteristic species of each community. For the summarized community value, we introduced an extension value according to the ratio of the number of species without unimodal response to the number of species with unimodal response. The optimum temperature data specific to each of the studied plant communities was transferred into a GIS temperature raster map. Current optimum temperature maps provide the current potential distribution area of the communities, and maps of predicted temperature scenarios provide maps of the communities’ shifts within their respective areas of distribution. Our research indicates that the combination of eHOF species response curves of plant communities with GIS temperature raster maps provides an easily applicable, powerful method of data generation in the investigation of regional effects of global warming on vegetation.

Bernhardt-Römermann M.

Oral presentation

Drivers of temporal changes in temperate forest plant diversity vary across spatial scales

Special session: Global change and vegetation dynamics: the use of historical data sets

Markus Bernhardt-Römermann [1,*], Lander Baeten [2,3], Dylan Craven [4,5], Pieter De Frenne [2], Radim Hédl [6,7], Jonathan Lenoir [8], Didier Bert [9,10], Jörg Brunet [11], Markéta Chudomelová [6,12], Guillaume Decocq [8], Hartmut Dierschke [13], Thomas Dirnböck [14], Inken Dörfler [15], Thilo Heinken [16], Martin Hermy [17], Patrick Hommel [18], Bogdan Jaroszewicz [19], Andrzej Keczyński [20], Daniel L. Kelly [21], Keith J. Kirby [22], Martin Kopecký [6], Martin Macek [23], František Máliš [6,24,25], Michael Mirtl [14], Fraser J.G. Mitchell [21], Tobias Naaf [26], Miles Newman [21], George Peterken [27], Petr Petřík [23], Wolfgang Schmidt [28], Tibor Standovár [29], Zoltán Tóth [29], Hans Van Calster [30], Gorik Verstraeten [2], Jozef Vladovič [25], Ondřej Vild [6,12], Monika Wulf [26,31] & Kris Verheyen [2]

[1]Institute of Ecology, Friedrich-Schiller University Jena, Jena, Germany; [2]Forest & Nature Lab, Ghent University, Gontrode-Melle, Belgium; [3]Department of Biology, Terrestrial Ecology Unit, Ghent University, Ghent, Belgium; [4]German Centre for Integrative Biodiversity Research (iDiv), Synthesis Centre for Biodiversity Sciences (sDiv), Halle-Jena-Leipzig, Leipzig, Germany; [5]Institute for Biology, University of Leipzig, Leipzig, Germany; [6]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [7]Department of Botany, Faculty of Science, Palacký University Olomouc, Olomouc, Czech Republic; [8]Ecologie et Dynamique des Systèmes Anthropisés (EDYSAN, FRE 3498 CNRS – UPJV), Jules Verne University of Picardie, Amiens, France; [9]INRA, UMR 1202 BIOGECO, Cestas, France; [10]Université de Bordeaux, UMR1202 BIOGECO, Pessac, France; [11]Southern Swedish Forest Research Centre, Swedish University of Agricultural Sciences, Alnarp, Sweden; [12] Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [13]Department of Vegetation and Phytodiversity Analysis, Albrecht-von-Haller-Institute for Plant Sciences, Georg-August University Göttingen, Göttingen, Germany; [14]Ecosystem Research & Environmental Information Management, Environment Agency Austria, Wien, Austria; [15]Department of Ecology and Ecosystem management, Technische Universität München, Freising, Germany; [16]Biodiversity Research/ Systematic Botany, Institute of Biochemistry and Biology, University of Potsdam, Potsdam, Germany; [17]Department of Earth & Environmental Sciences, Division of Forest, Nature and Landscape, Katholieke Universiteit Leuven, Leuven, Belgium; [18]Alterra Research Institute, Wageningen UR, The Netherlands; [19]University of Warsaw, Faculty of Biology, Białowieża Geobotanical Station, Białowieża, Poland; [20]Białowieża National Park, Białowieża, Poland; [21]Botany Department and Trinity Centre for Biodiversity Research, School of Natural Sciences, Trinity College Dublin, the University of Dublin, Dublin, Ireland; [22]Department of Plant Sciences, University of Oxford, Oxford, United Kingdom; [23]Department of GIS and Remote Sensing, Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [24]Faculty of Forestry, Technical University in Zvolen, Zvolen, Slovakia; [25]Forest Research Institute Zvolen, National Forest Centre, Zvolen, Slovakia; [26]Institute of Land Use Systems, Leibniz Centre for Agricultural Landscape Research (ZALF), Müncheberg, Germany; [27]Beechwood House, St. Briavels Common, Lydney, United Kingdom; [28]Department Silviculture and Forest Ecology of the Temperate Zones, Burckhardt-Institute, Georg-August University Göttingen, Göttingen, Germany; [29]Department of Plant Systematics, Ecology and Theoretical Biology, Institute of Biology, L. Eötvös University, Budapest, Hungary; [30]Research Institute for Nature and Forest, Brussels, Belgium; [31]Institute of Biochemistry and Biology, University of Potsdam, Potsdam, Germany

* Presenting author: markus.bernhardt@uni-jena.de

Global biodiversity is affected by manifold drivers, yet the extent to which environmental changes contribute to changes in local diversity is poorly understood. We investigated biodiversity changes in a meta-analysis of 39 European re-survey studies in temperate forests (3988 relevés in total, 17–75 years between the two surveys) by assessing the importance of coarse-resolution (i.e. among-sites) and fine-resolution (i.e. within-sites) environmental differences, and also the importance of changing environmental conditions between surveys. We contribute to clarifying the mechanisms underlying the direction and magnitude of local-scale biodiversity changes. While not detecting any net diversity loss, we observed considerable among-site variation, partly explained by temporal changes in light availability (a local driver) and game density (a regional driver). Furthermore, strong evidence was found that pre-survey levels of nitrogen deposition determined subsequent diversity changes. We conclude that models forecasting future biodiversity changes should consider coarse-resolution environmental changes, account for differences in baseline environmental conditions and for local changes in fine-resolution environmental conditions.

Bhardwaj A.

Poster with lightning talk D-04 (young scientist)

Spatial and temporal pattern of vegetation of *Podophyllum hexandrum* in Trans-Himalayan Ladakh region of India

Session: Vegetation science serving nature conservation

Ashwani Bhardwaj *, Sahil Kapoor, Pushpender Bhardwaj, Tsering Stobdan, Bhuvnesh Kumar & Om P. Chaurasia

Defence Institute of High Altitude Research, Defence R & D Organization, Leh-Ladakh, India

* Presenting author: ashwanibhardwaj67@gmail.com

This study intended to describe the associated vegetation of *Podophyllum hexandrum* and to identify important climatic variables responsible for species distribution in the Ladakh region for the first time. Twenty quadrats from each site were drawn in a random manner and vegetation was measured accordingly. Voucher specimens for each plant were collected for proper identification. This study was also supported by climatic data for identifying appropriate measures of vegetation of this endangered medicinal plant. Results showed that 19 species belonging to 14 families were encountered and that 46 individuals/site of *P. hexandrum* were present in our surveyed area with low density i.e., 3.34 ind/m^2. When compared with the past records and observable grazing pressure, our study sites fall within the category of unprotected area. The dominant vegetation of this surveyed area is grassland of *Catabrasa aquatica*. Principal component analysis (PCA) was used to identify the variation between vegetation and climatic data. PCA, a technique which reduces the dimensionality of multivariate data by removing inter-correlations among variables, has a number of useful applications in vegetation studies. The results showed significant relationships of vegetation and climatic factors with PC axes. The better conservation of natural resources can be well achieved through promotion of community-based conservation stressing in situ conservation through the establishment of nature reserves and ex situ conservation through tissue culture, developing cultivation technologies and nurseries and conducting regular trainins on the procedure of this plant collection, and involving the end users such as the local people, traders and stake holders.

Bhatta K.P.

Oral presentation (young scientist)

Changes in species composition after two decades of temperature increase and canopy closure of temperate oak-laurel forest in central Himalaya

Special session: Global change and vegetation dynamics: the use of historical data sets

Kuber Prasad Bhatta * & Ole Reidar Vetaas

Department of Geography, University of Bergen, Bergen, Norway

* Presenting author: kuber.bhatta@gmail.com

We compare oak forest from 1993 and 2013 to study an effect of increased canopy-closure and atmospheric temperature on the species composition. We sampled 64 plots of 100 m^2 following sampling protocol of Vetaas (1997), and recorded all terrestrial vascular plants, altitude, and canopy cover in each sample plot. We analyzed the changes in species abundance with respect to canopy cover and atmospheric temperature using uni- and multivariate statistics. Observed changes were an increased abundance of trees and climbers, and decline of the herbaceous and shrub species. The changes were mostly explained by the atmospheric temperature with a minor but significant canopy effect. A significant decrease in the weighted average elevation of the 2013 plots as compared to those in 1993 was evident. However, such a decrease in elevation optima was insignificant for the site with dense and stable canopy cover. Even though fine-scale temporal changes in the temperate forests are mostly driven by regional climate warming, landuse dynamics can modify the fingerprints of climate warming on the species composition. Hence, the magnitude of the temporal vegetation change is dependent on the severity of regional climate warming, landuse-change, and life form and traits of the plant species.

Bitomský M.

Poster with lightning talk A-01 (young scientist)

Seed mass diversity in weed plant communities on the Central European scale

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Martin Bitomský * & Šárka Cimalová

Department of Biology and Ecology, University of Ostrava, Ostrava, Czech Republic

* Presenting author: bitomsky.martin@gmail.com

Seed mass is widely considered to be one of the most important life history traits in plants. It is a very diverse trait (it commonly varies over five to six orders of magnitude among coexisting plant species) and it is not a coincidence that we also encounter this diversity in many ecologically specific groups, such as weeds in this case. Here we present patterns in weed communities with regards to seed mass as a functional trait responsible for their coexistence. We analysed 430 relevés of arable field weed vegetation in the north-eastern part of the Czech Republic. A total of 230 species were classified into five categories according to their seed mass. Species from category 3 (seed mass 0.101–1 mg) tend to negatively correlate with all other categories, having the strongest relationship with category 4 – seed mass 1.01–10 mg. Further analyses showed the optimal combination of proportions of each seed mass category resulting into the highest number of coexisting species in one relevé. These findings have supported the hypothesis that seed mass plays a role in weed communities but the whole picture is still incomplete. Further studies will need to consider other factors (e.g. environmental variables) in order to discover under which mechanism diversity of seed size is maintained within plant communities.

Bittebiere A.K.

Oral presentation

Is fungus community structure associated to a plant individual determined by its plant neighbors and at which spatio-temporal scale?

Anne-Kristel Bittebiere [1,2,*], Cendrine Mony [1], Elodie Maluenda [1], Agnès Gareil [1], Alexandra Dheilly [1], Sophie Coudouel [1], Mathieu Bahin [3] & Philippe Vandenkoornhuyse [1]

[1]UMR 6553 Ecobio, CNRS – Université de Rennes 1, Rennes, France; [2] UMR 5023 LEHNA, CNRS – Université de Lyon 1, Villeurbanne, France; [3] UMR 6074 IRISA, Rennes, France

* Presenting author: annekristel.bittebiere@orange.fr

Most plant species have developed symbiotic interactions with arbuscular mycorrhizal fungi (AMF). This mutualistic interaction which is arguably the most widespread on earth plays a major role in ecosystem functioning and plant community assembly since AMF support in average 70% of the plant nutrients acquisition including phosphorus. Plant symbiosis with AMF may thus be a major mechanism influencing their coexistence. Previous works demonstrated that plant community structure is determined by fungi community structure. However the reciprocity of this relationship remains poorly understood although niche theory and host preference suggest that plant community structure influences fungi community structure. Our study aims at determining whether the fungi community structure associated with a plant individual is influenced by the structure of the surrounding plant community and at which spatial and temporal scales. We will also test whether this scale of response depends on the plant host species. We sampled individuals of the species *Elytrigia repens* and *Brachypodium pinnatum* within five types of plant communities varying by their specific richness and compositions, and cultivated under experimental conditions in mesocosms. The exhaustive composition of the AMF community present in the sampled individual roots was established by mass sequencing of an amplified SSU rRNA gene fragment. Past and present plant species distribution in each mesocosm was mapped with a 5 cm resolution grid. We used GIS system to determine plant composition in the neighbourhood of the sampled individuals at different spatial scales. We demonstrated that fungi species richness and diversity responded to the identity and the abundance of varying plant species within the neighbourhood of the focal plant host. Species richness of the fungi communities depended rather on past than current neighbouring plant species abundances at a fine spatial scale (neighbourhood of 10 cm radius). Results on the fungi diversity varied with the considered plant species host: in *B. pinnatum* it depends on the past neighbouring plant species abundances whereas in *E. repens* it is related to the present neighbouring plant species abundances. Finally, our study brings new insight into the relationship between plant and AMF. Considering that AMF are involved in the mechanism of plant coexistence, our results have strong implications for the whole plant community assembly.

Bittnerová S.

Poster J-01

Effects of geological bedrock and historical land use on species richness of mesic pastures in Slovakia

Session: Patterns of vegetation change across landscapes

Silvia Bittnerová [1,*], Tomáš Hlásny [2] & Monika Janišová [1]

[1]Institute of Botany, Slovak Academy of Science, Banská Bystrica, Slovakia; [2]National Forest Centre, Forest Research Institute Zvolen, Zvolen, Slovakia

* Presenting author: silvia.bittnerova@savba.sk

Grassland communities belong to most species-rich plant communities in Slovakia. We studied the effects of geological bedrock and historical land use on species richness in the communities of the *Violion caninae* and *Nardo strictae-Agrostion tenuis* alliances within an altitudinal range from 200 to 1500 m a.s.l. We analyzed phytosociological data from the Slovak Vegetation Database. The geographically stratified dataset included 300 phytosociological relevés recorded on 6 types of geological bedrock. Historical land use was derived from historical photographs obtained in the 1950. Three categories of historical land use were distinguished: the former pastures, meadows and fields. We used the One-Way Analysis of Variance (ANOVA) and Fisher's LSD test to investigate the effects of geological bedrock and historical land use. We also analysed the effect of altitude on species richness using the correlation and regression analyses. According to our results, the effects of geological bedrock on species richness of the studied grassland communities were stronger than the effects of the historical land-use. The most species-rich communities of the *Violion caninae* and *Nardo strictae-Agrostion tenuis* alliances occurred on calcareous and flysch bedrocks while the grasslands on silicate bedrock were most species-poor. Species richness was highest at medium altitudes, while this factor explained 14.36% of species richness variation. This study also indicates that abiotic factors help to explain the variation in species richness which is dependent both on geological bedrock and altitude.

Acknowledgements: This study was supported by the grant VEGA 2/0027/15.

Bonari G.

Poster with lightning talk D-05 (young scientist)

Management effect on diversity of plants and insects in semi-natural grasslands: conflicts or reconciliation?

Session: Vegetation science serving nature conservation

Gianmaria Bonari [1,2,*], Karel Fajmon [3,4], David Zelený [2], Igor Malenovský [2], Jaroslav Holuša [5], Ivana Jongepierová [3,4], Petr Kočárek [6], Ondřej Konvička [7], Jan Uřičář [3] & Milan Chytrý [2]

[1]Department of Life Sciences, University of Siena, Siena, Italy; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Czech Union for Nature Conservation, Local Chapter "Bílé Karpaty", Veselí nad Moravou, Czech Republic; [4]White Carpathians Protected Landscape Area Authority, Luhačovice, Czech Republic; [5]Department of Forest Protection and Entomology, Czech University of Life Sciences Prague, Prague, Czech Republic; [6]Department of Biology and Ecology, University of Ostrava, Ostrava, Czech Republic; [7]Institute of Entomology, Biology Centre, The Czech Academy of Sciences, České Budějovice, Czech Republic

* Presenting author: gianmaria.bonari@gmail.com

Application of inappropriate management practices can harm biodiversity. The choice of grassland management practices that would be suitable for different groups of organisms is still under dispute among conservation biologists and practitioners. This study attempts to clarify the effect of different grassland management practices on diversity and species composition of plants and several groups of insects, including butterflies, moths, carabid beetles and orthopterans, taking into account also the effects of landscape context and climate. The study was performed in the White Carpathians Biosphere Reserve (Czech Republic), which is known for grasslands that host the highest fine-scale species richness of plants in the world. Different types of management (mowing, grazing, abandonment and mixed management) were applied for several years at 34 sites and plants and different insect groups were subsequently sampled at these sites. The effect of management on species diversity of different taxa was assessed using generalized linear models (GLM) and the effect of management on species composition was analyzed by redundancy analysis (RDA). Results show that the pure effect of management influenced variation in species richness mostly in plants, butterflies and moths whereas orthopterans were weakly influenced by precipitation. Carabid beetles did not respond to any of the studied variables. Mixed management positively influenced species richness of plants and butterflies. In contrast, moth species richness was positively influenced by mowing and abandonment, but mixed management did not have the same positive effect as in the previous taxa. Abandonment and grazing did not promote species richness of plants. Besides total species richness, richness of subsets of regionally important species (regionally rare or declining species or indicators of threatened habitats) was analysed. The effect of management on species composition differed, to some extent, from the effect on species richness: management did not significantly affect species composition of butterflies, carabid beetles and orthopterans, whereas mowing influenced species composition of moths, and mixed management was important for plants. Our results show that planning of conservation management of semi-natural grasslands has to include careful consideration of different responses of different taxa.

Borsukevych L.

Poster O-02

Changes in riparian communities of Western Ukraine – effect of invasive alien plants

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Liubov Borsukevych

Botanical Garden, Ivan Franco National University, Lviv, Ukraine

lborsukiewicz@gmail.com

Invasion of alien plants is connected with human activity and general processes of anthropogenic transformation of ecosystems. Adaptive strategies of invasive alien species provide them a possibility to easily and quickly spread in different types of habitats – ruderal, anthropogenic, and even in the undisturbed native habitats. Riparian habitats are one of the main native types of habitats in the study area, preserved along rivers (Natura 2000 codes 3230, 3240, 91E0, 91F0, 92A0). We used species pools of 122 communities of western Ukraine, especially of the Carpathian region, representing riparian habitat types and comprising 536 species. We considered that 12 of them have high invasion activity characterized by naturalization along rivers. The mass appearance of invasive plants (e.g. *Reynoutria japonica*, *Helianthus tuberosus*, *Echinocystis lobata*, *Bidens frondosa*, *Acer negundo*, *Solidago gigantea*) raises serious concerns for nature protection. Ecological influence of these plants is considered as serious because of the elimination of the native species through occupation of the same ecological niches. Primarily they reduce the number of native species by gradual invasion of communities until their complete disappearance. Their spread directly threatens rare and vulnerable species. The most active process of alien plants invasion takes place in the Zakarpattya region. Derivate communities are formed as a result of their introduction. Mostly they grow in the mono-dominant, dense populations along rivers and drastically change the floristic structure of native associations. The structure of the newly created communities often prevents the rehabilitation of natural associations. The level of invasion is strongly community-dependent. The most-invaded community types were lowland anthropogenic riverine habitats at altitudes of 100–200 m belonging to the *Salicion albae* alliance. Unlike most other ecosystems, high elevation communities in mountains currently experience relatively low levels of invasion by non-native plants. There were very few invasive species in the communities of the *Alnion incanae* alliance at elevations of 200–400 m and no non-native plants at higher elevations. The most striking is the fact that we detected only four alien invasive species in the lowland communities to the north of the Ukrainian Carpathians. All riparian communities of this region mostly represent undisturbed native habitats with very insignificant abundance of non-native species.

Botta-Dukát Z.

Poster B-03

How can we calculate effect size for skewed distributions

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Zoltán Botta-Dukát

Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary

botta-dukat.zoltan@okologia.mta.hu

In community assembly studies often not only the significant departure from randomness should be detected, but also the effect size (i.e. the "size" of this departure) has to be measured. Measuring effect size is necessary for example when the roles of different assembly forces (e.g. environmental filtering, competition) are compared between sites or their changes along environmental gradient are studied. The standard way is to calculate standardized effect size (SES), i.e. departure from the mean of random communities divided by their standard deviations. Standardized effect size is a useful measure if the test statistic (e.g. nestedness index, phylogenetic or functional diversity) in the random communities follows symmetric distribution. In the presentation I would call the attention that they may give misleading information if the distribution is skewed. Our thinking is dominated by the Gaussian distribution, where mean and standard deviation have easy interpretation. However, they are important characteristic of any distribution, and their interpretation for skewed distribution is not so straightforward. For symmetric distribution median and mean is equal, thus SES = 0 means $p = 0.5$, but it does not hold for skewed distribution. For symmetric distribution, departure from the mean shows the extremity of the value regardless the sign of departure, while for asymmetric distribution the same deviation can be highly probable and extremely improbable depending on its sign. These problems will be exemplified by artificial and real examples. Beyond calling attention to the problem, I will show some possible solutions (log-transformation of test statistics, using transformed p-values, fitting skewed distribution) and discuss their merits and limitations.

Bouchet D.C.

Oral presentation (young scientist)

Plant flowering phenology relates to resource acquisition strategy during a succession of Mediterranean road-slope vegetation with recurrent mowing

Diane C. Bouchet [1,*] & François Munoz [2]

[1]Université de Montpellier, UMR AMAP, Montpellier, France; [2]French Institute of Pondicherry, Pondicherry, India

* Presenting author: diane.bouchet@cirad.fr

Flowering time is critical for the success of plant reproduction. The onset, end and duration of flowering depend on abiotic constraints and on biotic interactions with other plants and fauna. Local assembly processes are thereby expected to influence the community-level functional response of flowering traits. However, few studies considered how flowering phenology and resource-use strategies interact and drive vegetation dynamic along ecological succession. We examined how changes in flowering phenology related to age and mowing mode along an ecological succession on road slopes in the Mediterranean area. We hypothesized that resource-use strategies influence community-level changes in reproduction phenology. Specifically, we expected late succession plants to invest later and over a shorter period into flowering because of their investment in resource storage. We also expected mowing to influence flowering time because seeds should be mature before the annual removal of aerial biomass. We built a chronosequence including 15 road slopes of varying age located near Montpellier (France) to represent the course of an ecological succession over 50 years. In each slope, a 1-meter wide band was mown yearly to ensure road safety, while the other part remained unmown. We surveyed 284 species during a whole year, precisely recording the onset, ending and duration of flowering by species, for mown and unmown parts of all slopes. We also measured the Specific Leaf Area (SLA) and Leaf Dry Matter Content (LDMC) of most abundant species to characterize changes in resource acquisition strategy according to mowing and successional stage. We analysed changes in community weighted means of both flowering and resource-use traits. We found that increasing age and mowing delayed the onset of flowering, while the end of flowering was earlier in communities with high LDMC. Flowering duration decreased with age in unmown communities only and was negatively correlated with LDMC (positively with SLA). These results revealed that resource conservation in aerial parts (associated with high LDMC) relates to shorter flowering period in late succession. Our results support a trade-off in the relative time investment into flowering, resource storage and seed maturation. Besides, late mowing did not influence end of flowering, as many species completed reproduction before disturbance time. We thus underline the practical interest of late mowing on Mediterranean road slopes.

Box E.O.

Oral presentation

Tell us again – what were those big questions from before?

Elgene O. Box

Geography Department, University of Georgia, Athens (Georgia), USA

boxeo@uga.edu

Ever since the “environmental movement” there have been major themes and programs in “big ecology”, beginning perhaps with the International Biological Program (IBP, 1964–74). These initiatives raised big but basic questions, about things such as ecosystem productivity and the potential stability or resilience of ecosystems. Does anyone remember – or have younger scientists ever asked – what some of these questions were? Were these questions important? Were these questions ever answered – or were they just abandoned as fads and buzzwords changed? Most of these “big” questions were global and geographical in nature. This talk reviews some of them and their current status, in four areas: ecology, vegetation science, modeling/monitoring, and global sustainability. Major programs in ecosystem ecology involved collection of field data by IBP teams and focused on ecosystem function, including the role of below-ground parts and processes. Two big thrusts in vegetation science involved universal sets of plant types and vegetation types, as could be used in global modeling. In modeling there has been a move away from rigor toward appearance, as funding became more competitive and modeling became more dependent on standard commercial software than on programming by thinking individual scientists. Some basic questions in global modeling are treated in more detail, including needs for more geographically reliable estimation of evapotranspiration and for geographically sensitive model validation. Finally we look at some present-day questions of global sustainability, including the problem we are not supposed to talk about openly. Did this short review miss important questions or topics? Are any of these old questions still important? Audience participation will be requested.

Brewer S.

Oral presentation

Estimating long-term functional diversity from pollen data and plant traits

Special session: Long-term perspectives on vegetation change

Simon Brewer [1,*], Thomas Giesecke [2], Walter Finsinger [3] & Steffen Wolters [4]

[1]Department of Geography, University of Utah, Salt Lake City, USA; [2]Albrecht-von-Haller-Institute for Plant Sciences, University of Göttingen, Göttingen, Germany; [3] Centre for Bio-archeology and Ecology (UMR 5059 CNRS/UM2/EPHE), Institut de Botanique, University of Montpellier 2, Montpellier, France; [4]Lower Saxony Institute for Historical Coastal Research, Wilhelmshaven, Germany

* Presenting author: simon.brewer@geog.utah.edu

Sedimentary records of pollen deposition offer a means to derive information about long-term vegetation dynamics and their environmental drivers. In addition to studies examining the dynamics of vegetation composition, there has been a long-standing interested in using these data to examine changes in vegetation diversity over long time scales (100's to 1000's of years). These studies have largely focused on taxonomic diversity, but have been limited by the imperfect sampling of the fossil pollen record. Increasingly, studies of modern biodiversity are focusing on functional diversity, in an effort to understand if, for example, increased variation in plant life strategies may control species level diversity (Lamanna et al. 2014). To date, however, fossil pollen based studies of functional diversity are rare. We present here preliminary results using a new, trait-based approach to estimate functional diversity over the past 11,000 years. Pollen taxa were assigned to trait categories using a pre-existing definition (Barboni et al. 2004), including life form, leaf type and plant characteristics. Diversity was calculated using several functional diversity indices, including richness (FRic), evenness (FE) and diversity (FD) (Schleuter et al. 2010). The results demonstrate clear spatial patterns in functional diversity, with a marked latitudinal gradient, but further show how these patterns have developed over time. We will discuss possible drivers for the observed changes, and the limitations of this approach.

References

Barboni, D., Harrison, S.P., Bartlein, P.J., Jalut, G., New, M., Prentice, I.C., Sanchez-Goñi, M.-F., Spessa, A., Davis, B. & Stevenson, A.C. 2004. Relationships between plant traits and climate in the Mediterranean region: A pollen data analysis. *Journal of Vegetation Science* 15: 635–646.

Lamanna, C. et al. 2014. Functional trait space and the latitudinal diversity gradient. *Proceedings of the National Academy of Sciences of the USA* 111: 13745–13750.

Schleuter, D., Daufresne, M., Massol, F. & Argillier, C. 2010. A user's guide to functional diversity indices. *Ecological Monographs* 80: 469–484.

Bruelheide H.

Oral presentation

Towards a robust large-scale vegetation classification: using Cocktail species groups in unsupervised hierarchical divisive classifications

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Helge Bruelheide [1,2,*] & Ute Jandt [1,2]

[1]Institute of Biology/Geobotany and Botanical Garden, Martin Luther University Halle-Wittenberg, Halle, Germany; [2]German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany

* Presenting author: helge.bruelheide@botanik.uni-halle.de

Species groups are one of many formalized vegetation classification approaches that aim at defining repeatable procedures to derive unequivocal rules for the assignment of individual vegetation records to vegetation units. Such assignment rules would allow common classifications across national boundaries. The species group approach provides such membership rules as they define a vegetation unit as a set of relevés each of which possesses a minimum number of species out of the total species number of that group. Although species groups are widely used in vegetation classification, the existing algorithms suffer from several shortcomings. Here, we present a procedure that turns the species group approach into an automated algorithm for unsupervised classification. First, an hierarchical agglomerative clustering algorithm (Cocktail clustering) is carried out that for *n* species in the dataset produces *n*-1 nested species groups. Second, based on a given species classification into species groups, these species groups are then used to classify vegetation relevés by either means of (partial) Redundancy Analysis (RDA), resulting in a Twinspan-like classification in two or more dimensions (Cspan), or by means of a brute-force approach that optimizes the match of species groups, or logical combinations of them, to a preconceived plot assignment from preceding traditional expert classification systems (Cmatch) We provide examples of applications of Cocktail clustering and subsequent Cspan and Cmatch classifications. The final results are unique and machine-readable membership rules of plots to units based on Cocktail species groups. As the processing time depends linearly on species and plot number in the sets, all algorithms are applicable to large databases. A clear advantage of this suggested framework is that species groups can be extracted from national or supranational databases, resulting in an exhaustive list of possible species groups, and subsequently plot classifications can be performed in local or regional subsets, based on these groups and with assignment rules that can be transferred across subsets. In consequence, stable and robust classifications are obtained that are largely unaffected by variations in the underlying data of different databases.

Bueno C.G.

Oral presentation

European distribution of mycorrhizal types and statuses: does data meet theory?

C. Guillermo Bueno *, Maret Gerz, Argo Ronk, Aveliina Helm, Martin Zobel & Mari Moora

Department of Botany, Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: cgbuenog@gmail.com

Mycorrhizal symbiosis has a fundamental role in the stability, resilience and dynamics of plant communities in terrestrial ecosystems, worldwide. The distribution of mycorrhizal main traits, such as the type of mycorrhiza (arbuscular, ecto-, ericoid, orchid and combinations of those), or mycorrhizal statuses (obligatory, facultative or non-mycorrhizal), are assumed to be spatially constrained and structured in vegetation types, responding to natural and anthropogenic gradients. However, up to now few studies have covered this topic with ecological data at large scales. In this talk, we will present the first analysis of the distribution of mycorrhizal types and statuses at the European scale. This analysis has been based on the distribution of plant species in Europe and their mycorrhizal types using the current knowledge of mycorrhizal traits. We used species distribution modelling techniques for analyzing (1) the distribution patterns of mycorrhizal traits, and (2) the relationship of these patterns along the main environmental gradients in Europe. These gradients include both natural, such as vegetation succession, climatic, topographic and edaphic gradients, and anthropogenic, such as the presence and distances to human population densities and their main land activities. The main expectations for the mycorrhizal types and statuses along these gradients will be further compared and discussed with our results during this talk.

Bültmann H.

Poster P-04

The synsystem of European thallophyte syntaxa

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Helga Bültmann

University of Münster, Münster, Germany

bultman@uni-muenster.de

Thallophyte syntaxa have been described by using the Braun-Blanquet approach right from the beginning. Researchers agreed to the rules of phytosociological nomenclature and to develop an independent system for thallophytes. However most phytosociologists are not aware of this system which has been developed by specialists for thallophytes. To remedy the situation the thallophyte syntaxa were compiled for the checklist of higher syntaxa of Europe, being the first large-scale survey, except for the bryophyte vegetation (Marstaller 2006). All 40 classes with orders and alliances of the bryophyte, lichen and algae vegetation in Europe will be introduced. Most thallophyte syntaxa occur on rocks with 14 classes for bryophyte and lichen vegetation and eight classes for algal vegetation, including two algal classes also growing epiphytic. The epiphytic thallophyte vegetation comprises eight classes of bryophyte and lichen vegetation and the two classes of algal vegetation also found on rock. The thallophyte vegetation on soft substrate is represented by four classes of bryophyte and lichen vegetation and three classes of algal vegetation. Furthermore two classes are described to accommodate planctic microalgae and snow and ice algae. Thallophyte vegetation is best developed in sites, where the habitat is adverse to the growth of vascular plants and thallophyte syntaxa often have large distribution areas. The floristic composition is only to a small extent determined by macroclimate, but more important are the structure of the surface including surface stability, the pH of the substrate and microclimate and water availability. The habitat factors, which determine the floristic composition of the thallophyte vegetation, are evaluated together with relevant traits of the dominant species. Thallophytes can form well-delimited and independent syntaxa but also synusiae within the vegetation. The degree of independence can vary. The rock-inhabitating thallophyte syntaxa for example are fully independent, while epiphytic and terricolous syntaxa co-occur with vascular plants. The relations of the system of thallophyte syntaxa and the system of phytocoena and the terminology will be discussed in detail.

References

Marstaller, R. 2006. Syntaxonomischer Konspekt der Moosgesellschaften Europas und angrenzender Gebiete. *Haussknechtia Beiheft* 13: 1–192.

Bürger J.

Oral presentation

Resampling a salt grass vegetation in a nature reserve after 20 years of grazing with changing intensity

Special session: Global change and vegetation dynamics: the use of historical data sets

Jana Bürger * & Jürgen Müller

Chair of Grassland and Fodder Sciences, University of Rostock, Rostock, Germany

* Presenting author: jana.buerger@uni-rostock.de

Ecosystem functions of salt grassland include habitat functions for birds, insects and endangered plant species, soil accretion and nutrient retention. These grasslands are strongly connected to use by grazing animals (a prerequisite for their development) and they provide production for fodder. Conservation is dependent on regular disturbance by grazing, but changed economic conditions have led to abandonment of such areas by farmers over the last decades. In this case, conservation aims for birds and plants are endangered by reed encroachment and costly cutting regimes may be required. We studied vegetation development over 20 years of changing management on coastal island in the southern Baltic Sea, situated in a National Park. Since 1989 the island has been grazed in decreasing intensity in an ongoing attempt to unify economical production aims and conservation aims. A vegetation survey in 1993 found a number of rare and endangered salt vegetation, but gave a negative forecast for the future development of the most important vegetation type, short saltmarsh grassland vegetation (Atlantic Salt Meadows). In 2012, a re-sampling was carried out, relocating the 25 original sites by GPS. The original survey used a phytosociological approach with sample areas between 1 and 25 m², the re-sampling was carried out with areas of 25 m². Data are complemented by air-borne photographs from 2005, 2007 and 2010. In our analysis we aim to relate vegetation change at the sample sites to the use history at the different sites as influenced by soil properties and height above sea level. Processes that have driven vegetation development include grazing, trampling and lying by animals, eutrophication by excrements, change of salt content due to leaching, flooding depositing salt, succession and reed encroachment, and occasional mowing to reduce reed stands. Around 2010, reed enlargement was observed due to low cattle grazing intensity, followed by introduction of water buffalo that successfully diminished reed stands and increased saltmarsh grassland again. Vegetation in the samples is more homogeneous in 2012 compared to 1993. The number of endangered plant species on the island has increased from six to nine, but the species have changed from typical salt meadow species to more ruderal species. We have to conclude that the management for a longer period has failed to conserve and increase areas of the salt meadow but the latest management change may improve this area again.

Burrascano S.

Oral presentation

Conflicts between climate change mitigation and biodiversity conservation in Europe: can carbon sink without sinking grassland biodiversity?

Sabina Burrascano [1,*], Milan Chytrý [2], Tobias Kuemmerle [3], Eleonora Giarrizzo [1], Sebastiaan Luyssaert [4], Francesco Maria Sabatini [1] & Carlo Blasi [1]

[1]Department of Environmental Biology, Sapienza University of Rome, Roma, Italy; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Geography Department, Humboldt-University of Berlin, Berlin, Germany; [4]Laboratoire des Sciences du Climat et de l'Environnement (LSCE-IPSL), CEA-CNRS-UVSQ, Gif-sur-Yvette, France

* Presenting author: sabinaburrascano@gmail.com

Due to the importance of forests for global biodiversity conservation and climate stabilization, the reduction of deforestation is considered a milestone towards sustainability. Rather than deforestation, most temperate regions are recently experiencing an increase in forest area, which is generally perceived as creating co-benefits for biodiversity conservation and carbon sequestration and storage. However, such a win-win perception is questionable in some region such as Europe where low-intensity farming has created and maintained extraordinarily biodiverse ecosystems including different types of semi-natural grasslands. We synthesized various sources of evidence on the contribution of EU-27 forests and grasslands to biodiversity conservation and carbon storage and sequestration. We then analyzed the main EU policies on the conservation and management of these systems, and identified conflicts between them. Existing data show an increase in extent and carbon stock of European forests, partly due to abandonment of the least productive agricultural lands. In addition to the areas undergoing natural succession, two million hectares were deliberately afforested in the EU-27 between 1990 and 2010 within the framework of the Kyoto Protocol mostly through CAP funding. The effects of these actions on biodiversity are still uncertain, especially since they are concentrated in the least productive agricultural areas. Based on our analysis, less favored agricultural areas include the greatest part of the High Nature Value semi-natural grassland, which is valuable for biodiversity conservation and at the same time stores topsoil carbon in a greater density than average European grasslands. These systems include habitats of conservation concern that are being targeted by EU conservation and restoration projects to counteract abandonment and successional trends. If compared to afforestation, until now, little effort has been put on improving the management of existing forests that could increase carbon sequestration without affecting highly valuable semi-natural grassland systems. European policies addressing biodiversity conservation and climate change mitigation are not fully harmonized and partly conflicting. This is also due to the fact that whereas many studies focused on forests and carbon dynamics, and others addressed grassland biodiversity, these two issues were seldom investigated jointly, and we think vegetation science may contribute to filling this gap.

Busch V.

Oral presentation (young scientist)

Relationships between plant functional diversity, land use intensity and nutrient stoichiometry

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Verena Busch [1,*], Markus Fischer [2], Fabrice Grassein [2], Norbert Hölzel [1], Valentin H. Klaus [1], Daniel Prati [2] & Till Kleinebecker [1]

[1]Institute of Landscape Ecology, University of Münster, Münster, Germany; [2]Institute of Plant Sciences, University of Bern, Bern, Switzerland

* Presenting author: buschv@uni-muenster.de

Land use intensification and change are considered the most important threats affecting biodiversity. Hence, land use may be seen as the major disturbance factor in grasslands directly affecting plant diversity and vegetation composition. Furthermore, land use also impacts nutrient stoichiometry in soil and plant biomass. Functional diversity as one component of plant diversity has rarely been taken into account in relation to nutrient stoichiometry, although it has been shown that the richness of functional traits strongly determines ecosystem functioning and stability. Furthermore, identifying changes in the functional composition of a plant community is crucial to understand underlying mechanisms of biodiversity changes. Our research aims at evaluating the impact of land use and nutrient stoichiometry on plant functional diversity. Therefore, we assessed plant species richness and productivity and measured nutrient concentrations in above-ground biomass in 150 agricultural grasslands in three regions in Germany during a time period of six years. Additionally, functional trait information regarding reproduction, phenology, leaf economy and competition ability was used to calculate community weighted means (CWM) and functional diversity (FD). First results showed distinct relationships between functional trait diversity, land use and biomass nutrient concentrations, even though specific relationships vary considerably depending on the respective trait. Variability of reproductive and competition ability-related traits such as vegetation height showed strong responses to land use, especially grazing and fertilization intensity. Flowering onset and seed mass were negatively influenced by increased fertilization, whereas a higher grazing intensity favors species with reduced seed mass. Furthermore, both CWM and FD of all plant traits are strongly associated with nitrogen and phosphorus concentrations in biomass, which are known to increase with increasing fertilization. However, our analyses revealed that the impact of land use on functional diversity may be mostly indirect, mediated by decreasing plant diversity in the course of intensive management. Our study shows that in order to improve the understanding and prediction of diversity patterns and ecological changes as a result of anthropogenic disturbance, an integrative approach is needed, considering functional composition of the vegetation, stoichiometric regulation and management information.

Cahill J.

Oral presentation

Bromus inermis invasion in an Albertan Savanna: Soil-feedbacks and local adaption promote enhanced invasion

James F. Cahill [1,*], Gisela C. Stotz [1], Alec Carrigy [1], Margarete Dettlaff [1], Inderjit [2], Ernesto Gianoli [3] & Nadir Erbilgin [4]

[1]Department of Biological Sciences, University of Alberta, Edmonton, AB, Canada; [2]Department of Environmental Studies, University of Delhi, Delhi, India; [3]Departamento de Biologia, Universidad de La Serena, La Serena, Chile; [4]Department of Renewable Resources, University of Alberta, Edmonton, AB, Canada

* Presenting author: jc.cahill@ualberta.ca

Smooth brome, *Bromus inermis*, is an aggressive invader throughout much of Canada. In Alberta, it is widespread within the Aspen Parkland ecoregion, a savanna system consisting of a mosaic of native fescue (*Festuca hallii*) grasslands and Aspen (*Populus tremuloides*) stands. Though there is a diversity of invasive species found within these productive systems, smooth brome is rare in its ability to penetrate and spread within the system in the absence of disturbance. Smooth brome, once established, forms dense stands greatly reducing native plant diversity. There may also be legacy effects, associated with high litter buildup, potential shifts to the soil community structure and functioning, and local adaptation of co-occurring species. Despite these concerns, smooth brome is also a favoured species for planting as a tame pasture crop, and routinely planted throughout Canada. Due to the potentially delicate balance between ecological risk and economic value of this single species, it is essential that we have a clear understanding of the ecological mechanisms driving invasion and its impacts. Several groups in Canada have now turned their attention to this species of concern. Here I present findings from a number of ongoing studies within my lab addressing issues related to (1) brome establishment in a complex landscape, (2) abiotic and biotic drivers of establishment and expansion, (3) soil-legacy impacts associated with invaded stands. In both field and greenhouse experiments, we are finding convincing evidence of a negative self-feedback in relation to smooth brome's establishment and growth. In the field, brome seedling survival is lowest within brome stands, relative to survival within aspen-dominated stands or adjacent native grasslands. This is surprising, as brome soils have the highest soil nitrogen levels, and greenhouse studies indicate their soils promote the growth of other species. Field studies also suggest more rapid and vigorous brome growth at the leading edge of a brome stand, rather than within the already established stand. Combined, these results present a troublesome scenario suggesting the plant-soil feedbacks associated with smooth brome will facilitate more rapid expansion of brome throughout this mixed landscape, putting pressure on native grasslands. We find little indication of biotic resistance in any of the community types, limiting management options.

Carli E.

Poster with lightning talk D-06

Generating a risk and ecological analysis toolkit for the Mediterranean coastal vegetation: An application in the Gulf of Cagliari (Italy)

Session: Vegetation science serving nature conservation

Emanuela Carli [1,3,*], Davide Astiaso-Garcia [2], Gianluigi Bacchetta [1], Daniele Bruschi [2], Giuseppe Fenu [1], Mauro Fois [1], Raffaella Frondoni [3], Franco Gugliermetti [2], Michela Marignani [1], Silvia Pinna [2], Selena Puddu [1] & Carlo Blasi [3]

[1]Department of Life and Environment, University of Cagliari, Cagliari, Italy; [2]Department of Aereonautical, Electrical and Energetic Engineering, Sapienza University of Rome, Roma, Italy; [3]Department of Environmetal Science, Sapienza University of Rome, Roma, Italy

* Presenting author: emanuela.carli@gmail.com

The GREAT Med project, funded by the ENPI CBC Med program, aims to contribute to the development of an integrated and interdisciplinary strategy for assessing plant diversity and main human pressures in five selected coastal areas of the Mediterranean Basin, located in Italy, France, Lebanon and Tunisia. The main objective is to develop a toolkit for assessing biodiversity at plant species and community levels and their vulnerability to potential risks due to marine traffic and urbanization.

In each case study, biodiversity is being assessed with reference to a 1 × 1 km spatial grid using two floristic parameters (species richness, and species with high conservation value) and two habitat indicators (diversity of natural and semi-natural ecosystems, and relative cover for habitats of high conservation value). Data on biodiversity values will then be combined with indicators of hazard (occurrence of exotic species, habitat fragmentation due to urbanization, and pollution derived from oil and HNS spills), which are also under calculation.

The Gulf of Cagliari (about 80 km long) represents the Italian study area, with more than 900 plant species and a wide range of coastal and brackish habitats of Community interest. Pilot sites for the project are the area of Chia-Santa Margherita di Pula, at the western tip of the Gulf, and the coastal area of Poetto-Molentargius, within the urban area of Cagliari.

We are creating a floristic geodatabase, based on fieldwork (90 plots) and literature data (about 140 floristic records and 161 published relevés). Field sampling in the test sites was stratified per lithomorphological class and habitat type within each grid cell. Definition of species of high conservation value is based on the regional and national Red Lists, the CITES Convention and Habitats Directive (92/43/EEC), and original data on endemicity. Habitat indicators were calculated over the entire Gulf of Cagliari using available land cover and habitat maps at a scale of 1:25,000.

Here we present the vulnerability maps for species and habitats in the Gulf of Cagliari, and the proposal for a synthetic biodiversity vulnerability value that combines the individual indicators into a scoring scheme. The proposed methodology refers to a small number of criteria and to "easily" quantifiable biological information, with a view to develop a simple standard framework that can be applied to different Mediterranean contexts and benefit local agencies and administrations.

Carmona C.P.

Oral presentation

A unified framework for functional diversity across scales using trait probability densities

Carlos P. Carmona [1,*], Francesco de Bello [1,2], Cristina Rota [3] & Jan Lepš [1,2]

[1]Department of Botany, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [2]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [3]Terrestrial Ecology Group, Department of Ecology, Universidad Autónoma de Madrid, Madrid, Spain

* Presenting author: carlos.perez@uam.es

Most trait-based methods are focused on a single level of analysis (between species, within species, between communities, etc.). Their integration, particularly considering the multidimensional nature of traits, has been limited so far. We present a framework that incorporates the underlying probabilistic nature of trait distributions in a uni- or multivariate trait space. It includes different methods, based on the trait probability densities (TPD) from populations to species and communities, to estimate several components of functional diversity and partitioning it across scales. To clarify the selection of the most adequate methods for potential users depending on their needs, we arrange the methods attending to 1) whether the identity or number of species is or is not of primary concern, and 2) whether they focus only on sampling units or if they involve the simultaneous consideration of more than one population or community and the turnover between them. Among other things, the framework includes adaptations of existing components and indices of functional diversity (functional richness, functional evenness and functional divergence) that retains the original conception based on the probability density functions of communities. It also includes a novel index of functional redundancy, along with a calculation of the dissimilarity between sampling units based on trait overlap, and its decomposition into shared and non-shared trait volume. Finally, we show how overlap-based dissimilarities can be used in combination with the Rao index of diversity to partition diversity into different spatial (or temporal) components. We show the potential of the approach using data from Mediterranean grasslands along a productivity gradient, where individuals were measured for each species in each site where the species was found. We show that our framework is more intuitive and represents a clear and more integrated alternative to existing methods, with a great potential to expand the analyses of functional ecology in terms of descriptive and predictive ability. Finally, we introduce a new R package (TPD), which performs all the analyses proposed in this framework.

Carranza M.L.

Poster E-01

Long-term ecological research in Italian summit vegetation: observations in the central Apennines

Special session: Global change and vegetation dynamics: the use of historical data sets

Alberto Evangelista [1], Ludovico Frate [1,2], Maria Laura Carranza [1,*], Bruno Petriccione [3], Giovanni Pelino [1], Fabio Attorre [4], Michele De Sanctis [4] & Angela Stanisci [1]

[1]Envix-Lab, Dipartimento di Bioscienze e Territorio, Università degli Studi del Molise, Pesche, Italy; [2]Istituto di Biologia Agro-Ambientale e Forestale, CNR/IBAF, Monterotondo, Roma, Italy; [3]Corpo Forestale dello Stato, Ufficio Territoriale per la Biodiversità, L'Aquila, Italy; [4]Dipartimento di Biologia Ambientale, Università di Roma "La Sapienza", Roma, Italy

* Presenting author: carranza@unimol.it

High elevation ecosystems are increasingly threatened by climate change, causing loss of biodiversity, habitat degradation and landscape modifications. The increase in temperatures, along with changes in atmospheric and soil moisture content and the increase in atmospheric nitrogen deposition are considered the primary drivers of ecological changes. However, detailed studies focusing on compositional and ecological changes in high elevation Apennine's plant communities over time are still needed.

We investigated long-term (50 years) changes of diversity, structure and ecological features of plant communities in high elevation habitats of the central Apennines, Italy (Dolines, Plateaux, Gentle slopes, Steep slopes and Ridges). In particular, using geo-referenced phytosociological relevés collected on the Gran Sasso and Majella massifs in 1962–1972 and in 2009–2014, we investigated changes in floristic composition over time. Moreover, we analyzed ecological changes using the mean cover-weighted values of Landolt indicators (T: Temperatures, F: Moisture, N: Nutrients, DG: dominance in situ, FP: Flowering period) and the frequency of life forms. Floristic analysis was done using a Detrended Correspondence Analysis. Permutational multivariate analysis of variance (PERMANOVA) was performed to assess the effects of time and habitat type and their interaction on the ecology of plant communities.

The DCA analysis showed a clear floristic separation between the old and the new relevés and among habitat types. Moreover, PERMANOVA analysis showed significant effects of the time period and habitat types on the ecological characteristics of plant communities. In particular, we found significant increase in T, F and N values and in the frequency of hemicryptophytes (He) over time. The long-term analysis suggests that the structure, the composition and the ecology of high elevation plant communities changed over the last 50 years. The observed changes are most likely related to a thermophilization process (T increase) which has determined a turnover in floristic composition and the spread of He. In addition to higher temperatures, changes in precipitation patterns (F increase) in combination with nitrogen depositions (N increase) may have enhanced the upward shifting of thermophilous and meso-nitrophilous plant species and the decrease of cryophilous species frequency. This process is expected to further accelerate according to climate change predictions.

Carranza M.L.

Oral presentation

Temporal changes in forest fragmentation contexts at multiple extents: patch, perforated, edge and interior forests in the Gran Chaco, Central Argentina

Special session: Remote sensing for vegetation science

Maria Laura Carranza [1,*], Ludovico Frate [1], Alicia T.R. Acosta [2], Laura Hoyos [3] & Marcelo Cabido [3]

[1]Envix-Lab, Dipartimento di Bioscienze e Territorio, Università degli Studi del Molise, Pesche, Italy; [2]Dipartimento di Scienze, Università degli Studi di Roma Tre, Roma, Italy; [3]Instituto Multidisciplinario de Biologıa Vegetal (UNC-CONICET) and Facultad de Ciencias Exactas, Fisicas y Naturales,
Universidad Nacional de Cordoba, Cordoba, Argentina

* Presenting author: carranza@unimol.it

The context in which a forest exists strongly influences its function and sustainability, but this issue remains almost unexplored in subtropical ecosystems. In this paper, we quantified the forest fragmentation context in the dry Chaco (Central Argentina) over the last three decades at multiple scales. We classified forest locations (pixels) as interior, dominant and patch based on forest cover (Pf) and connectivity (Pff) values that were measured in forest surroundings using a moving window device fixed at eight different extents (from local, ~6 ha, to regional, ~8300 ha). Specific multi-scale forest fragmentation profiles (for the years 1979 and 2010) were defined as the mean Pf versus Pff values and compared across a selected range of spatial extents. The dry Chaco has undergone an intensive process of forest fragmentation that has affected the spatial pattern of forests at different scales but is more evident at larger ones. Multi-scale fragmentation analysis depicted a landscape in which local forest exploitation perforates forest cover, occurs alongside extensive forest loss, and reduces forests to small and isolated patches. Such changes have most likely been the result of the interplay between human activities and environmental constraints and have shaped the spatial pattern of forests across scales. Based on our results, the conservation and sustainable management of the dry Chaco should take the context of each habitat location and the scales over which a forest pattern might be preserved, altered or restored into account.

Castillioni K.

Poster D-07 (young scientist)

Evaluation of different management techniques to control an invasive grass in Cerrado nature reserves

Session: Vegetation science serving nature conservation

Karen Castillioni *, Elizabeth Gorgone-Barbosa & Alessandra Fidelis

Departamento de Botânica, Universidade Estadual Paulista – UNESP, Rio Claro, SP, Brazil

* Presenting author: karen.castillioni@gmail.com

Biological invasion can lead to extinction of native species and challenge the conservation of biodiversity. In Brazil, African grasses have already invaded most part of Cerrado, modifying its structure and composition. In this study, we evaluated the efficiency of different management techniques: Cut (Ct), Herbicide (He), Herbicide + Cut (He + Ct) and Control (Co) (no intervention) to control *Urochloa decumbens* in a Cerrado area under regeneration, as well the response of native vegetation to these techniques. The treatments were applied in 4 × 4 m plots (3 replicates/treatment = 12 plots). In each plot, the vegetation cover (%) was estimated in the following categories (8 subplots of 1 × 1 m/plot): live invasive grass, graminoids, forbs, shrubs, total dead biomass and bare soil. The aboveground biomass was sampled within each sample unit (1 subplot of 0.5 × 0.5 m/plot), and separated into: live and dead invasive grass, graminoids, shrubs, forbs and dead native biomass, then dried and weighted (70 °C, 3 days). Surveys were performed before treatment application (T0) and then every four months, during a year. At T0, there was a dominance of *U. decumbens* cover (> 55%) and biomass (live: > 105 $g.m^{-2}$ and dead: > 380 $g.m^{-2}$) and low representativeness of functional groups cover (< 10%) and biomass (< 60 $g.m^{-2}$). One year after treatments application, He ($H = 9.46$, $P = 0.04$) showed less *U. decumbens* cover than in Co plots and He + Ct efficiently removed *U. decumbens* live biomass. However, Ct (45 ± 15%) tended to show similar cover to Co plots (51 ± 8%) and the highest amounts of live biomass (129 ± 33 $g.m^{-2}$). Despite the efficiency in reducing *U. decumbens* live cover, the use of herbicide showed a trend to result in high accumulation of dead biomass at the end of the first year of observation (323 ± 253 $g.m^{-2}$), which may affect vegetation structure and dynamics in the area. Whilst He + Ct led to opening of gaps, exposing more bare soil (58 ± 21%, $H = 7.66$, $P = 0.04$) compared to Co plots (13 ± 11%). Cover and biomass of the functional groups were not significantly affected. However, forb cover tended to be reduced in Ct plots, as well as its biomass in all treatments, while shrub biomass increased in Ct and He + Ct. Therefore, in the short-term, He + Ct would be the recommended technique, since it effectively controlled *U. decumbens* and did not result in high biomass accumulation, providing more bare soil that may facilitate native species regeneration.

Čeplová N.

Poster with lightning talk L-01 (young scientist)

Is the proportion of alien species in urban habitats influenced by city size?

Special session: Urban vegetation

Natálie Čeplová [1,2,*], Veronika Kalusová [1] & Zdeňka Lososová [1]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Biology, Masaryk University, Brno, Czech Republic

* Presenting author: ceplova@ped.muni.cz

Although cities are centres of introduction of alien species, the relative role of dispersal limitation with respect to invasibility of urban habitats is still unknown. We assume that city size could be used as a proxy for dispersal limitation. We suppose that large cities with high traffic, industry and high population density will host more alien species in comparable areas than small cities due to higher availability of dispersal vectors and seed sources. Data sampling was carried in three types of human settlements: cities with more than 100,000 inhabitants, towns with population between 20,000 and 50,000 inhabitants, and villages with less than 5,000 inhabitants. All settlements are situated in Central Europe. In each settlement, three habitat types were chosen: paved settlement centre, residential area and abandoned area with perennial grassland and shrubs. Plots of 1-ha size were sampled in each habitat type by recording all spontaneously occurring taxa of vascular plants. Recorded species were divided according to their origin and residence time to native species, archaeophytes and neophytes. We found that the total species number in the studied habitats is affected by city size. The proportion of neophytes increases with city size especially in residential areas, where human activities serve as a source of propagules of neophytes. In contrast, the proportion of archaeophytes does not vary with size of the settlement. Archaeophytes are well established part of the flora of cities and their surroundings and as such they are not dependent on the repeated human introductions to urban habitats. Proportion of native species varies according to habitat type. In centres native species are under-represented in large settlements, and we suggest that this is the result of isolation from the surrounding landscape. The opposite pattern was recorded in residential areas and abandoned areas, which are situated closer to the edge of the settlements.

Chao W.C.

Poster N-02

Assessing species richness, endemism and phytogeographical affinities of Taiwan based on an integrated vascular plant distribution database

Session: Vegetation in macroecological modelling

Wei-Chun Chao [1,*], Jer-Ming Hu [2], Chang-Fu Hsieh [2] & Huan-Yu Lin [2,3]

[1]Department of Forest and Nature Resources, National Chiayi University, Taiwan; [2]Institute of Ecology and Evolutionary Biology, National Taiwan University, Taiwan; [3]Taiwan Forestry Research Institute, Taiwan

* Presenting author: wcchao@mail.ncyu.edu.tw

A geo-referenced database of 1,336,029 records was compiled for the flora of Taiwan, based on the plant distribution information from four major herbaria and two biological resource inventory projects. Taiwan is a continental island on the Tropic of Cancer with an area of 35,980 km^2. More than 73% of the land is occupied by hills and mountains, and the central ridge of Taiwan is nearly 4000 m high. The dynamic environment creates diverse topography and habitats harboring over 4200 vascular plant species, of which 1052 (22.9%) are endemic to Taiwan. The land of Taiwan island and its associated islets was divided into 1575 geographical 5 × 5 km grids using a Geographic Information System (GIS). Information on species composition, richness and endemic percentage was incorporated for 1345 of the grids, which contain more than 50 records per grid. The results clearly showed that the mid-altitude mountains and Orchid Islet are the most species-rich areas of Taiwan, despite of some missing information on remote mountain grids. The spatial pattern of endemic percentage showed a positive relationship with increasing elevation, from 4% in the lowland area to around 60% in the central mountain ridge. We also found that 1148 of native species, accounting for 24.98% of the flora of Taiwan, showed an eastern Asiatic distribution pattern, whereas 1016 species (22.11%) have a tropical Asiatic distribution pattern. Such two distributional types of species also represented different spatial patterns in Taiwan. The eastern Asiatic species are concentrated in the middle altitude mountains, especially in the central and northern part of Taiwan. The tropical Asiatic species are concentrated in the southernmost tip, Henchun, and Orchid Islet, and decrease progressively from south to north along the latitudinal and altitudinal gradients. In addition, we also found that some areas located in the topography-isolated hills around the central mountain ridge have an extremely high composition of eastern Asiatic species, possibly because of the influence of the north-eastern monsoon and cool-temperate climatic conditions.

Chelli S.

Poster J-02

The importance of early season precipitation conditioning sub-mediterranean grassland responses to rainfall variation

Session: Patterns of vegetation change across landscapes

Stefano Chelli [1,*], Roberto Canullo [1], Giandiego Campetella [1], Armin Otto Schmitt [2], Sándor Bartha [3], Marco Cervellini [1] & Camilla Wellstein [2]

[1]Plant Diversity and Ecosystems Management Unit, School of Biosciences & Veterinary Medicine, University of Camerino, Camerino, Italy; [2]Faculty of Science and Technology, Free University of Bozen/Bolzano, Bozen/Bolzano, Italy; [3]MTA Centre for Ecological Research, Hungarian Academy of Sciences, Vácrátót, Hungary

* Presenting author: stefano.chelli@gmail.com

Background and aims: Climate change will likely modify patterns of precipitation, with an expected increase in frequency and magnitude of extreme events. The Mediterranean area seems to be very sensitive to such events, but their effect on ecosystem services, such as plant productivity, is widely unknown. Here we evaluate the short-term effect of an experimental precipitation gradient on the above ground net primary productivity (ANPP) of mesic and xeric sub-Mediterranean grassland systems over two consecutive years.

Study sites: Torricchio Nature Reserve, Central Apennines, Italy. Mesic (north-facing) and xeric (south-facing) grasslands are differentiated in geophysical and edaphic properties.

Methods: In both systems, a gradient of declining precipitation was obtained using additional rainfall, ambient rainfall and reduced rainfall for two years (2011, 2012). ANPP of the system as well as its functional groups was measured after the period of rainfall manipulation. An increase of ANPP and its variability with rainfall availability in each study year was analysed with monotonic trend tests (Jonckheere-Terpstra Test, Neuhauser-Hothorn Test).

Main results and interpretations: A significant increase of the ANPP due to increased rainfall appeared only in the mesic system in the year 2012. This response was driven by the increased productivity of perennial forbs while grasses showed little changes. Comparing our findings of two different climatic years we conclude that positive effects of an increased precipitation on ANPP could be weakened by dry springs which might influence plant growth of the entire growing season. In sum, precipitation variation can have noticeable implications for sub-Mediterranean montane grassland productivity depending on local functional group composition and the amount of early season precipitation on ANPP.

Chen T.Y.

Poster P-05

Classification of mountain lacustrine vegetation in Yilan, Taiwan

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Tze-Ying Chen [1,*], Jian-Jhong Chen [2] & Tzung-Tai Hung [1]

[1]Department of Forestry and Natural Resources, National Ilan University, Ilan, Taiwan; [2]Chiayi Forest District Office, Forestry Bureau, Council of Agriculture, Executive Yuan, Chiayi, Taiwan

* Presenting author: e82249@yahoo.com.tw

This study investigated 38 shallow lakes and palustrine wetlands in the Yilanese mountain area, Taiwan. A total of 1400 plots were sampled to answer the questions: how many mountain lacustrine vegetation types are there in Yilan and what are their habitats. Detrended correspondence analysis (DCA) and cluster analysis were applied to explore the patterns of vegetation. The concept of two-step vegetation analysis was applied in recognizing vegetation units (associations) and the results were summarized in a synoptic table. Finally similar associations were combined into higher-level vegetation units, the alliances, based on diagnostic species. The mountain lacustrine vegetation in Yilan consists of 64 associations, which can be grouped into 17 alliances. They are: *Lemna aequinoctialis* Alliance (3 associations), *Potamogeton octandrus* Alliance (3 associations), *Hydrilla verticillata* Alliance (1 association), *Ceratophyllum demersum* Alliance (1 association), *Nymphaea tetragona* Alliance (2 associations), *Eleocharis congesta* subsp. *japonica* Alliance (1 association), *Schoenoplectus mucronatus* subsp. *robustus* Alliance (4 associations), *Eleocharis dulcis* Alliance (1 association), *Hyophila propagulifera* Alliance (1 association), *Pyrrhobryum dozyanum* Alliance (3 associations), *Sphagnum junghuhnianum* Alliance (6 associations), *Carex phacota* Alliance (7 associations), *Isachne globosa* Alliance (8 associations), *Polygonum foliosum* Alliance (6 associations), *Juncus effusus* var. *decipiens* Alliance (10 associations), *Miscanthus sinensis* Alliance (5 associations) and *Salix kusanoi* Alliance (3 associations). These alliances could be further grouped into 8 formations including floating plant formation, submerged plant formation, floating-leaved plant formation, emergent plant formation, moss formation, marsh formation, tall-grass formation and swamp forest formation. These 8 formations could be sorted into 6 classes including floating plant class, submerged plant class, floating-leaved plant class, marsh class, tall-grass class and swamp forest class.

Chian Y.S.

Poster with lightning talk P-07 (young scientist)

Formalized classification of forest vegetation at southern part of Taiwan: species composition and geographic distribution

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Yi-Shin Chian [1,*], Ching-Feng Li [2], David Zelený [2], Chih-Chiang Wang [3] & Ching-Long Yeh [3]

[1]Graduate Institute of Bioresources, National Pingtung University of Science and Technology, Pingtung, Taiwan; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Department of Forestry, National Pingtung University of Science and Technology, Pingtung, Taiwan

* Presenting author: r902771@gmail.com

Southern part of Taiwan is located at the boundary of subtropical and tropical biome and hosts diverse vegetation distributed along an altitudinal gradient of more than 3000 m. Although the region has a history of several decades of vegetation surveys, the synthetic overview of vegetation types is still missing. Our aim in this study is to combine previously published knowledge about vegetation diversity in this region with our experience from field survey and available vegetation data to develop comprehensive and consistent vegetation classification system for the southern part of Taiwan, using a formalized phytosociological approach. The dataset of 727 vegetation plots used for this study was partly collected by intensive field survey and partly compiled from the National Vegetation Database of Taiwan (AS-TW-001). It covers the distribution at different temperature and moisture conditions in latitudes between 22°19'N and 22°57'N and at altitudes between 95 m and 3038 m a.s.l. The dataset contains 1353 species of vascular plants including trees, shrubs, herbs, epiphytes and lianas, and environmental factors including information about temperature, moisture and topography of each vegetation plot. In our results, we developed a conceptual framework of vegetation types structured mainly by altitude, topography and rock/soil ratio. Using various methods of data sorting, including unsupervised classification methods and unconstrained ordination, we defined number of species groups, typical for given combinations of habitat conditions. Based on these species groups, we created formalized definitions of vegetation types at the association level, defined by unequivocal assignment rules using the Cocktail Determination Key. We described differences between associations in their species composition and environmental conditions and formally described their names following the third edition of International Code of Phytosociological Nomenclature.

Cho H.

Poster J-03 (young scientist)

Differences in vegetation distribution in the drawdown zone of reservoirs according to their operation purpose

Session: Patterns of vegetation change across landscapes

HyunSuk Cho * & Kang-Hyun Cho

Department of Biological Sciences, Inha University, Incheon, Republic of Korea

* Presenting author: eghscho@naver.com

Most reservoirs in Korea were built by the constructions of dams and levees for the purpose of the flood control, the hydroelectric power generation, and the water supply. Their water levels and the other hydrological properties are controlled and affected by their operational purposes. In this study, vegetation structure and the environmental factors of geomorphology, hydrology and properties of water and soil were compared in the drawdown zone of the Korean reservoirs according to their operational purposes. The annual ranges of water level fluctuation are very diverse from 1 m to 27 m in Korean reservoirs. The water quality of reservoirs was mesotrophic or eutrophic. The range, frequency and duration of water level fluctuation were distinctive according to the usage of reservoirs. The reservoirs for flood control had a wide range and a low frequency of water fluctuation, those for waterpower generation had a narrow range and high frequency, and those for agricultural water supply had various hydrological characteristics. The result of principal component analysis with environmental factors showed that the reservoirs were differentiated by their size, water level fluctuation, water quality, and texture and organic matter of soils. From a result of vegetation analysis using canonical correspondence analysis, vegetation structures of reservoirs were classified into four groups. Emergent hydrophytes were dominant in the waterpower-generation reservoirs, floating-leaved hydrophytes were dominant in the agricultural water-supply reservoirs. Pioneer vegetation of annuals and biennials was dominant in flood-control reservoirs. *Salicaceae* vegetation was widely distributed in all types. The major environmental factors that affected vegetation structure were selected by classification and regression tree analysis. The results of this study showed that the environment and vegetation distribution of the drawdown zone were affected by the hydrological management according to the operational purpose of reservoirs in Korea. This research also provides a framework for further vegetation research in the drawdown zones with various environmental conditions.

Acknowledgements: This research was supported by a grant (12-TI-C02) from Advanced Water Management Research Program funded by Ministry of Land, Infrastructure and Transport of the Korean government.

Choung Y.

Poster P-08

Forested vegetation and successional seres in the Central-eastern Korean Peninsula

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Kyungeun Lee [1] & Yeonsook Choung [2,*]

[1]National Institute of Ecology, Seocheon, Republic of Korea; [2]Department of Biology, Kangwon National University, Chuncheon, Republic of Korea

* Presenting author: yschoung@kangwon.ac.kr

Central-eastern region, mainly belonging to Gangwon-do province, is a representative of relatively preserved forests in the Korean Peninsula. It has been considered as a core of ecosystem services in Korea. Approximately 82% of the region is covered with a wide range of vegetation types on a mountainous area. Due to remoteness and small population, it has been less disturbed and protected earlier as national parks and protected areas. In spite of such importance, vegetation classification work has not been done on the regional scale. In this study, we classified vegetation types and determined different successional seres from 455 plots. As a result of cluster analysis with species abundance values, fourteen types of vegetation are identified, which are either *Pinus densiflora* or *Quercus mongolica* dominated or form mixed stands with other broad-leaved deciduous trees such as *Quercus variabilis*, *Q. serrata*, *Tilia amurensis*, *Acer pseudo-sieboldianum*, *Carpinus laxiflora*, or occasionally with *Abies holophylla*. The different successional seres were also examined, and we proposed five seres occupying different locations, mainly combination of elevation and topographic position. In the Low/Dry-mesic sere, early *P. densiflora* stands develop to *Q. mongolica* stands and these develop to *Q. variabilis* stands at the end. In the Low/Mesic sere, early *P. densiflora* stands develop to *Carpinus laxiflora* stands via *Quercus* stands. In the Middle/Dry-mesic sere, *Q. mongolica* forms pure stands from early to late phase. In the Middle/Mesic sere, early *Q. mongolica* pure stands end in broadleaved stands or mixed stands with conifers like *Abies holophylla*. Last, in the High sere, the succession starts from pure *Q. mongolica* stands and then reaches mixed stands with *Q. mongolica*, *Tilia amurensis*, *Betula ermanii*, *Abies nephrolepis*, *Taxus cuspidata* at the end. We will discuss the forest types and seres in relation to species composition, diversity elements and regeneration patterns in the forested stands.

Chu Y.S.

Poster D-08 (young scientist)

Loss of transverse continuity and terrestrialization of shoreline vegetation by the human disturbance in a reservoir

Session: Vegetation science serving nature conservation

Yun-Soo Chu * & Kang-Hyun Cho

Department of Biological Sciences, Inha University, Incheon, Republic of Korea

* Presenting author: hjloveys@hanmail.net

The Reservoir Uiam located in the central part of Korea was constructed for the purpose of the hydroelectric power generation. The shoreline vegetation has been well developed because its annual water level fluctuation is as small as 1 m and the slope of waterfront is gentle. Recently, habitats of the shoreline vegetation have been limited because of human-induced disturbances such as construction of bike road and riprap protection structure. To understand the changes of shoreline vegetation in the Reservoir Uiam, we investigated changes in hydrology and water quality from 2004 to 2013 and flora and structure and distribution of shoreline vegetation in 2006, 2010 and 2013. Among water quality factors, only total nitrogen had a significant tendency of increase, and other factors did not show a significant change from 2004 to 2013. Changes in the species number of hydrophytes and hygrophytes were not significant but that of mesophytes increased from 2006 to 2013 in the shoreline of the Reservoir Uiam. The results of detrended correspondence analysis using vegetation data showed a tendency of decrease in hydrophytic communities and increase in hygrophytic and mesophytic communities in the reservoir from 2006 to 2013. The distribution area of shoreline vegetation in the reservoir decreased from 2010 to 2013. In particular, the distribution area of hydrophytic vegetation decreased in the littoral zone but that of hygrophytic and mesophytic vegetation increased above the waterfront of the reservoir. In conclusion, the shoreline vegetation has decreased due to the destruction of waterfront habitat and the terrestrialized vegetation has increased due to the loss of the transverse continuity from the waterbody to upland due to the riprap construction as the shoreline was recently developed in the Reservoir Uiam.

Acknowledgements: This research was supported by a grant (12-TI-C02) from Advanced Water Management Research Program funded by Ministry of Land, Infrastructure and Transport of the Korean government.

Chytrý J.

Poster with lightning talk J-04 (young scientist)

Landscape changes in the south-eastern Czech Republic (1920s–2010s) assessed using repeat photography

Session: Patterns of vegetation change across landscapes

Jan Chytrý

Gymnázium Brno-Řečkovice, Brno, Czech Republic

chytryj@gmail.com

The landscape of southern Moravia (SE Czech Republic) has undergone remarkable changes due to various human interventions and changes in land use over the last century. Historical photographs can serve as appropriate data to assess these changes and trace vegetation dynamics in the landscape. In this study I analyse the changes in vegetation and landscape by re-taking historical photographs at their original localities. The source of historical photographs was an archive of photographic slides in the Department of Botany and Zoology, Masaryk University, Brno. The slides in this archive were taken in the 1920s and 1930s and had not been used since World War II. The archive was assembled by the significant Czech botanist Professor Josef Podpěra and his collaborators. First I studied and partly sorted out this archiv with almost 7000 slides, chose photographs displaying the landscapes and vegetation of southern Moravia and digitized them. Then I searched for the localities of historical photographs in the field and took new photographs of the same landscape sections. In total, I visited 24 localities in these areas: Dyje River area (Podyjí National Park and its surroundings), Mohelno Serpentinite Steppe (Mohelenská hadcová step), Moravský Krumlov area (Krumlov-Rokytná Conglomerates), Brno area, Pouzdřany Steppe – Kolby Wood (Pouzdřanská step – Kolby), Pavlov Hills (Pavlovské vrchy) and the White Carpathians (Bílé Karpaty). Of 186 chosen historical photographs I successfully repeated 59. The results have been made available in an interactive online photoarchive at *http://botzool.sci.muni.cz/history-photos/*. The comparison of historical and recent photographs revealed considerable changes in both natural and cultural landscapes. The main processes of landscape change included: (1) extension of forest and scrub on originally open land; (2) abandonment of agricultural land in less fertile and poorly accessible areas; (3) merging of small fields into large field tracts; (4) establishment and subsequent gradual abandonment of quarries; (5) dam building and flooding of river valleys by water reservoirs; (6) urban sprawl.

Chytrý M.

Oral presentation

Vegetation of the Czech Republic: basic patterns, survey programmes and the European context

Milan Chytrý

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic
chytry@sci.muni.cz

The Czech Republic is situated mainly in the biome of the temperate broad-leaved deciduous woodland, although small areas are occupied by the continental forest-steppe. The most common types of potential natural vegetation from the lowlands to the mountains would be *Quercus* and *Carpinus betulus* forests, *Fagus sylvatica* forests, mixed *Fagus sylvatica-Abies alba-Picea abies* forests, montane *Picea abies* forests, subalpine *Pinus mugo* scrub and subalpine and alpine grasslands. Czech landscape and vegetation has been under intensive human impact since the Neolithic, resulting in the current landscape with 35% forest cover and extensive areas of arable land. Still many sites with natural or semi-natural vegetation have been preserved. Diversity of many of these vegetation types depends on human management, including one of the globally species-richest grasslands at the Carpathian foothills in the east of the country. The survey of the Czech vegetation has a long tradition since the 1920s, resulting in descriptions of many types of plant communities and maps of potential natural vegetation. Since the 1990s vegetation-plot records have been systematically collected in a national vegetation database, which is one of the largest databases of this kind in the world (currently 109,000 plots). It is also among the databases that are most intensively used for research. Based on this database, a national vegetation classification with 496 associations was developed and published in a four-volume monograph in 2007–2013. This classification is unique in that all associations are explicitly formally defined using logical formulas, which are contained in a computer expert system for automatic identification. Vegetation classification has also become a basis of the national habitat mapping at a scale of 1:10,000, which was completed in 2004 and has been regularly updated since then. Currently the experience from the Czech national vegetation survey is being extended to the European scale. A team of the IAVS Working Group European Vegetation Survey, led by experts from Masaryk University (Brno, CZ) and Alterra (Wageningen, NL), has recently established the European Vegetation Archive (EVA) a centralized European database containing over one million vegetation plots. Formalized classifications of European vegetation based on the EVA data are currently under development, partly in cooperation with European Environment Agency to support European nature conservation policies.

Cianciaruso M.

Poster A-02

Using traits, environment and phylogeny to predict plant fitness

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Marcus Cianciaruso * & Marcos B. Carlucci

Department of Ecology, ICB, Universidade Federal de Goiás, Goiânia, GO, Brazil
* Presenting author: cianciaruso@gmail.com

Understanding the hierarchy of factors that determine the fitness of species is one of major challenges for ecologists and evolutionary biologists. Species fitness is thought to be the outcome of the ecological traits and the environment in which the species occurs. Nevertheless, it is likely that the evolutionary history also explains the species ability to establish, persist, and reproduce across its range. Here we used a model selection approach to test this idea using data on 101 herbaceous species native to the UK. We investigate what are the best predictors of relative growth rate (RGR, a measure of fitness) using plant traits (seed mass, plant maximum height, and leaf dry matter content), environmental variables (Ellenberg indicator values for light, moisture, pH, nitrogen, and salt tolerance), and the phylogenetic distances among species. We found that seed mass, soil nitrogen and pH were positively related to RGR. These were the most important predictors of RGR (importance values equal 1.0 and 0.99, respectively) followed by evolutionary history (0.80). Thus, both environment and seed mass are strongly related to plant fitness, whereas evolutionary history played a minor role. Such result is predicted by evolutionary models showing that fitness traits are most closely related to ecology whereas organ-level traits should be more related to phylogeny. Indeed, we observed a phylogenetic signal only for leaf dry matter content.

Čierniková M.

Poster I-01 (young scientist)

The development of vegetation on raised bog in Martinské Hole Mts (NW Slovakia)

Special session: Long-term perspectives on vegetation change

Malvína Čierniková * & Ivana Vykouková

Department of Soil Science, Faculty of Natural Sciences, Comenius University in Bratislava, Bratislava, Slovakia

* Presenting author: ciernikova@fns.uniba.sk

Central European raised bogs at mountain summits can serve as a unique repository of information on past climates, vegetation and human activity. Our main aim was to capture the local vegetation history of the Martinské Hole Mts (NW Slovakia) and reconstruct the landscape development at the high altitudes during the Holocene. The Martinské Hole Mts. (1475 m a.s.l.) are located in the Malá Fatra Mts. The bog is surrounded by waterlogged spruce forest and is covered by hollows with *Sphagnum* (*Oxycocco-Sphagnetea*). We use the pollen analysis, ^{14}C dating and LOI analysis to evaluate the vegetation history. At the beginning of peat accumulation, in the Early Holocene, the landscape might have a character of a mosaic of *Pinus* forests with admixture of *Larix* and *Artemisia* steppes with high abundance of *Veronica*. The next development is characterised by decrease of *Pinus* because of the increased presence of the pollen of other trees, particularly *Corylus*, *Picea* and *Alnus*. The abrupt increase of *Fagus* in the next part of the pollen diagram and accumulation of organic matter suggest a presence of a hiatus. It can be caused either by human activities, or by an extreme drought causing decomposition of previously accumulated peat. The Late Holocene is represented by dominance of *Fagus* and continuous increase of *Abies* (in the second half of this period *Abies* reached its highest values). The high abundance of *Corylus* is steeply replaced here with other deciduous trees such as *Alnus*, *Ulmus*, *Quercus*, *Carpinus*, and *Fraxinus*. The local vegetation development is characterised by *Cyperaceae*, *Vaccinium* and continuous occurrence of *Sphagnum*. Initial human impact is captured by presence of *Triticum*, *Secale cereale*, *Fagopyrum esculentum*, *Centaurea cyanus* and *Lithospermum arvense* likely because of the beginning of land using. The last phase of the profile represents the recent development of the site. Human deforestation was associated mainly with the decrease of deciduous trees (*Ulmus*, *Tilia*) and *Abies*, which were probably transformed into grazed meadows. Following steep increase of *Picea* could be caused by modern planting of spruce. According to the pollen record and current observation the recent vegetation of the bog mostly consists of *Vaccinium* cover with surrounding *Picea* trees with admixture of *Pinus mugo*.

Closset-Kopp D.

Oral presentation

Walk on the wild side… seeking focal species in hedgerows to evaluate their forest corridor function

Déborah Closset-Kopp *, Safaa Wasof & Guillaume Decocq

Department of Plant Biodiversity, EDYSAN (FRE 3498 CNRS-UPJV), Jules Verne University of Picardie & CNRS, Amiens, France

* Presenting author: deborah.closset-kopp@u-picardie.fr

Forest fragmentation is one of the main threats to biodiversity in agricultural landscapes. Forest metacommunity functioning relies on the possibility for species to disperse among forest fragments. Whether linear wooded habitats such as hedgerows could act as efficient corridors for forest herb species and facilitate their movements across the landscape is still controversial. Habitat quality in hedgerows indeed differs from forest patches and is strongly constrained by surrounding agriculture. Moreover, many forest specialists are dispersal-limited. When conserving and re-establishing connections between semi-natural habitats fragments, it is challenging to find relevant indicators of corridor functioning. This study was conducted in two contrasting agricultural landscapes of N France (openfield and “bocage”). From the regional forest species pool (including specialists and generalists) we successively (i) distributed species among socio-ecological groups using BASEFLOR database, (ii) extracted a set of traits accounting for dispersal capacities from the LEDA database, and (iii) computed their rarity in the study area. For each group, we retained the focal species as the most dispersal-limited with a mid frequency. To test how far focal species adequately reflected species richness and composition (as sorted by DCA axes) of hedgerows, hence their corridor potential, we computed correlations between predicted vs. observed values. The results were compared with those obtained with the same number of species randomly selected from the regional forest species pool. The difference between predicted and observed richness was further investigated for each socio-ecological group using General Linear Models and a set of explanatory variables describing hedgerow structure and landscape composition. Finally, we compared species restricted to forest fragments to those also found in hedgerows with respect of their Ellenberg indicator values and dispersal traits. The focal species approach performed better than a pure random approach. All forest herb species may occur in hedgerows and their actual absence can be explained by a low habitat quality but not by their dispersal traits. We conclude that focal species can be a valuable tool to assess the efficiency of hedgerows as forest corridors in agricultural landscape. This efficiency increases as hedgerows are older and/or larger and when the management intensity of adjacent lands decreases.

Coetzee A.

Oral presentation (young scientist)

Investigating the influence of pollination on *Proteaceae* community structure in the Cape Floristic Region, South Africa

Anina Coetzee * & Anton Pauw

Department of Botany and Zoology, Stellenbosch University, Stellenbosch, South Africa

* Presenting author: coetzeeaninaz@gmail.com

The influence of environmental factors in structuring communities is relatively well-studied, but evidence is growing that biotic interactions, particularly pollination-related interactions, can also affect community assembly. We expect pollination to play a role in the community structuring of the floristically diverse *Proteaceae* occurring in the Cape Floristic Region, a biodiversity hotspot in South Africa. Using the Protea Atlas Project data, we investigated the distribution patterns of pollination syndromes, style lengths and flowering phenology in 337 *Proteaceae* species in an area of 8000 km^2. Two null models were used; one assumes complete spatial randomness, while the other preserves spatial autocorrelation. The patterns were analysed at different spatial scales (500 m diameter plots and 8 × 8 km grid cells) for all the species of the family, and then for species of the largest genera and the pollination syndrome groups separately. We discuss the distribution patterns found, as well as which pollination-related traits and which subgroup of species seem to contribute most to the patterns.

Conradi T.

Oral presentation (young scientist)

Beta diversity in human-transformed landscapes: the roles of resource competition, environmental filtering, landscape structure and historical contingency

Timo Conradi [1,*], Vicky M. Temperton [2,3] & Johannes Kollmann [1]

[1]Department of Ecology and Ecosystem Management, Technische Universität München, Freising, Germany; [2]Plant Sciences, Forschungszentrum Jülich, Jülich, Germany; [3]Institute of Ecology, Leuphana University Lüneburg, Lüneburg, Germany

* Presenting author: timo.conradi@tum.de

Recognizing that beta diversity has two components, richness differences and species replacement, allows evaluating the roles of alternative mechanisms that might control diversity patterns. We test competing theories about how resource competition, environmental filtering, landscape context and historical factors regulate beta diversity in human-transformed grassland landscapes in south Germany. We found that beta diversity is mainly driven by environmental filtering rather than competitive exclusion as a result of resource competition. Moreover, our results reveal a strong role of historical contingency, emphasizing that current beta diversity patterns in transformed landscapes can only be understood in the light of historical landscape context. Conversely, current landscape configuration had only marginal effects on beta diversity and its components, probably indicating that an extinction debt is already paid in the study areas. Our approach not only allows testing fundamental ecological theory in the context of beta diversity studies, it also identifies opportunities for conservation and restoration in human-transformed landscapes. In the case of our study areas, it revealed that assisted colonization during early stages of habitat restoration can effectively promote the persistence of desired species combinations, but that environmental filtering sets clear limits to such efforts.

Conti L.

Oral presentation (young scientist)

Changes in functional trait patterns, competition and invasion success under different stress levels: disentangling their relationships with an experimental approach

Luisa Conti [1,*], Svenja Block [2], Madalin Parepa [2], Marta Carboni [3], Tamara Münkemüller [3], Wilfried Thuiller [3], Alicia T.R. Acosta [1] & Oliver Bossdorf [2]

[1]Dipartimento di Scienze, Università degli Studi di Roma Tre, Roma, Italy; [2]Plant Evolutionary Ecology, University of Tübingen, Tübingen, Germany; [3]Laboratoire d'Ecologie Alpine Universite Joseph Fourier/CNRS Grenoble BP 53, Grenoble, France

* Presenting author: luisa.conti@gmail.com

Understanding how changing environmental conditions influence plant community assembly processes and invasion success is a major challenge in community ecology. Recently, this relationship has been inferred by analyzing functional trait patterns but few have experimentally tested it. Our project aims to test, through a mesocosm experiment, the relationship between success of invaders and their mean functional distance to their native neighbors, while testing the effect of changing aridity stress levels on this relationship. We planted six replicates of each of 25 different exotic ornamentals with and without native European grassland communities and under different aridity stress levels. The stress treatments were created manually by applying different water quantities: normal and reduced. Leaf, height and seed traits were measured in each replicate for the ornamentals and in at least 20 individuals per species per treatment for each of the nine species in the native community. We calculated the Weighted Mean Distance to Native Species (WMDNS) for each exotic individual, weighted by the individual biomass of each of the native species present in the pot. In each replicate we quantified success by measuring survival span, dried aboveground biomass and flowering. Absolute success is defined as the success of the ornamental in the community while the relative success is the difference of success between the ornamental growing in the community and growing alone. We compared each of the measures of success s to the functional distance in interaction with the treatment through Mixed Effect Models. The results suggest that exotic species that were functionally distant from the native community had higher absolute success rates. This trend was much less pronounced in the stressed treatment. Furthermore there was a significant effect of treatment on the relative success rate of the ornamentals, indicating that the strength of competition exerted by the native community was much stronger in the non-stressed treatment. These results are in line with the hypothesis that a native community can competitively exclude functionally similar species and that the strength of this competitive effect decreases in stressed conditions. Our findings offer promising support for the application of functional similarity metrics to infer invasion processes and their variation along environmental gradients.

Culmsee H.

Oral presentation

Wilderness in Natura 2000: transforming conflicts in conservation management approaches to synergy effects

Heike Culmsee

DBU Natural Heritage, German Federal Foundation for the Environment, Osnabrück, Germany

h.culmsee@dbu.de

Europe is one of the most densely populated areas in the world and European nature is to a large extent shaped by long-term human interventions. Natura 2000, the European network of protected areas, protects high biodiversity value across Europe. Sites within Natura 2000 reflect both habitats of high conservation concern created by historical land uses and dependent on current management, but Natura 2000 also includes places that are in a relatively undisturbed natural state. In the latter, species and habitats of conservation concern are in good conditions if human intervention is reduced to a minimum in order to allow natural processes to predominate. Natural processes require sufficiently large areas to allow for dynamic changes over time and space, thus wilderness areas larger than 1000 ha are promoted in "rewilding" Europe. Such large-scale non-intervention management (set aside) needed for (forest) wilderness areas may lead to conflicts with the conservation of ecologically valuable habitat types that are partly (e.g. fens, open dunes with herbaceous vegetation) or fully (e.g. heathland, grasslands) dependent on management. The German Natural Heritage comprises ca. 125,000 ha of outstanding protected areas in natural and semi-natural environments all over Germany. Conflicts arising from promoting wilderness in Natura 2000 are solved in Natural Heritage areas by a systematic conservation planning approach. A standardised vegetation mapping and monitoring protocol was developed which ensures high quality of vegetation data allowing for identifying spatially explicit priority areas (biodiversity hotspots of both species and habitat types) and for analysing future development options under different management scenarios (spatial modelling under consideration of environmental gradients and local species pools). Dynamic conservation approaches are discussed and decision making processes are presented that lead to synergy effects of wilderness in Natura 2000.

Ćušterevska R.

Poster P-09

Differentiation of the classes *Daphno-Festucetea* and *Elyno-Seslerietea* in the southern part of the Balkan Peninsula

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Renata Ćušterevska [1,*], Vlado Matevski [1,2], Mitko Kostadinovski [1] & Andraž Čarni [3]

[1]Institute of Biology, Faculty of Natural Sciences and Mathematics, University of Ss. Cyril and Methodius, Skopje, Republic of Macedonia; [2]Macedonian Academy of Sciences and Arts, Skopje, Republic of Macedonia; [3]Institute of Biology, Scientific Research Center of the Slovenian Academy of Sciences and Arts, Ljubljana, Slovenia; [4] University of Nova Gorica, Nova Gorica, Slovenia

* Presenting author: renatapmf@yahoo.com

Our study deals with the (sub-)alpine grasslands vegetation of the *Elyno-Seslerietea* and the oromediterranean grasslands of the *Dapho-Festucetea*. The class *Elyno-Seslerietea*, represented by the order *Onobychido-Seslerietalia* in the study area, occurs in the north and the class *Daphno-Festucetea*, represented by the order *Daphno-Festucetetalia* in the south. In the southern Balkans, the main regional gradient is between the south and north: the southern part is dominated by the Mediterranean climate, whereas the northern part in under influence of continental climate. The aim of the study is to assess the diversity of high-mountain vegetation over carbonate bedrock. We tried to locate the transitional zone between these two classes (being part of two floristic regions: Alpine-high-Nordic and Mediterranean). The main floristic, structural and chorological features and their changes along the climatic and altitudinal gradient are presented. For this purpose, we have built a database containing about 750 relevés (600 from the literature and 150 done in the field). At the same time we prepared several additional databases containing climatic, geomorphological, structural and chorological features. Then we preformed various numerical analyses and compared results with several other studies and drew conclusions. In the most southern parts of Balkans oromediterranean grasslands of the *Daphno-Festucetea* occur. In the central parts of the Balkans, where the influence of the Mediterranean is reduced, they appear sporadically depending on microclimate conditions and slope aspect. While they are found in the oromediterranean belt at 2,750 m (Olympus) in the south, they can be found in the montane-subalpine belt at the altitude of 1500–1750 m in more continental parts of the Balkans. On the top of the mountains in the central part of the Balkan the *Elyno-Seslerietea* vegetation appears and replaces the *Daphno-Festucetea* entirely towards the north. Vegetation change in the southern Balkan mountains from xeric grasslands and tragacanthic vegetation (*Daphno-Festucetea*) in the south to (sub-)alpine swards of the nemoral zone (*Elyno-Seslerietea*) is induced by climatic differences. In the south there is extremely intense solar radiation, strong winds and a remarkable summer drought, whereas in the north there are low temperatures, high snow cover and short growing season. This is also reflected in species composition, structural and chorological features.

Czarniecka M.

Poster O-03 (young scientist)

Influence of alien species on biodiversity of mesic-meadows in the Sudeten Mts.

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Marta Czarniecka * & Zygmunt Kącki

Polish Vegetation Database, Department of Botany, University of Wrocław, Wrocław, Poland

* Presenting author: m.czarniecka86@gmail.com

The expansion of alien species is one of the most important ecological problems relating to the conservation of biodiversity. Relations between the occurrence of alien species and the species composition of meadows are one of the poorly known aspects of these valuable plant communities. The expansion of alien species in the meadows is often associated with land-use change. The primary objective of this study is to understand: (1) the effect of alien species on the floristic diversity of meadows, (2) the importance of landscape context in plant invasion process. Vegetation data were collected using nested plots. Selection of plots was done in GIS on the basis of the digital terrain model and vector layers including information on where grassland areas occur in the Sudeten Mountains. Five point locations in meadow areas were randomly selected in each square of a 10 × 10 km grid. Within a circle with a radius of 250 m around each point, two nested plots (one plot with alien species and the other without) were sampled. Additionally, data on landscape context were gathered for each plot and circle, including information on the occurrence of trees, roads and other landscape elements. The results show that *Solidago canadensis*, *S. gigantea* and *Lupinus polyphyllus* are the most widely distributed alien species in meadow communities of the Sudeten Mts. The presence of alien species is affected by the landscape context and meadows with and without alien species differ in their species richness.

Czortek P.

Poster E-02 (young scientist)

Impact of tourism and cessation of grazing on changes in the flora of summits in the Tatra Mountains

Session: Global change and vegetation dynamics: the use of historical data sets

Patryk Czortek [1,*], John-Arvid Grytnes [2], Anna Delimat [3] & Bogdan Jaroszewicz [4]

[1]Department of Biology, University of Warsaw, Warsaw, Poland; [2]Department of Biology, University of Bergen, Bergen, Norway; [3]Institute of Nature Conservation, Polish Academy of Sciences, Kraków, Poland; [4]Department of Biology, University of Warsaw, Warsaw, Poland

* Presenting author: patrykczortek@biol.uw.edu.pl

The development of tourism in the Tatras is strictly associated with history of settlement. The first visitors explored the Tatra Mountains in the second half of the 16th century. Most of them came into the area for purposes of settlement and among them prevailed the shepherds. Initially the valleys and summits at low altitudes were explored. Over the centuries sheep grazed at higher altitudes, however the number of inhabitants and visitors remained low in the area. Only since the 1950s mass tourism developed and the pastoralism turned down, and in the middle of the 20th century, most of the Tatra's alpine grasslands was not grazed. The aim of this study is to determine whether observed changes in the flora of 14 selected summits can be explained by tourism and change in pastoralism. The current summit flora survey was compared with surveys from the years 1854–1948. We compared changes in species composition (beta diversity) and change in average ecological indicator values of vascular plants, with information on the number of visitors and grazing intensity. Principal components analysis and linear regression analyses were done. The beta diversity increased with increasing number of visitors on the summits and decreased with increasing summit altitude. We did not find significant correlation between tourism intensity and changes in the mean value of the ecological indicators.

Daibes L.F.

Poster J-05 (young scientist)

How does fire heterogeneity drive seed mortality in Cerrado?

Session: Patterns of vegetation change across landscapes

Luis Felipe Daibes [1,*], Elizabeth Gorgone-Barbosa [1], Fernando A.O. Silveira [2] & Alessandra Fidelis [1]

[1]Departamento de Botânica, Universidade Estadual Paulista, Rio Claro, SP, Brazil; [2]Departamento de Botânica, Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil

* Presenting author: luipedaibes@gmail.com

Fire is a major disturbance shaping plant traits in many ecosystems worldwide, but surprisingly key knowledge on fire ecology is missing from the savannas of central Brazil. We aimed to evaluate (1) how does vegetation percentage cover (bare soil, dead biomass and grass cover) drive fire parameters in a heterogeneous environment and (2) how does fire temperature and residence time affect seed germination and mortality on the soil surface, using two dominant legume shrub species, *Mimosa leiocephala* and *Harpalyce brasiliana*. The field experiment was performed in Central Brazil, in open Cerrado grassland. Four 12-m long transects were set into each of four 15 × 20 m experimental burning plots. At each meter, a dish containing 10 seeds from each species was placed into a 0.5 × 0.5 m subplot. Dishes were filled with local soil and seeds sown at the surface. Fire temperatures were measured by thermocouple sensors (placed in each subplot) and vegetation cover percentage was visually estimated. After fire passage, dishes containing seeds were taken to the laboratory and seeds were set to germinate under optimum conditions (27 °C, 12/12h light) for four weeks. After that, a tetrazolium test was applied to non-germinants to confirm embryo death. Regression analysis was used to explore relationships between vegetation cover and fire parameters and also between fire parameters and seed mortality. We found lower values for fire temperature and residence time (seconds > 100 °C) with increasing percentage of bare soil. Dead biomass and grass cover did not explain any of the fire parameters. Lower temperatures resulted in higher survival probability. Maximum fire temperatures explained 28 and 18% of seed mortality of *M. leiocephala* and *H. brasiliana*, respectively. Thus, the pre-fire vegetation gaps lead to less intense fires and reduced seed mortality for both species. Our data suggest that environmental heterogeneity plays a hitherto unrecognized role in determining seed fate and that fire effects on seed germination may be more complex than previously thought.

Daniel H.

Oral presentation

Does fragmentation of woodland habitats influence plant distribution along an urban rural gradient?

Special session: Urban vegetation

Hervé Daniel [1,*], Joséphine Pithon [2], Guillaume Pain [2] & Véronique Beaujouan [1]

[1]Agrocampus Ouest, Research Unit Landscape and Ecology, Angers, France; [2]Ecole Supérieure d'Agriculture d'Angers, Research Unit Landscape and Ecology, Angers, France

* Presenting author: herve.daniel@agrocampus-ouest.fr

The effect of urbanization on plant species distribution has been extensively documented, but a main challenge is to better understand processes involved. Habitat fragmentation is recognized as one major consequence of urbanization. However, the response of plants to fragmentation remains largely unknown and it is necessary to determine the relative influence of local environment vs. dispersal on contrasting plant species distributions in urban and rural areas. This question is important for guiding management of biodiversity in urban areas and particularly for assessing the potential efficiency of greenways. The aim of this study is to determine the influence of the isolation between patches of woodland habitats on the distribution of plants along an urban-rural gradient. The study was carried out in three cities of western part of France (Angers, Nantes and Rennes). Over 500 woodland habitat patches (over 200 m², with low level of management and dominated by spontaneous vegetation) were sampled according to (1) the urban-rural gradient and (2) the degree of woodland isolation. We visited all patches and collected presence/absence data of 70 plant species (selected by degree of specialization in forest habitats) and habitat characteristics reflecting the intensity of management. Each site was also characterized by surrounding land cover, by indices of habitat connectivity and by its historical land cover (in the 1960s, assessed by aerial photography). The relationships of plant richness and distribution with patches characteristics were analyzed by regression models and multivariate analysis. Both urban-rural gradient and patches isolation had major effects on plant distribution. Plant richness of woodland patches decrease with their area, but specialist forest species remains present in small urban sites and their distribution can be significantly explained by the degree of patches isolation. Our study underlines that habitat fragmentation must also be taken into account for plant biodiversity in urban context and it may contribute to the design and the development of urban green infrastructure.

Darvand R.

Poster with lightning talk P-10

Assessing associations between species and groups of sites in vegetation classification

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Omid Esmailzadeh, Rezgar Darvand * & Hamed Asadi

Department of Forestry, Faculty of Natural Resources, Tarbiat Modares University, Noor, Iran

* Presenting author: rezgardarvand@yahoo.com

There are many indices to assess associations between species and groups of sites in order to identify diagnostic species. In this study, we introduced 11 species-site group association indices and evaluated their quality using a TFVI model and four numerical criteria, including average positive fidelity, sharpness, uniqueness and crispness based on of 168 relevés of *Buxus hyrcana* habitats. We used modified TWINSPAN classification of 168 relevés (nine vegetation community/site groups) in order to determining species fidelity value. The results showed that new classification obtained from the assignment of relevés using TFVI model based on IndVal, UbinB and Ochiai indices had the highest amounts of fourfold criteria in evaluating classification quality and they had higher quality than the other indices from this point of view. Also, results of cluster analysis and principal component analysis (PCA) showed that 11 species-site group association indices can be divided into four groups. Scatter plot of association indices along the first two axes in PCA with eigenvalues 0.556 and 0.365 explained 92% of total variation. Species fidelity values based on IndVal and Ochiai indices were similar and they were distinct noticeably from the other indices. In general, the results of this study revealed that IndVal and Ochiai indices have the higher priority in determining diagnostic species of vegetation communities than the other association indices.

de Bello F.

Oral presentation

A field validation of species pool and dark diversity estimations

Special session: The relevance of “dark diversity” for theoretical and applied ecology

Francesco de Bello [1,2,*], Petra Janečková [2], Petr Šmilauer [3], Štěpán Janeček [2], Mária Májeková [4] & Jan Lepš [1]

[1]Department of Botany, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [2]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [3]Department of Ecosystem Biology, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [4]Department of Soil Science, Comenius University in Bratislava, Bratislava, Slovakia

* Presenting author: fradebello@ctfc.es

Plant ecological theory and biodiversity conservation have traditionally relied on the number of species observed within vegetation sampling units. This observed diversity however represents only a portion of the species that actually can inhabit a site, i.e. some species can remain undetected because of incomplete biodiversity monitoring, dispersal limitation or because biotic and abiotic conditions on the site might not temporarily allow some species to establish a detectable population. The species that are absent from a sample unit in a site, but belong to its potential species pool, constitute the “dark diversity” of the site. Knowledge about dark diversity can allow meaningful biodiversity comparisons and large-scale conservation planning. Several quantitative approaches were developed to predict species pools and dark diversity, but it is unclear how to validate them, since dark diversity is built up by species that were not observed. We followed an approach by which we sampled species composition in different vegetation types (41 sampling units, half in forests and half in grassland with different alliances within each type), using recommended size of sample plots within each type. We then extended this first sampling by four times the area already sampled. We tested different methods to estimate species pools and dark diversity of a site using the data at the smaller scale. We used the species found at bigger scale (those absent from the smaller scale) to validate predicted species lists. We compared three estimations of species pool to assess which method, or their combination, better predicted species expected at the larger scale sampling. The methods, using large vegetation plots database as a reference, were based on (1) species co-occurrence matrices (Beals smoothing), (2) species ecological preferences (Ellenberg values) and, with a new method, (3) species composition prediction based on unconstrained ordination analyses. Results show some moderate success in predictions of dark diversity. Particularly, the combination of methods seem to offer the most promising way to deal with operational estimations of the species which were not detected by a classical sampling units. We discuss these results, and existing mismatches, in the context of measurements of dark diversity and species pools and their implications for the assessment of community assembly, including community saturation.

De Cáceres M.

Oral presentation

Classification of vegetation using both the structure and composition of plant communities

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Miquel De Cáceres [1,2,*], Susan K. Wiser [3], Santiago Martín-Alcón [1], José Ramón González-Olabarria [1] & Lluís Coll [1,2]

[1]CTFC-CEMFOR (Forest Sciences Center of Catalonia), Solsona, Spain; [2]CREAF, Cerdanyola del Vallès, Spain; [3]Landcare Research, Lincoln, New Zealand

* Presenting author: miquelcaceres@gmail.com

Numerical classification of vegetation is often based on species composition and the starting point for calculations is usually a site-by-species data table. Depending on the purpose of the classification, however, structural characteristics such as trunk diameter or the height of constituent plants may be also important classification criteria complementing community composition. Our aim in this contribution is to show how both criteria can be simultaneously considered in numerical classification analyses. By adopting a framework that generalises conventional resemblance measurements, we present two examples of numerical classification exercises where community composition and the size of plants are both taken into account to define vegetation types. In the first example, we use Spanish forest inventory data to create a forest typology aimed to be useful under a context of forest management. For this purpose, forest types are defined according to tree species composition and the bivariate distribution of tree heights and tree diameters. In the second example, we use New Zealand’s vegetation plot data, sampled by strata, to define broad vegetation types with a physiognomic perspective. In this classification exercise, growth form, leaf phenology and leaf shape are used to define compositional categories from species identity, whereas the vegetation stratum reached by plants is taken as structural variable. The examples presented illustrate that the same classification framework can be adopted in very different situations, by specifying user’s choices regarding abundance measure, structural variable(s) and compositional classes.

De Cáceres M.

Poster with lightning talk P-11

A comparative framework for broad-scale plot-based vegetation classification

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Miquel De Cáceres [1,*], Milan Chytrý [2], Emiliano Agrillo [3], Fabio Attorre [3], Zoltán Botta-Dukát [4], Jorge Capelo [5], Bálint Czúcz [4], Jürgen Dengler [6,7], Jörg Ewald [8], Don Faber-Langendoen [9], Enrico Feoli [10], Scott B. Franklin [11], Rosario Gavilán [12], François Gillet [13], Florian Jansen [14], Borja Jiménez-Alfaro [2], Pavel Krestov [15], Flavia Landucci [2], Attila Lengyel [4], Javier Loidi [16], Ladislav Mucina [17], Robert K. Peet [18], David W. Roberts [19], Jan Roleček [20], Joop H.J. Schaminée [21], Sebastian Schmidtlein [22], Jean-Paul Theurillat [23, 24], Lubomír Tichý [2], Donald A. Walker [25], Otto Wildi [26], Wolfgang Willner [27] & Susan K. Wiser [28]

[1]Forest Science Center of Catalonia, Solsona, Spain; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Department of Environmental Biology, Sapienza University of Roma, Roma, Italy; [4]Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary; [5]Instituto Nacional de Investigação Agrária e Veterinária, Herbarium, Oeiras, Portugal; [6]Disturbance Ecology, Bayreuth Center of Ecology and Environmental Research, University of Bayreuth, Bayreuth, Germany; [7]Synthesis Centre, German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany; [8]Faculty of Forestry, University of Applied Sciences Weihenstephan-Triesdorf, Freising, Germany; [9]Conservation Science Division, NatureServe, Arlington, USA; [10]Department of Life Sciences, University of Trieste, Trieste, Italy; [11]School of Biological Sciences, University of Northern Colorado, Greeley, USA; [12]Departamento de Biología Vegetal II, Facultad de Farmacia, Universidad Complutense, Madrid, Spain; [13]UMR 6249 Chrono-environnement, University of Franche-Comté – CNRS, Besançon, France; [14]Institute of Botany and Landscape Ecology, University of Greifswald, Greifswald, Germany; [15]Botanical Garden-Institute of the Far Eastern Branch of the Russian Academy of Sciences, Vladivostok, Russia; [16]Department of Plant Biology and Ecology, University of the Basque Country, Bilbao, Spain; [17]School of Plant Biology, The University of Western Australia, Perth, Australia; [18]Department of Biology, University of North Carolina, Chapel Hill, USA; [19]Ecology Department, Montana State University, Bozeman, USA; [20]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [21]Alterra WUR and Radboud University Nijmegen, Wageningen, The Netherlands; [22]Institute of Geography and Geoecology, Karlsruhe Institute of Technology, Karlsruhe, Germany; [23]Fondation J.-M. Aubert, Champex-Lac, Switzerland; [24]Section de Biologie, Université de Genève, Chambésy, Switzerland; [25]Institute of Arctic Biology and Department of Biology and Wildlife, University of Alaska Fairbanks, Fairbanks, USA; [26]Biodiversity and Conservation Ecology; WSL Swiss Federal Institute of Forest, Snow and Landscape Research, Birmensdorf, Switzerland; [27]Vienna Institute for Nature Conservation and Analyses, Vienna, Austria; [28]Landcare Research, Lincoln, New Zealand

* Presenting author: miquelcaceres@gmail.com

Classification of vegetation is an essential tool to describe, understand, predict and manage biodiversity. Given the multiplicity of approaches to classify vegetation, it is important to develop international consensus around a set of general guidelines and purpose-specific standard protocols. Before these goals can be achieved, however, it is necessary to identify and understand the different choices that are made during the process of classifying vegetation. Starting in a workshop sponsored by IAVS and held in Rome in 2013, we have been discussing around concepts, criteria and current standards in the field of classification of vegetation, with the aim to find commonalities between different broad-scale plot-based approaches and, ultimately, promote the adoption of international standards. As a first outcome of this collaborative process, we present a conceptual framework aimed at facilitating comparisons between classification approaches. Our framework is based on the distinction of four structural elements (plot record, vegetation type, consistent classification section and classification system) and two procedural elements (classification protocol and classification approach). For each element we describe essential properties that can be used for comparisons. This framework should be useful for understanding and comparing plot-based vegetation classification approaches, as well as for integrating classification systems and their sections. After briefly describing the comparative framework, we will enumerate the steps that, in our opinion, are still needed in order to advance towards the integration of existing classification systems and the promotion of classification approaches with international acceptance.

Deák Á.J.

Poster J-06

The role of geographical background in the vegetation pattern of Southeast Hungary

Session: Patterns of vegetation change across landscapes

Áron József Deák

Department of Physical Geography and Geoinformatics, University of Szeged, Szeged, Hungary
aron@geo.u-szeged.hu

The local and landscape-level vegetation pattern of Southeast Hungary was mapped by recent vegetation surveys (MÉTA-mapping, survey of Natura 2000 sites) using Hungary's General National Habitat Classification System (ÁNÉR). This field experience made it possible to determine landscape-level habitat complexes, vegetation types and revise the country-level vegetation map of Hungary by using GIS technology. On the mesoregional scale the surface deposits are the key factor in the differentiation of the landscape-level habitat pattern, namely sand, loess and floodplain vegetation landscape main-types can be determined. The habitat composition of Pannonic salt steppes and salt marshes differs according to the surface deposits as well. In loess landscapes the *Artemisia* salt steppes are indicator habitats. The large percentages of *Achillea* steppes and tall-herb salt meadow steppes are typical in salty low floodplains formed after the regulation of river channels. The dry short-grass salt steppes are absent in the salt vegetation of sandlands, where only salt meadows, *Puccinellia* and annual salt pioneer swards appear beside the salt marshes. On the microregion-level the geomorphology, the water supply, the salt content of soils and the land-use have important effects on the pattern of the vegetation. The geomorphology determines the available water and the concentration of Na-salts as well. The vegetation pattern of the blow-out depressions of the Dorozsma-Majsaian Sand-ridge is influenced by groundwater-flows. *Molinia* fens cover the northwestern part of the depressions, where groundwater-flows reach the surface. They are turned to salt meadows and further to *Puccinellia* swards in the southeastern parts of the depressions. This pattern means soil-type, pH, salt and organic material gradients as well. Similar landscape-level pattern was observed on microchor-level as in the eastern parts the salt vegetation dominates the depressions, while westwards the *Molinia* fens are more typical, the tussock sedge communities also appear, but salt communities are weakly represented mainly just with salt meadows. The erosion of the Pleistocene point-bars and levees of loess ridges results in an extremely micro-mosaic vegetation pattern at their bottom as the salty sub-soil appears on the surface. Due to forest logging the woodlands are rare in the sand and loess landscapes, but as a result of secondary regeneration willow-poplar forest are common in the floodplains inside the dykes.

Deák B.

Oral presentation

The role of cultural monuments in nature conservation: barrows as refugia for steppe vegetation

Balázs Deák [1,*], Béla Tóthmérész [1], Orsolya Valkó [2], Barbara Sudnik-Wójcikowska [3], Ivan I. Moysiyenko [4], Tatyana M. Bragina [5,6], Iva Apostolova [7], Nikolay Bykov [8], Iwona Dembicz [3] & Péter Török [2]

[1]MTA-DE Biodiversity and Ecosystem Services Research Group, Debrecen, Hungary; [2]Department of Ecology, University of Debrecen, Debrecen, Hungary; [3]Department of Plant Ecology and Environment Conservation, University of Warsaw, Warsaw, Poland; [4]Department of Botany, Kherson State University, Kherson, Ukraine; [5]Kostanay State Pedagogical Institute, Kostanay, Kazakhstan; [6]Southern Federal University, Rostov on Don, Russia; [7]Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia, Bulgaria; [8]Faculty of Geography, Altay State University, Barnaul, Russia

* Presenting author: debalazs@gmail.com

Steppe is one of the most endangered biome in the world, less than 25% of its original area remained. They have been destroyed mainly by agricultural intensification and urbanisation. Nowadays steppe vegetation is often restricted to small fragments generally inadequate for arable farming like barrows, which are ancient soil monuments of the steppe region. Our goal was to collect the existing knowledge on these barrows, focusing on their distribution, vegetation and threatening factors, and to highlight the necessity of their effective protection. Despite their small size (generally up to a few hectares) barrows are characterised by high microhabitat diversity and play a crucial role in preserving steppe vegetation especially in intensively managed agricultural landscapes. Kurgans hold endangered desert, grass-, herb-grass- and forest steppe habitats. They harbour many red listed species such as *Adonis vernalis*, *Amygdalus nana*, *Echium russicum* and *Tulipa schrenkii* which are extinct in the surrounding areas. Barrows represent a unique nature conservation and historical value, but their protection is not guaranteed in most regions. According to our estimations, 250,000 barrows remained in the whole steppe and forest steppe zone, which is only the 20% of their original number. Barrows are essential for maintaining landscape-scale habitat- and species diversity, and can act as stepping stones and potential core areas for habitat restoration projects.

Decocq G.

Oral presentation

Local environmental conditions override macroclimatic factors in explaining plant species diversity of forest fragments across the European temperate biome

Alicia Valdés [1], Jonathan Lenoir [1], Kris Verheyen [2], Guillaume Decocq [1,*] & smallFOREST consortium [3]

[1]Jules Verne University of Picardie, UR Ecologie et Dynamique des Systèmes Anthropisés (EDYSAN, FRE 3498 CNRS), Amiens, France; [2]Forest & Nature Lab, Ghent University, Melle-Gontrode, Belgium; [3]http-//www.u-picardie.fr/smallforest/

* Presenting author: guillaume.decocq@u-picardie.fr

Macroclimate is a major determinant of large-scale diversity patterns, although the influence of smaller-scale factors for local diversity across large spatial extents is not well documented. We quantify the relative importance of local (patch-scale), landscape and macroclimatic drivers for herbaceous species diversity of small forest patches in agricultural landscapes along a 2500 km-long gradient across the European temperate biome, from South France to Central Sweden and Estonia. In each of eight regions along this macroclimatic gradient, we selected two 5 × 5 km landscape windows, one in an intensively cultivated landscape (openfield) and another in a less intensively managed landscape ("bocage"). All forest patches in each window were intensively surveyed for vascular plant species. Diversity of forest specialists and generalists at three levels (whole patch, sampling points in the patch and between-scales) was then related to local drivers (area, age, abiotic and biotic heterogeneity of the patch), landscape attributes (amount of forest, grasslands and hedgerows around the patch, patch isolation) and macroclimatic variables (temperature and precipitation) using generalized linear mixed models and variation partitioning for each variable group. The total amount of explained variation in diversity ranged from 8% for mean-point scale diversity of forest specialists to 54% for patch-scale diversity of generalists. Local drivers always contributed more than 60%, mainly due to the positive effect of within-patch heterogeneity on patch-scale and between-scale diversities and to the positive effect of patch age on mean-point scale diversity of forest specialists. Landscape attributes mostly contributed to the total amount of explained variation in mean-point scale diversity, being more important for forest specialists (21%) than for generalists (18%). Macroclimatic variables contributed to a maximum of 11% for mean-point scale diversity of generalists. We conclude that macroclimatic drivers poorly predict local diversity along this gradient, and herbaceous diversity is mainly driven by habitat features, with some effect of landscape structure. We show the importance of conserving old forest patches as refugia for typical forest species, and of enhancing the landscape context around the patches by reducing the degree of disturbance caused by the agricultural matrix.

Deil U.

Oral presentation

Strong phylogenetic niche conservatism in rock and cliffs habitats?

Ulrich Deil

Department of Geobotany, Faculty of Biology, University of Freiburg, Freiburg, Germany

ulrich.deil@biologie.uni-freiburg.de

Evolutionary relationships between associated species and phylogenetic niche conservatism are intensive debated by taxonomists and evolutionary biologists. Surprisingly, the role of different habitats is rarely discussed in this context. Since a long time, vegetation scientists and plant geographers consider rock habitats as evolutionary traps, as refugia for ancient lineages and as sites to survive climatic fluctuations in Earth history. Reasons are some traits in chasmophytes (mostly stress tolerators respectively perennial stayers with short distance dispersal syndromes), and two ecological features of rocks, favouring relictic vegetation and high rates of endemism: 1) Isolated mountain chains act as "sky islands", stimulating allopatric speciation and genetic drift. 2) The small scale environmental variability concerning exposure, inclination, water supply and soil depth can buffer macroclimatic changes by shifting to another microsite, a precondition for the existence of palaeoendemics on cliffs and the ancestral stock of the rock flora. Molecular methods allow new insights into the phylogeny, phylogeography and history of plant communities. This presentation will apply results of such studies to three rock vegetation types from the Western Holarctic and Palaeotropical Kingdoms: (i) Palaeo- and neoendemics in rock communities of SW Arabia (*Kleinio-Carallumetea* and *Crassulo-Aeonietea*) and the vicariance between the Eritreo-Arabian phytochorion and Macaronesia, a pattern dating back to the Upper Miocene and known as African Randflora; (ii) Cliffs and half-caves with soaking water (*Adiantetea*) sheltering vicariant species of specific lineages in *Pinguicula*, *Primula* and *Hypericum* as remnants of a pluvial period in an actual subhumid and semi-arid Mediterranean environment; (iii) Grassland on limestone (*Caricetum firmae* s.l.) in the European Alps with local endemics, indicating ice-free refugia during the last glaciation by the occurrence of taxa with poor dispersal capacity. Niche conservatism seems to play a major role in chasmophyte evolution. It results in an outstanding rate of stenochorous species and primitive taxa among saxicolous plants and in obvious examples for parallel evolution and synvivariism. Finally, the consequences of endemics and relicts for classification approaches and syntaxonomy will be discussed by the concept of Coenosyntaxa at the alliance and class-group level and by the normal respectively historical relict form for associations.

Dembicz I.

Poster J-07 (young scientist)

Kurgans as habitat islands

Session: Patterns of vegetation change across landscapes

Iwona Dembicz [1,*], Ivan I. Moysiyenko [2], Anastasia Shaposhnikova [2], Denys Vynokurov [3], Valeriy Akatov [4] & Barbara Sudnik-Wójcikowska [1]

[1]Department of Plant Ecology and Environmental Conservation, Faculty of Biology, University of Warsaw, Warsaw, Poland; [2]Department of Botany, Kherson State University, Kherson, Ukraine; [3]M.G. Kholodny Institute of Botany of the National Academy of Sciences of Ukraine, Kyiv, Ukraine; [4]Maikop State Technological Institute, Maikop, Russia

* Presenting author: i.dembicz@biol.uw.edu.pl

One of the major issues in the steppe biodiversity conservation is fragmentation and isolation of the preserved habitat patches within intensive agricultural landscape. In Ukraine less than 10% of the original steppe area survived and the remaining refuges are located far from each other. They include a few nature reserves and loess ravines and many kurgans (burial mounds, barrows) – small but relatively numerous objects with steppe vegetation. Nowadays barrows located within large cropfields are threatened with ploughing. However their role in maintaining steppe biodiversity can be relatively large if species inhabiting kurgans are proven to form metapopulations. The aim of the study was determining the influence of habitat patch size and degree of isolation on community diversity patterns at different spatial scales. Forty samples with presence-absence data on vascular plants species were collected from the slopes of kurgans (typical habitat islands) and in loess ravines as well as the steppe nature reserves (treated as a reference of continuous steppe vegetation) within an area of 15,000 km^2 located in southern Ukraine (West Pontic steppe zone). Each sample consisted of 10 × 10 m plot and 25 subplots 1 × 1 m uniformly distributed within a large plot. All noted species were divided into habitat specialists and generalists. The area and the degree of geographical isolation of the each habitat island was assessed (the latter calculated as the area of steppe vegetation in certain radius from a kurgan). Habitat specialist numbers were significantly smaller on kurgans than within reference areas both within large and small plots. The correlations between specialist species richness at large and small spatial scales and habitat island size were observed. At the same time isolation degree influenced strongly only species richness within large plots. Our study confirms that for steppe species kurgans are habitat islands according to the island biogeography theory and their specialist species richness depends on both the size of an island and the degree of its isolation. Kurgans are important refuges for steppe flora, but extinction processes could strongly reduce the number of species within the smallest and most distant ones. Only preserving whole system of steppe patches can protect populations of species functioning in this fragmented landscape.

Didukh Y.P.

Poster P-12

Phytoindicating comparison of vegetation of the Polish Tatras, the Ukrainian Carpathians and the Mountain Crimea

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Yakiv P. Didukh [1,*], I.S. Chetvertnykh [1] & Adam Boratynski [2]

[1]M.G. Kholodny Institute of Botany of NAS of Ukraine, Kyiv, Ukraine; [2]Polish Academy of Sciences, Institute of Dendrology, Kornik, Poland

* Presenting author: ya.didukh@gmail.com

Based on the synphytoindication methodology numerical scores were calculated and compared for the Polish Tatras, Ukrainian Carpathians and Mountain Crimea for 12 leading ecological factors (Didukh 2012) reflecting the gradient changes within each mountain system (β-coenodiversity) and also the location of the mountain systems in the global ecological space. In the direction from the Tatra to the Ukrainian Carpathians and Crimea the averages of thermal climate, cryo-climate and continental climate increased and humidity decreased. The climatic parameters are within 40–60% of the scales, that is optimal, comfortable conditions, although the Crimean Mountains are above the 60% in the indicators of cryo-climate because they are located in an area of the Mediterranean climate with warmer winters, and the indicators of the Tatras are above 60% by the humidity due to the impact of the humid Atlantic climate. The limiting factor of seral vegetation changes in the presence of soil is hydrothermal regime caused by the ratio of heat and moisture. Changing of continental climate and humidity is not affected by the edaphic characteristics of the Tatras and the Ukrainian Carpathians. In the arid conditions of Crimea such effects are significant because their decrease leads to increased pH and salt content of the soil. Establishing this correlation is very important for predicting possible ecosystem changes.

Diekmann M.

Oral presentation

Ecological significance of limits of species responses to soil variables

Special session: Species and plant community responses along soil gradients

Martin Diekmann *, Jana Michaelis & Angela Pannek

Vegetation Ecology and Conservation Biology, Institute of Ecology, University of Bremen, Bremen, Germany

* Presenting author: mdiekman@uni-bremen.de

The ecological behaviour of plant species is most often characterized by the optima of their response curves with respect to climatic and edaphic variables. These preferences of species are for example captured in indicator values which are widely used in vegetation science, especially for the interpretation of ecological conditions in sample plots. In this presentation we argue that more attention should be paid to the response limits of species, i.e. the extreme values under which species are able to survive and beyond which they are absent. This may be particularly true in landscapes facing global change in terms of altered climate or nutrient levels under which many species no longer find optimal site conditions. In this study we use vegetation data from two contrasting habitat types and analyze the responses of species of deciduous forests to soil pH, and of species of calcareous dry grasslands to soil phosphorus availability. The response limits were generally more closely related to the range sizes and threat levels of species than the response optima as reflected by measurements or Ellenberg indicator scores. Species assumed to have similar preferences showed considerable differences in their limits that again were correlated with the species' range sizes. Apart from showing that species limits are ecologically relevant, we explore whether these limits are consistent over larger spatial scales, as consistency across regions might tell us something about whether limits are caused by physiological thresholds or competition. We stress that there is an urgent need for collecting more and better soil data and for analyzing the relationships between the spatial distribution of plant species and edaphic variables, in order to identify optimal and marginal habitats of species as a pre-requisite for their successful conservation.

Divíšek J.

Poster with lightning talk C-02 (young scientist)

Modelling fine-resolution plant species richness patterns of grasslands and forests in the Czech Republic

Session: Patterns and drivers of alpha and beta diversity in plant communities

Jan Divíšek [1,2,*] & Milan Chytrý [2]

[1]Department of Geography, Masaryk University, Brno, Czech Republic; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: divisekjan@mail.muni.cz

Species richness patterns have always fascinated ecologists and numerous studies attempted to map, explain and predict species richness across large areas. Such studies usually used inventory or atlas-based data with coarse spatial resolution, because fine-resolution data were not available. Within large areas, our knowledge of species richness patterns is thus significantly limited to coarse-resolution patterns. However, recent development of large databases of vegetation plots provides an opportunity to explore distribution of species richness at very fine resolutions. Here we aim to create maps predicting fine-scale species richness of vascular plants in grassland and forest vegetation across the Czech Republic and to examine factors underlying the observed species richness patterns. We used data from the Czech National Phytosociological Database, where 27,002 georeferenced plots of grasslands and 19,764 plots of forests were available. However, data processing showed that only 15–50% of plots, depending on selection criteria applied, were suitable for modelling. To build predictive models we used Random Forest method which is considered as a very powerful tool for prediction purposes. The modelling of species richness was based on three groups of environmental variables, namely topography & geology, climate and surrounding landscape context. Resulting models explained up to 50% of variability in species richness and residuals showed neither any obvious patterns nor significant positive spatial autocorrelation. When we used our best models to predict species richness of grasslands and forests in 37,760 grid cells, each of them spanning 1.25‘ of longitude and 0.75‘ of latitude (ca. 1.39 × 1.5 km = 2.09 km^2), resulting maps showed meaningful patterns expected based on expert knowledge. The most species-rich grasslands of the Czech Republic were identified in the White Carpathians and adjacent Carpathian highlands of eastern Moravia. The highest species richness of forests was found in the limestone areas of the Bohemian and the Moravian Karst, in the Křivoklátsko region and in the central part of the volcanic mountains of České středohoří. We suggest that predictive maps based on vegetation-plot databases provide valuable insights into patterns of fine-scale species richness over large areas. Moreover, separate maps for different vegetation types can be prepared, which may reveal different patterns of species richness, each with specific drivers.

Doležal J.

Oral presentation

Vulnerability of Himalayan plants to climate change: a new approach in assessing impacts of climate change on plant migrations

Special session: Global change and vegetation dynamics: the use of historical data sets

Jiří Doležal [1,2,*], Miroslav Dvorský [1], Martin Kopecký [1], Pierre Liancourt [1], Jakub Borovec [3], Martin Macek [1], Inga Hiiesalu [1], Jan Altman [1,2], Kateřina Čapková [1,2], Zuzana Chlumská [2], Ondřej Mudrák [1], Klára Řeháková [1], Jan Wild [1] & Fritz Schweingruber [4]

[1]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [2]Department of Botany, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [3]Biology Centre, The Czech Academy of Sciences, České Budějovice, Czech Republic; [4]Swiss Federal Research Institute WSL, Birmensdorf, Switzerland

* Presenting author: jiriddolezal@gmail.com

Understanding how climate change affects plant communities is a key goal in alpine ecology. However, these impacts are rarely explored at the highest elevations with angiosperms on the Earth such as in the arid northwest Himalayas. The region has been experiencing rapid warming, but also higher occurrence of extreme snowfall events. We resurveyed subnival vegetation between 5600 and 6150 m elevation and found a significant decrease in plant cover, no major changes in richness, and compositional shift towards species preferring wetter habitats. Comparison of plant ages revealed that warming in the 1990s allowed the establishment of outpost populations up to 6150 m, about 150 m above the upper limit of continuous plant distribution. However, these outposts recently experienced high mortality due to excessive snowfalls and subsequent frost heave. Transplant experiment of 11 subnival species showed that three years after the transplantation, there were 3 species surviving at 6100 m (*Saxifraga cernua*, *S. nanella and Poa attenuata*), i.e. 210, 105 and 100 m above their respective elevation limits. All three species prefer wetter habitats. Transplant experiment indicates that the upper subnival population are in non-equilibrium state with the climate and the colonisation of higher altitudes is possible when dispersal and recruitment limitations are overcomed. We conclude that climate change in arid Himalayas produces a complex pattern of plant migration, which could be unravelled by approaches combining vegetation resurvey with anatomical age determination and transplant experiments.

Doležal J.

Poster P-13

Altitudinal changes in tropical forest vegetation on Mt. Cameroon, Western Africa

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Jiří Doležal [1,2,*], Jan Altman [1,2], Tomáš Albrecht [3], Martin Dančák [1,4], Ľuboš Majeský [4], Eric Djomo Nana [5], Ondřej Sedláček [5], Miroslav Svoboda [6] & Fritz Schweingruber [7] & David Hořák [5]

[1]Department of Functional Ecology, Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [2]Department of Botany, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [3]Department of Population Biology, Institute of Vertebrate Biology, The Czech Academy of Sciences, Studenec, Czech Republic; [4]Faculty of Science, Palacky University in Olomouc, Olomouc, Czech Republic; [5]Department of Ecology, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [6]Faculty of Forestry and Wood Science, Czech University of Life Science, Prague, Czech Republic; [7]Swiss Federal Research Institute WSL, Birmensdorf, Switzerland

* Presenting author: jiriddolezal@gmail.com

Montane tropical forests of Western Africa have been identified as biodiversity “hotspots” with extraordinary species diversity and exceptional concentrations of endemic species. However, most of the primary vegetation has been destroyed. It is estimated that 96% of the original forests in western Cameroon may have been lost. One of the largest block of surviving forests is preserved on Mt. Cameroon (4045 m, 4°13’N, 9°10’E), one of Africa’s most active volcanoes, located near the Gulf of Guinea. Here is the most complete representation of the Afromontane flora west of the Congo basin. Over 2300 species of plants from more than 800 genera and 210 families have been found in the area of only 2000 km^2. From 2011–2015 on the SW flanks of Mt. Cameroon, along an altitudinal gradient from the summit down to lowland tropical forests (4000–0 m a.s.l.), we explored: (1) plant and bird community composition, structure and diversity using a system of permanent research plots; (2) diurnal and seasonal course of radial tree growth using a Dendrometer Increment sensor and X-ray wood microdensitometry; (3) relationships between forest diversity, structure, tree growth and site climatic and edaphic conditions. Between the lowland tropical forests and the summit of Mt. Cameroon (4045 m a.s.l.), average air temperature decreases from 24 to 3 °C. Alpha diversity of woody species decreases with increasing elevation up to the treeline at 2200 m. Alpha diversity of herbs is much higher, peaking at middle elevations of the forested zone (700–1100 m). In the afroalpine savanna belt (2400–4000 m) above the treeline, mid-elevation species richness peak is observed around 3000 m elevation. The year on Mt. Cameroon is divided into two distinct seasons. The dry season runs from November to April and is warmer. In the Mt. Cameroon coastal tropical forests, due to the extreme amount of precipitation (about 10 m rainfall annually) and lack of sunshine, trees cease growing at the peak of the wet season and start intensively growing at the beginning of the dry season (which is never too dry to limit wood formation). Conversely, montane trees cease their growth during the dry season (the higher the precipitation, the higher the increment), while mid-elevation trees seem to grow best in between the two seasons. This seasonality in tree growth and flowering pattern seems to have strong impact of behaviour of other organisms such as birds.

Donnelly S.

Poster with lightning talk D-09

Does seed source matter in grassland restoration?

Session: Vegetation science serving nature conservation

Sabina Donnelly *, Lauchlan H. Fraser, Wendy Gardner, Ron Smith & Jonathan Van Hamme

Department of Biology, Thompson Rivers University, Kamloops, BC, Canada

* Presenting author: sabina.donnelly@gmail.com

Natural grassland in British Columbia, Canada occupies less than one percent of the terrestrial land base of the province, but are very important because they contain a large diversity of plant and animal species, and provide valuable ecosystem services. British Columbia grasslands are under threat from industrial development projects, urban sprawl, and overgrazing; therefore restoration of grasslands is a priority. Grassland seeds used for restoration of the predominantly bunchgrass grassland ecosystems are commonly sourced from a variety of climatic and edaphic conditions, sometimes thousands of kilometers removed from the site to be restored. This may be problematic as these can be poorly adapted to current environmental site conditions as well as future conditions altered by climate change. The goal of the project was to evaluate the importance of local seed source and to assess the potential for assisted intraspecific migration during restoration practice. We collected seeds of *Pseudoroegneria spicata* (Bluebunch wheatgrass) and *Festuca idahoensis* (Idaho fescue) from ten populations in a north to south range extending from central British Columbia to northern California. We established a common garden in Kamloops, BC and measured morphological and physiological responses of these populations, including specific leaf area (SLA), blooming date and inflorescence number and height. SLA was compared among populations to determine if significant variation in resource-use strategy existed. Our results indicated that there were underlying differences in the growth and resource use strategies between some of the *P. spicata* and *F. idahoensis*. Future work examining intraspecific competition among collected populations will create informed restoration practice for grasslands that takes into account the impacts of climate change.

Drescher A.

Poster with lightning talk J-08

Reconstructing the riparian vegetation of the Viennese Danube floodplain prior to regulation

Session: Patterns of vegetation change across landscapes

Anton Drescher [1,*] & Gregory Egger [2]

[1]Institute of Plant Sciences, University of Graz, Graz, Austria; [2]Environmental Consulting Ltd., Klagenfurt, Austria

* Presenting author: anton.drescher@uni-graz.at

Riverine vegetation is considered to be one of the most threatened ecosystems in Europe. Only few floodplains with near-natural forests have survived, e.g. upper Loire (France) and Tagliamento (northern Italy). Prior to the regulation at the end of the 19th century the Danube river stretch around Vienna was another example for an anabranching river. Modeling of the historical floodplain vegetation poses the main challenge for the restoration of floodplains. The approach presented is based on historical maps and archive data from the early 19th century, knowledge about plant traits and expert rules adapted from long-term field experience in recent floodplains. This enables to design a simplified succession model for the aggradation and sedimentation series and the organic and mineral siltation series. We also reconstructed the historical floodplain vegetation types for the six distinct succession phases. For the floristic characterization we used the flagship species concept. Flagship species (fs) of the pioneer phases on gravel banks and young islands in the active zone with increasing sandy sediments (s) along slowly floating arms are *Agrostis stolonifera* (fs, s), *Calamagrostis pseudophragmites* (fs, s), *Chlorocrepis staticifolia*, *Epilobium dodonaei*, *Hieracium piloselloides*, *Typha minima* (fs, s). Selected pioneer shrubs are *Myricaria germanica* (fs, s), *Hippophaë rhamnoides*, for the later shrub phase the willow species *Salix daphnoides*, *S. eleagnos* (fs), *S. purpurea* (fs) and *S. triandra* (fs, s). The flagship species for the woody succession phases are *Salix alba* (fs, s) along with the poplar species *Populus alba* (fs, s), *P. nigra* (fs) and *Alnus incana* (fs). The mature phase is characterized by a wider variety of woody species, among them *Ulmus minor* (fs) and *Acer campestre* (fs). The same procedure was applied for aquatic habitats, slowly floating water bodies and oxbows. The selected species cover all types of water bodies: *Nuphar lutea* (dom.), *Carex elata* (dom.), *C. acuta*, *Butomus umbellatus*, *Hydrocharis morsus-ranae* (dom.), *Glyceria aquatica* (dom.), *Phragmites australis* (dom.), *Schoenoplectus lacustris* (dom.) and *Stratiotes aloides* (dom.). All the species listed above are documented from the historic floodplain of the Viennese Danube. The area balance comparing the 1825 and 2010 vegetation cover shows an almost complete loss of the vegetation of the pioneer, shrub phases and early successional woodland phases.

Dubyna D.

Poster P-14

Syntaxonomy of vegetation of annual wetland herbs in Ukraine

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Dmyrto Dubyna *, Tetiana Dziuba & Svitlana Iemelianova

M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, Kyiv, Ukraine

* Presenting author: geobot@ukr.net

The class *Isoëto-Nano-Juncetea* represents plant communities of low-growing annual wetland graminoids and dicot herbs. In Ukraine they are widely distributed mainly in the forest and forest-steppe zones. In the steppe zone ephemeral wetlands occupy ecotopes only in the valleys of large rivers. In Ukraine this class has 2 alliances which belong to 1 order (*Nanocyperetalia*). Alliance *Eleocharition ovatae* includes 5 associations (*Middendorfio borysthenicae-Crypsietum alopecuroides*, *Stellario-uliginosae-Isolepidetum setaceae*, *Cyperetum flavescentis*, *Cyperetum micheliani* and *Juncetum buffonii*) and *Verbenion supinae* includes two (*Pulicario vulgaris-Menthetum pulegioidis* and *Eragrostietum suaveolentis*). The leading factors of territorial distribution of ephemeral wetlands are the relief of pioneer ecotopes, and type and structure of alluvial sediments. Coenotaxonomical specificity of the communities is revealed in the group of diagnostic species, in particular prevailing of therophytes with short ontogenesis. Features of coenotic structure are low cover of herb layer (20–30%) and complexity of floristic structure in connection with active diaspore dispersal. The main factors of ecological differentiation are substrate moisture, the degree of its aeration and concentration of mineral salts. The class *Bidentetea tripartitae* represents vegetation of tall-growing nitrophilous annual wetland herbs. In Ukraine they occur often in the forest and forest-steppe zones and sporadically in the steppe zone. This class includes the associations *Bidentetum tripartitae*, *Bidentiti-Polygonetum mitis*, *Bidentiti-Polygonetum hydropiperis*, *Bidentetum radiatae*, *Polygono lapathifolii-Bidentetum tripartitae*, *Bidentetum cernuae*, *Leersio-Bidentetum* belonging to the *Bidention tripartitae* alliance and *Bidentetalia tripartitae* order, and also *Chenopodietum rubri*, *Chenopodio-Atriplicetum hastatae* from the *Chenopodion glauci* alliance and *Chenopodietalia* order. The leading factors of territorial distribution of communities are habitat development, mechanical structure of the substrate, regime of soil moisture and duration of flooding. Coenotaxonomical specificity manifested in the variability of the composition of diagnostic species that change with the increase of continentality to the east, and ombroregime that changes to the south. Coenostructure of communities is characterized by high floristic diversity and seasonal and perennial polydominance. The main factors of ecological differentiations are nitrogen content in the soil and its degree of humidity.

Dudová L.

Oral presentation (young scientist)

Tilia-dominated Early Holocene woodlands in the Western Carpathians (Slovakia)

Special session: Long-term perspectives on vegetation change

Lydie Dudová [1,2,*], Eva Jamrichová [1,2] & Michal Hájek [1]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic

* Presenting author: cvilinek@gmail.com

The short-term climatic oscillations occurring at the end of the Late Glacial and beginning of the Holocene had a significant impact on the dynamic of the temperate tree species. The cold oscillations caused restriction of trees whereas increase in temperature and humidity supported their expansion. At the beginning of the Holocene, temperate trees started to expand into the landscape of the Western Carpathians. In the foothills of the Carpathians (contact zone with the Pannonia Basin), mainly *Quercus* and *Corylus* were the dominants, whereas in the northern part and higher altitudes the woodlands were composed mainly of *Pinus*, *Corylus* and *Picea*. In the middle altitude of the Western Carpathians the palaeoecological records were scarce so far. Three recently analysed pollen records from sites located in the middle altitudes at lime-rich bedrock show occurrence of *Tilia* in the Early Holocene sediments, which is unique for the study region. In Mituchovci site (White Carpathians) *Tilia* appeared around 11,100 cal BP and expanded around 10,000 cal BP forming *Tilia*-dominated woodlands with *Ulmus*. At Rojkov site (Velká Fatra foothills) *Tilia* was recorded since 10,800 cal BP, forming mixed deciduous woodlands with *Ulmus*, *Quercus*, *Fraxinus* and *Corylus* since 9,950 cal BP. Similar record comes from Mitická Slatina (Strážovské Mts., in contact with Panonia basin) where *Tilia* appeared around 11,000 cal BP and expanded around 9,500 cal BP. At these three sites *Tilia* appeared uncommonly early and is exceptionally abundant. Its early occurrence and expansion after the end of the first climate deterioration might be explained by local surviving of *Tilia* during Late Glacial in moist limestone regions of the Western Carpathians, probably as a shrub with vegetative growth. The amelioration of the climate promoted generative reproduction and pollen production of lime. The almost synchronous early Holocene dynamic of *Tilia* in all three profiles support decisive role of climate oscillation on woodland vegetation. The appearance of *Tilia* pollen around 11,000 cal BP could be associated with the warming of the climate after the Preboreal oscillation and the expansion of *Tilia* might be related to the decisive amelioration of the climate after the 10.2 ky event.

Acknowledgements: The research was supported by the grant project GAČR P504/11/0429, institutional support of Masaryk University and long-term research development project no. RVO 67985939.

Dudová L.

Poster I-02 (young scientist)

Did *Larix* survive the Holocene climatic optimum in the Czech Republic?

Special session: Long-term perspectives on vegetation change

Lydie Dudová * & Péter Szabó

Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic

* Presenting author: cvilinek@gmail.com

According to the present state of knowledge, *Larix* occurred in the Czech Republic during the last ice age and expanded to its maximal distribution in the Late Glacial period. *Larix* grew in steppe vegetation in the Bohemian Massif, whereas in the Moravian part of the Western Carpathians it was a component of taiga vegetation together with *Pinus cembra*. After the onset of the Holocene, the distribution range of *Larix* started to disintegrate due to the expansion of ecologically more competitive species. Larch gradually disappeared from the vegetation in most areas of the Czech Republic. In a small part of the country (Nízký Jeseník Mts), scattered historical evidence suggests that larch has survived until the present. However, there has been no direct evidence in the form of pollen, seeds, branches or cones to prove the existence of *Larix* in this region during the Holocene. We present a multidisciplinary dataset that confirms the hypothesis that *Larix* existed in the Nízký Jeseník Mts throughout the Holocene. We present pollen records from four peat sections in which *Larix* was found throughout the entire Holocene: Vozka bog, Skřítek mire, Pstruží potok mire and Lomnice mire. In addition, a complete survey of early (16th–17th centuries) documents and the detailed forest survey of the Josephian cadastre (1787–1789) provide a spatially exact image of the distribution and relative importance of larch immediately before it started to be used in plantation forestry over the entire country.

Acknowledgements: This research was funded from the European Research Council under the European Union's Seventh Framework Programme (FP7/2007–2013)/ERC Grant agreement no 278065 and by long-term research project RVO 67985939 from The Czech Academy of Sciences.

Dziuba T.

Poster H-02

Halophytic and coastal vegetation database of Ukraine

Session: Data sources for broad-scale vegetation studies

Tetiana Dziuba

Geobotany and Ecology Department, M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, Kyiv, Ukraine

tdziuba2014@gmail.com

A database of geobotanical relevés of halophytic vegetation of Ukraine was developed in the M.G. Kholodny Institute of Botany. It includes the *Thero-Salicornietea*, *Salicornietea fruticosae*, *Juncetea maritimi*, *Festuco-Puccinellietea*, *Crypsietea aculeatae*, *Bolboschoenetea maritimi* classes of the Black and Azov Sea coast in Ukraine and of the vegetation of the estuary regions of large rivers such as the Danube and Dnieper (*Cakiletea maritimae*, *Ammophiletea*, *Crithmo-Staticetea*, *Festucetea vaginatae*, *Salicetea purpureae*, *Alnetea glutinosae*, *Nerio-Tamaricetea*, *Ruppietea maritimae*, *Zosteretea* classes and others). It is registered in GIVD under the code EU-UA-005 and contains 4606 relevés of Ukrainian authors published in deposited issues, monographs and articles, and unpublished relevés. The database contains information about relevé date, relevé area, projective cover (total and of individual layers), locality, authors and references. The characteristics of the habitats include slope aspect and inclination, human impact degree and soil properties. Information is mainly used for vegetation classification, coenoflora analysis and study of vegetation dynamics.

Eichel J.

Oral presentation (young scientist)

Linking plant traits to a geomorphic disturbance gradient: the biogeomorphic window concept for lateral moraines

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Jana Eichel [1,*], Dov Corenblit [2,3], Sebastian Schmidtlein [4] & Richard Dikau [1]

[1]Department of Geography, University of Bonn, Bonn, Germany; [2]Clermont Université, Maison des Sciences de l'Homme, Clermont-Ferrand, France; [3]CNRS, UMR 6042, GEOLAB – Laboratoire de Géographie Physique et Environnementale, Clermont-Ferrand, France; [4]Department of Geography and Geoecology, Karlsruhe Institute of Technology, Karlsruhe, Germany

* Presenting author: j.eichel@uni-bonn.de

Biogeomorphology investigates interactions between geomorphological processes and plants. A proposed new conceptual framework of "biogeomorphic windows" describes the conditions under which these interactions can occur. It relates species trait-based resilience (recovery time) and disturbance resistance to the magnitude and frequency of different geomorphic processes. Empirical evidences for biogeomorphic windows are provided from on-going research on lateral moraines in the Turtmann glacier foreland (Switzerland). Based on permanent plot data acquired in annual vegetation and geomorphic surveys, a statistical relationship between geomorphic disturbance regimes and community compositions with specific traits can be shown. Large, infrequent disturbances (e.g., debris flows) and higher frequency, but lower magnitude disturbances (e.g., interrill erosion) favour pioneer species with low resistance but high resilience. Once the frequency or magnitude of processes decrease, dwarf shrub species (e.g., *Dryas octopetala* L.) with low resilience but high resistance establish. These species possess specific biomechanical (e.g., high root tensile strength) and morphological (e.g., high coverage) traits through which they can further decrease magnitude and frequency of geomorphic processes. This promotes lower magnitude and frequency processes such as solifluction. When geomorphic processes become inactive due to increasing slope stabilization, late successional species with low resilience and resistance dominate. Thus, the geomporphic disturbance gradient determines species composition and its changes, while, at the same time, species traits can influence the geomorphic disturbance regime and thereby determine the spatiotemporal development of the disturbance gradient.

El-Sheikh M.A.

Poster G-03

Distribution of soil organic carbon on vegetated and non-vegetated sites of Wadi Al-Thulaima, Saudi Arabia

Special session: Species and plant community responses along soil gradients

Mohamed A. El-Sheikh [1,2,*], Ebrahem M. Eid [3,4] & Soliman El-Oteby [2]

[1]Botany & Microbiology Department, College of Science, King Saud University, Riyadh, Saudi Arabia; [2]Botany Department, Faculty of Science, Damanhour University, Damanhour, Egypt; [3]Botany Department, Faculty of Science, Kafr El-Sheikh University, Kafr El-Sheikh, Egypt; [4]Biology Department, College of Science, King Khalid University, Abha, Saudi Arabia

* Presenting author: el_sheikh_eg@yahoo.co.uk

The objectives of the present study are: (1) to quantify the vertical distribution of the soil bulk density (SBD), soil organic carbon (SOC) content and SOC density in the soil of vegetated and unvegetated sites in Wadi Al-Thulaima, Al-Kharj Oasis (Saudi Arabia); and (2) to establish a baseline data on SOC pools for future studies on SOC dynamics. Sampling was carried out at four sites to represent the Wadi Al-Thulaima. The sampled sites were classified to vegetated and unvegetated. In each of them, three soil cores were taken. The mean SBD in the vegetated and unvegetated sites increased significantly with depth. SOC content in the vegetated sites declined significantly with depth from 17.08 g C kg^{-1} at a depth of 0–3 cm to 3.27 g C kg^{-1} at a depth of 15–18 cm. SOC content in the unvegetated sites declined significantly with depth from 4.68 g C kg^{-1} at a depth of 0–3 cm to 0.68 g C kg^{-1} at a depth of 15–18 cm. The site type affected significantly the SOC pool, where the total mean of SOC pool of the vegetated sites (1.96 kg C m^{-2}) was higher than that of the unvegetated sites (0.51 kg C m^{-2}).

Erfani M.

Poster D-10

A new index for wood exploitation at landscape scale: case study of Hyrcanian forest, Kheyrud, Iran

Session: Vegetation science serving nature conservation

Malihe Erfani [1,*], Afshin Danehkar [1], Abdolrassoul Salmanmahiny [2] & Vahid Etemad [3]

[1]Department of Environmental Sciences, Faculty of Natural Resources, University of Tehran, Iran; [2]Gorgan University of Agricultureal Sciences & Natural Resources, Gorgan, Golestan, Iran; [3]Department of Forestry and Forest Economic, Faculty of Natural Resources, University of Tehran, Iran

* Presenting author: Malihe1erfani@gmail.com

Hyrcanian forests occur along the southern coast of the Caspian Sea. These forest. like other temperate forest, provide many services, one of them being wood exploitation for industrial purposes. This survey has investigated how much is forest disturbed as a result of harvesting at the landscape scale. Effective indicators are number of harvesting periods; amount of harvesting (m^3) and number of years since the last harvesting period. Factors were weighted based on expert opinion. Three indicator WLC technique (weighted linear combination) was applied and obtained values for each parcel were normalized between 0 (for no disturbance) and 1 (for highest disturbance) and its map was prepared. This map can be used considering goals of different studies. Wood exploitation disturbance was not considered as a direct and unique disturbance by now. Disturbance was studied by some indicators such crown density or diversity of density, but the new view is different. In this view disturbance has force role and indicators such crown density or diversity of density are response variables, not the disturbance (pressure factor). This method is useful tool for disturbance study, because any kind of disturbance can assessed using some indicators and composed to one disturbance index. It is better than past classification of disturbance that divided disturbance subjectively to high, medium, low or other qualitative classes. This approach is useful to quantify and map of any types of disturbance.

Feilhauer H.

Oral presentation

A tale of bees and flowers – mapping local patterns of pollination types with remote sensing

Hannes Feilhauer

Institute of Geography, University of Erlangen-Nürnberg, Erlangen, Germany

hannes.feilhauer@fau.de

Remote sensing is increasingly used to map and monitor functional plant traits. In particular optical leaf properties such as specific leaf area, leaf biochemistry, or structural traits that are responsible for the optical signal are frequently targeted. In contrast, our current knowledge on the potential of remote sensing to address flowering and pollination traits is very limited. This study thus aims to answer the following questions for an extensively used mosaic of grasslands and mires in Bavaria, Germany: (1) Is the distribution of pollination types in the study site related to optical traits that account for a characteristic spectral signature? (2) Can we map spatial patterns of pollination types with high resolution remote sensing data? To answer these questions, cover fractions of all occurring vascular plant species and traits related to their spectral signal were sampled in 100 plots randomly distributed across the study site. Information on pollination vectors and selfing abilities of the occurring species were extracted from the BIOLFLOR trait data base. Simultaneously, hyperspectral image data of the study site were acquired with the airborne sensor AISA Dual. Support vector machine regression was used to link the plot pollination data to the canopy spectra. The model results show that the spectral signal can explain up to 55% of the variation in the pollination data. In particular patterns of wind and insect pollination show a close relation to traits that determine the reflectance properties of the canopy and can thus be accurately addressed with spectral data. Application of the models onto the image data allows for spatially explicit predictions that can be used to map the distribution of pollination types across the study area. These maps may enable additional analyses that provide new insights towards a better understanding of ecosystem functional diversity. The results of this study show that relations between optical and pollination traits exists and enable a detailed and accurate mapping of the related patterns.

Fidelis A.

Poster O-04

The role of dry-heat shock in seed germination of invasive and native grasses

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Elizabeth Gorgone-Barbosa, Luis Felipe Daibes, Rafael de Barros Novaes & Alessandra Fidelis *

Departamento de Botânica, Universidade Estadual Paulista, Rio Claro, SP, Brazil

* Presenting author: afidelis@rc.unesp.br

Several plants can resist fire in flammable ecosystems, sprouting or germinating just after the disturbance and spreading even more in the environment. Cerrado is a biodiversity hotspot and fire is a natural disturbance. Nowadays, Cerrado is threatened by wildfires and invasive African grasses. Therefore, we evaluated the relations between dry-heat shocks and seed germination of three common invasive grass species (*Melinis minutiflora*, *Urochloa decumbens* and *U. brizantha*) and of two native grass species (*Aristida* sp. and *Gymnopogon foliosus*). We submitted the seeds of each species to dry heat shock treatments of 60, 100 and 200 °C for one minute. After that, seeds were displaced in Petri dishes and put to germinate in optimal conditions. Five replicates of 20 seeds for each temperature treatment and for the control (no exposure to high temperatures) were used. We calculated germination percentage and evaluated differences between treatments using one-way ANOVA applied to randomization tests. For the native species, more than 80% of seeds of *Aristida* sp. germinated in all treatments independent of the heat shocks, while more than 60% of seeds of *Gymnopogon foliosus* germinated in all treatments. For the invasive grasses, *Melinis minutiflora* resisted to the heat shocks and we could observe 89% of germination for all treatments. The germination of *U. decumbens* seems to be decreased by the exposure to high temperatures: 69% in the control, 59% in 60 °C, 49% in 100 °C and 42% in 200 °C ($P > 0.05$). *U. brizantha* germinated more than 70% in the control, 60 °C and 100 °C, but this germinability decreased significantly with the exposure to 200 °C (22%). Our data provide important information about how high temperatures and fire affects the germination of native and invasive species in fire-prone systems as the Cerrado, helping to understand the invasion process in these environments.

Fidelis A.

Oral presentation

The invasive's advice to kill your neighbor: when fire comes, burn hotter!

Alessandra Fidelis * & Elizabeth Gorgone-Barbosa

Departamento de Botânica, Universidade Estadual Paulista, Rio Claro, Brazil

* Presenting author: afidelis@rc.unesp.br

The presence of invasive species in the plant community can alter fire regime in several ways, including the change of fire frequency and intensity. However, invasive species could also affect other fire parameters at individual species level. Therefore, these species could have an advantage not only in post-fire environments, but also during fire events. Thus, we aim to evaluate how African grasses alter fire temperatures in tropical savannas in Brazil at the end of the rainy season at the tussock level. In May 2014, we measured fire temperatures inside tussocks of African grasses (*Melinis minutiflora* and *Urochloa decumbens*) and native grasses (*Axonopus pressus* and *Aristida* sp.) during prescribed burnings. We established experimental plots (15 × 15 m) in the areas invaded by *M. minutiflora*, *U. decumbens*, and with no presence of the invasive species. In these plots, we randomly chose five tussocks and established thermocouples (type K) at soil surface and 50 cm above soil surface. Sensors measured temperature every 2 seconds. We analyzed fire maximum temperature and residence time at 60 °C, 100 °C and 200 °C. Maximum temperatures were higher in *Melinis minutiflora* tussocks at soil surface and at 50 cm (407.7 °C and 383.5 °C, respectively) than for native and *Urochloa decumbens* tussocks, which did not reach 300 °C at any height.

Fischer F.M.

Oral presentation (young scientist)

Estimating dark diversity by functional traits

Special session: The relevance of “dark diversity” for theoretical and applied ecology

Felícia M. Fischer [1,*], Pille Gerhold [2], Meelis Pärtel [2], Sergio Camiz [3] & Valério D. Pillar [1]

[1]Department of Ecology and Graduate Program in Ecology, Federal University of Rio Grande do Sul, Porto Alegre, Brazil; [2]Institute of Ecology and Earth Sciences, Department of Botany, University of Tartu, Tartu, Estonia; [3]Department of Mathematics, Sapienza University of Rome, Roma, Italy

* Presenting author: feliciafischer@yahoo.com.br

Dark or hidden diversity is the fraction of the species pool that could potentially be present but is absent from a community. Potential community has been defined based on habitat specificity of the species pool. However, could dark diversity be estimated based on potential community composition predicted by the functional traits of the species? For this, we used as input a matrix of communities described by species performances (**W**), and another matrix of species described by functional traits (**B**) that are relevant for the structuring of the communities. We generated a fuzzy set matrix (**U**) with each species defining a fuzzy set to which every species may belong with a certain degree of belonging in the 0 to 1 range. **U** is derived from pairwise species similarities, which were standardized by columns so that the species’ degrees of belonging across all fuzzy sets add to one. Then we computed a fuzzy-weighted community composition matrix **X** integrating functional traits and species performance. In other words, it shows on which community a given species is expected to be present, based on their trait similarities to the species that were actually present. The difference **V W** showed negative values in **V**, but the ones excluded randomly presented more negative deviations from expectation than the ones that were naturally absent based on the environmentally structured community. We also applied this analysis to real vegetation data in which a gradient of random species extinctions was applied. The correlation between dark diversity and the gradient of species extinctions was 0.71 and 0.64 respectively for the simulated and partially real data sets, indicating a potential use for this method.

Fischer H.S.

Oral presentation

The Weihenstephan Wood Indicator System WeiWIS

Special session: Species and plant community responses along soil gradients

Hagen S. Fischer * & Anton Fischer

Geobotany, Department of Ecology and Ecosystem Management, Technische Universität München, Freising, Germany

* Presenting author: HFischer@wzw.tum.de

A new approach to use plants as bioindicators is presented here. It is well known that the distribution of plant species depends on habitat conditions. Humbold (1807) describes the dependence of plants in the tropics on the altitudinal (i.e. basically temperature) gradient. Braun-Blanquet (1928) proposed the sociological determinism, which states that plant communities depend on habitat conditions. These findings lead to the famous system of Ellenberg’s (1948, 2003) of indicator values that were adapted in many countries. Until now these indicator systems were based on the personal experience of experts rather than on measurements. The data of the Forest Soil Inventory (Bodenzustandserhebung, BZE II) in Bavaria (Germany) gave the possibility to develop an indicator system that is based on measurements and a statically sound sampling design. 372 soil samples as well as vegetation relevés were taken in a regular grid with a grid size of eight km. Based on these data we developed an indicator system by means of generalized linear models and the Bayes approach to directly predict measurable soil properties in the field based on the species that are growing in the forest stands – without laborious analyses in the laboratory. In the near future the system will be extended to the whole of Germany based on all 2462 sampling points of the nation-wide Forest Soil Inventory of Germany.

Franklin S.B.

Poster P-15

The USNVC proposal review process

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Scott B. Franklin [1,*], Don Faber-Langendoen [2], Robert K. Peet [3], Todd Keeler-Wolf [4], David W. Roberts [5] & Esteban Muldavin [6]

[1]School of Biological Sciences, University of Northern Colorado, Greeley, USA; [2]Conservation Science Division, NatureServe, Arlington, USA; [3]Department of Biology, University of North Carolina, Chapel Hill, USA; [4]Biogeographic Data Branch, California Department of Fish and Wildlife, Sacramento, USA; [5]Ecology Department, Montana State University, Bozeman, USA; [6]Natural Heritage New Mexico, Albuquerque, USA

* Presenting author: scott.franklin@unco.edu

The United States National Vegetation Classification (USNVC) is a comprehensive existing vegetation classification that features dynamic content by design. The challenge of a dynamic classification system is how to provide a fully comprehensive set of types that are mutually exclusive while allowing ongoing revisions to types. For that reason, the USNVC adopted a model of peer review based on a coordinating body or panel. The ESA Vegetation Classification Panel is responsible for developing and overseeing a review process, and we describe that process along with a pilot efficacy test. There are eight levels to the USNVC hierarchy and proposed changes may span multiple levels. We describe here three major decisions that were required to develop a process that will insure the best possible improvement to the USNVC. First, what types of changes require a review by vegetation experts? Second, how often should the USNVC be "officially" changed to match accepted proposals? Third, how do we document changes such that users understand why changes occurred and their historical context? A different review structure was developed for upper-level tiers (Levels 1–5) than for lower-level tiers (L6–8; Group, Alliance and Association). We did this for two reasons: we believed the more narrowly-defined lower levels would be subject to more frequently proposed changes, and we wanted the updating the USNVC to reflect those more-rapidly-changing levels (official updates will be yearly or more frequent). For upper-level tiers (L1–5), classification users requested a more stable structure (official updates will not occur more frequently than at least five years). Much of the structure of the peer review process is analogous to manuscript reviews. The process begins by deciding which of three possible concept changes are being proposed: (1) minor concept changes (mostly editing), (2) major concept upgrade (without creating a new type concept, and (3) new type concept). Once this decision is made, expert vegetation ecologists are solicited to review the proposed changes. Following the review a moderated discussion of proposed changes takes place among the editors, reviewers, and proposers to achieve a consensus on the merits of the possible change. We implemented this interaction as a means of good faith improvement of the USNVC, as opposed to simply making changes. Changes are documented in the Proceedings, where the full proposals will be published.

Fraser L.H.

Oral presentation

Plant trait similarity model: a framework for predicting trait convergence and divergence in herbaceous plant communities

Lauchlan H. Fraser

Department of Natural Resource Sciences, Thompson Rivers University, Kamloops, British Columbia, Canada

lfraser@tru.ca

Plant traits affect the success or failure of plants to establish, grow and reproduce. Although we have an increased understanding of certain individual plant traits and their relative effect on performance and fitness there is no framework for predicting relative similarity of traits between neighbouring plants. Assembly rules suggest that abiotic filters will restrict the range of viable strategies, thus tending to funnel towards plants sharing similar suites of traits. Limiting similarity is based on character displacement of traits and segregation of species' resource use. What is the relative strength of these two processes and do they differ depending on site condition? What we know is that trait similarity of herbaceous plants can vary with site productivity and disturbance. Here, I argue that the interaction of these two ecological factors has powerful consequences for patterns in herbaceous plant-trait similarity, which has strong implications for ecosystem function. A conceptual model is proposed where trait similarity occurs at low productivity/high disturbance and high productivity/low disturbance, and trait dissimilarity is most likely at intermediate levels of disturbance and productivity. The relationships among evolution, plant traits, and ecology are multivariate, hierarchical and complex making plant traits at the ecosystem level an exciting and challenging agenda for the future.

Frisch J.

Poster J-09

Vegetations dynamics in the beech forests at Serrahn Hills (UNESCO World Heritage Site)

Session: Patterns of vegetation change across landscapes

Johann Frisch

Institute for Landscape Planning and Landscape Information Systems, Berlin, Germany
johann_frisch@yahoo.de

The first results from the Müritz National Park after one decade of monitoring are presented. The study area is located in the northeast of Germany. The forests of the Serrahn Hills belong to the last remaining semi-natural beech forests in Germany. In the last century the hills were designated as a nature reserve and forestry use was abandoned when the region becomes national park. Since 2011 they have been recognised as a UNESCO World Heritage Site along with four other German forests. In order to study the biodiversity dynamics permanent plots were established and the vegetation was recorded in ten-year intervals. The data from the first decade were analysed with multivariate analyses. The ordinations elucidate the mosaic-cycle-concept as the main driving force and the natural cyclic regeneration could be identified as the main process. Apart from the processes of reversible patch dynamics additional processes based on changing light condition and increasing leaf litter can be found in the ground layer. These processes generate irreversible changes in the ecosystem and long-term changes in the herb-layer vegetation are taking place in space and time. It is very interesting that there is an invasion of beech recruits, but instead of stabilising the forest ecosystem the recruits are working as ecosystem engineers and as a result new tree species could also be found in the herb layer. For the time being it is not clear if the successional changes depend on the degree of human impact or on supraregional events (immissions, climate change) and what will happen in the future if the processes keep on running.

Fujita T.

Poster C-03 (young scientist)

Relative importance of perch and facilitative effects on nucleation process in tropical woodlands

Session: Patterns and drivers of alpha and beta diversity in plant communities

Tomohiro Fujita [1,*] & Chisato Yamashina [2]

[1]Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan; [2]The Center for African Area Studies, Kyoto University, Kyoto, Japan

* Presenting author: tfujitaster@gmail.com

Individual trees in savannas and woodlands can act as nuclei for the colonization of forest tree species, which consequently lead to the formation of forest patches. This phenomenon is known as nucleation. The mechanism of nucleation is generally attributed to two factors: trees provide perches for birds that increase seed deposition, and tree crowns ameliorate environmental conditions, which improves seedling establishment. Few studies have attempted to distinguish the relative importance of these two processes. In this study, we separated these two effects in woodland in northern Malawi (southeast Africa). We chose *Ficus natalensis* as a potential nucleus species because large individuals of this species are commonly located at the center of forest patches within open woodlands at the study site. We monitored several environmental variables, as well as seedling survival, seedling composition, and seed rain at three microsites: under *F. natalensis* trees, under *Brachystegia floribunda* trees (a dominant woodland species), and at open sites. Both tree species provided similar favorable conditions for the establishment of forest species compared to open sites. The survival of forest tree seedlings under *F. natalensis* and *B. floribunda* was similar, and substantially higher than seedling survival in open sites. However, communities of naturally occurring seedlings differed significantly between *F. natalensis* and *B. floribunda*. I attribute this result to the perch effect of *F. natalensis*, given that forest seedlings recorded under *F. natalensis* had small and brightly coloured diaspores suggesting that they are predominantly dispersed by birds. Seed deposition of forest species under *F. natalensis* was much higher than under *B. floribunda* or in open sites. These results indicate the importance of the perch effect during the nucleation process.

Gąbka M.

Poster G-04

Calcium content as a chief factor in diversity of plant communities in rich fens – traits of charophytes, bryophytes and vascular plants

Special session: Species and plant community responses along soil gradients

Maciej Gąbka [1,*], Emilia Jakubas [1] & Anna Rusińska [2]

[1]Department of Hydrobiology, Faculty of Biology, Adam Mickiewicz University, Poznań, Poland; [2]Natural History Collections, Faculty of Biology, Adam Mickiewicz University, Poznań, Poland

* Presenting author: gmaciej@amu.edu.pl

Charophytes together with mosses play a crucial role in the calcium precipitation, maintenance of water transparency and are known to be early indicator of water fluctuation regime of peatlands. Interactions between plant functional types (PFTs) can be significant in the regulatory processes of wetland ecosystems. Based on previous data it was hypothesized that structure of charophyte and bryophyte communities in the rich fens is shaped by different interrelated physicochemical parameters. Both groups significantly and reciprocally influence each other. To test this hypothesis, the species distribution of these groups along the environmental gradients in a 15 poor to rich fens in NW Poland was investigated. We measured the percentage cover of charophytes, mosses and other plant species in 109 sites of 1 × 1 m. We also measured 16 environmental variables that reflect trophy and calcium contents. Most studied plots were characterized by ground water rich in Ca, nutrients, especially N-NH_4 and P-PO_4, with high electrolytic conductivity. Using detrended correspondence analysis (DCA) and canonical correspondence analysis (CCA), we analyzed the relationships between species composition and the environmental variables. We used the GAM models to investigate the response curves of charophyte species to the water parameters. During the study 11 charophytes (e.g. *Chara vulgaris*, *C. tenuispina*, *C. polyacantha* and *Nitella tenuissima*), 18 mosses (e.g. *Hamatocaulis vernicosus*, *Limprichtia cossonii*, *Scorpidium scorpioides* and *Sphagnum teres*) and 64 vascular plant taxa (e.g. *Utricularia* spp., *Aldrovanda vesiculosa* and *Cladium mariscus*) were detected in 109 vegetation plots. Among 16 environmental variables of surface water chemistry 5 (DWT – depth water table, Ca, SO_4, NO_3 and colour of water) explained 24% of the variation in floristic composition. Charophytes seem to respond to ecological gradients differently from mosses. Ca, SO_4, NO_3 turned out to be the most important environmental gradients for the charophytes, while DWT, water colour and Mg concentrations were more relevant for bryophytes. Calcium contents is the most important factor influencing the distribution of plant functional types species including charophytes in rich fens. This study provides new data on the ecology and typology of calcareous fens in western Poland.

Gałka M.

Poster I-03

Impact of climate change on development of the population of *Cladium mariscus* in East- Middle Europe in the last 2000 years

Special session: Long-term perspectives on vegetation change

Mariusz Gałka [1,*], Angelica Feurdean [2,3], Kazimierz Tobolski [1], Krystyna Milecka [1], Piotr Kołaczek [1], Milena Obremska [4], Karina Apolinarska [5], Liene Aunina [6] & Łukasz Lamentowicz [7]

[1]Department of Biogeography and Palaeoecology, Adam Mickiewicz University, Poznań, Poland; [2]Senckenberg Research Institute and Natural History Museum & Biodiversity and Climate Research Center (BiK- F), Frankfurt am Main, Germany; [3]Institute of Speleology, Romanian Academy Emil Racoviśă, Cluj Napoca, Romania; [4]Institute of Geological Sciences, Polish Academy of Sciences, Warsaw, Poland; [5]Institute of Geology, Adam Mickiewicz University, Poznań, Poland; [6]Institute of Biology, University of Latvia, Salaspils, Latvia; [7]Regional Environmental Management, Poznań, Poland

* Presenting author: galka@amu.edu.pl

The effect of ongoing climate changes on the plants range shifts, often at the expense of rare and protected plants, is widely discussed. *Cladium mariscus* is one of the rare, endangered and vulnerable plant species. To determine the history of *C. mariscus* populations over the last 2000 years in Central-East Europe we are conducting palaeoecological studies in three countries in this region (Latvia, Poland, Romania). Our study area is located at the current eastern range limit of *C. mariscus* in Europe, which makes this species particularly sensitive to changes in climate conditions, and therefore an excellent bioindicator for past climate changes.

We test the hypothesis that climate changes over the last 2000 years considerably affected the range distribution and abundance of the populations of *C. mariscus* at its eastern distribution limit in Europe. Specifically: (i) The cold periods (Migration Period, Little Ice Age) led to a massive reduction or even disappearance of *C. mariscus* from more northerly located peatlands; (ii) During the warm periods (Roman Warm Period, Medieval Warm Period), *C. mariscus* populations recovered and expanded to new sites, extending the distribution range of the species. We selected various habitats with recent occurrence of *C. mariscus*: calcareous fen, rich fen by lake and spring-fen, which permit multi-aspect comparisons of the effect of the climate on the studied species. Analyses of these peat cores in high resolution (1 and 2 cm) using multi-proxy palaeoecological analyses (plant macrofossils, palynology, testate amoebae, molluscs, oxygen and carbon isotopes, charcoal and AMS ^{14}C radiocarbon dating), are ongoing. Results from our palaeoecological studies will contribute to better ecological and biogeographic understanding of *C. mariscus* and will improve the predictive capacity in assessing the potentially sensitive areas for this species during the future environmental change.

Acknowledgements: Research was funded by the National Science Centre, grant no. UMO-2013/09/B/ST10/01589, conducted in 2014–2016.

Gálová A.

Poster I-04 (young scientist)

The origin of the boreal mire birch woodland: a multi-proxy study from the Carpathian-Panonnian border

Special session: Long-term perspectives on vegetation change

Andrea Gálová [1,*], Petra Hájková [1,2], Malvína Čierniková [3], Libor Petr [1], Jan Novák [4] & Jan Rohovec [5]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [3]Department of Soil Science, Faculty of Natural Sciences, Comenius University in Bratislava, Bratislava, Slovakia; [4]Department of Botany, Faculty of Sciences, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [5]Institute of Geology, The Czech Academy of Sciences, Czech Republic

* Presenting author: galova.ada@gmail.com

The area near the border of the Western Carpathian and Pannonian phytogeographical regions is an important contact zone of different phytogeographical elements. However, its vegetation history still remains largely unknown because of the lack of ancient sediments suitable for palaeoecological studies. We analysed two peat cores from a rare birch mire woodland site "Nad Šenkárkou" situated on the ridge of Malé Karpaty Mts (SW Slovakia) by means of macrofossil, pollen, peat chemistry and charcoal analyses to determine the local succession patterns and regional vegetation development and to trace the history of some rare and important species. The analysis of two peat cores situated about 20 m apart in today homogeneous vegetation enabled us to explore small-scale differences in local vegetation history. The sediment started to accumulate in Late Glacial (Younger Dryas), when the site was a shallow oligotrophic lake with aquatic macrophytes such as *Potamogeton pusillus*, *Batrachium trichophyllum* and *Nitella* sp. In the Early Holocene, the lake started to infill and littoral zone species like *Menyanthes trifoliata* and *Ranunculus flammula* appeared. Two fire events indicated by peaks in charcoal were recorded: The first one in the Early Holocene was very local, we could only trace it in one profile. The second recorded charcoal peak was connected with a large hiatus spanning over the Middle and Late Holocene. At that time the site was probably overgrown with *Pinus* and *Betula* trees and sediment mineralization occurred. The youngest phase shows a rapid change from (semi-)open mire vegetation with *Carex rostrata*, *Eriophorum vaginatum* and *Sphagnum* sp. to a closed-canopy *Betula pubescens* mire woodland, which started in the 19th century. However, it remains unclear whether this development was caused by autogenic factors, climate induced or caused by human impact. The two profiles showed basically the same patterns of succession, though some local succession trends and many of the rare species (e.g. *Potamogeton alpinus*, *P. praelongus*, *Scorpidium scorpioides*, *Abies alba* and *Orlaya grandiflora*) only appeared in one profile. Therefore it is advisable to analyse more than one peat core to discern local events from larger-scale trends and to capture rare species.

García de León D.

Oral presentation

Secondary succession in alvar grasslands – How do plant and arbuscular mycorrhiza fungal communities covary?

David García de León *, Lena Neuenkamp, Maret Gerz, Martti Vasar, C. Guillermo Bueno, Ede Oja, Maarja Öpik, Mari Moora & Martin Zobel

Department of Botany, Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: david.garciadeleon@ut.ee

Mycorrhizal symbiosis plays a key role in the dynamic and composition of most terrestrial ecosystems, thus influencing plant community assembly and successional processes. Therefore, patterns of plants and arbuscular mycorrhizal fungi (AMF) communities may be tightly interrelated. Several hypotheses have been proposed to describe the fluctuations of AMF and plant communities over time. The Driver and Passenger hypotheses state that plant and AMF communities are led by changes in their partner community. The Habitat hypothesis stresses that both communities may co-vary in response to abiotic conditions. However, the strength of plant-mycorrhiza relationships, along with the exact mechanism driving the changes and the implications for ecosystem management and restoration, are poorly known. The aims of this study were: (1) To describe the changes in AMF and plant communities along a secondary succession, (2) To assess the strength of the relationship between AMF and plant communities and (3) To determine the prevalent hypothesis (among Driver-Passenger or Habitat) describing the co-variation of plants and AMF communities over time, in a secondary succession in alvar grasslands of Western Estonia. We selected sites after 30, 50 and over 50 years of gravel pit abandonments and analysed the abundance and diversity of plants and AMF in soil and roots using linear models and ordination techniques. Our preliminary results pointed out that abundance, richness and alpha diversity of plants and the number of AMF virtual taxa both in soil and roots increased along the succession. The relationship between plants and AMF in soil was stronger than in roots. We did not find strong evidence of plants or fungi were led by their partners. We hypothesized that both partners responded in parallel to abiotic factors. Therefore, Habitat hypothesis may potentially help to understand patterns of plants and AMF fluctuations in alvar grasslands. The implications of these preliminary results will be discussed in the context of ecosystem management, and restoration ecology.

García-Mijangos I.

Poster O-05

Drivers of plant invasion at broad and fine scale in short temperate streams

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Diego Liendo, Itziar García-Mijangos *, Juan Antonio Campos, Unai López de Muniain & Idoia Biurrun

Department of Plant Biology and Ecology, University of the Basque Country (UPV/EHU), Bilbao, Spain

* Presenting author: itziar.garcia@ehu.es

Riparian ecosystems have been described as highly prone to alien plant invasions, thus disentangling the contributing factors of the invasion process is of utmost importance to conserving and managing these valuable ecosystems. In this study we examined the drivers of riparian plant invasion in 16 Cantabrian river basins of the northern Iberian Peninsula. These streams are characterised by their short length (15–70 km), with riparian vegetation being mainly constituted by alder forests (*Alnus glutinosa*) subjected to varying levels of human-driven degradation. Human influence in the study area is notably high. Five sampling sites consisting of a 100-m-long stretch were randomly selected within each basin, where a comprehensive list of native and alien plants was compiled. Fieldwork was conducted from 2008 to 2013 between late spring and early autumn. 130 alien plant species were found across the 80 sampling sites, representing 21% of the recorded total flora. The most frequent alien plant was *Crocosmia* × *crocosmiiflora*, present in 46 sampling sites. Other herbaceous (e.g. *Cyperus eragrostis*, *Conyza bilbaoana*, *C. sumatrensis*) and woody (e.g. *Platanus hispanica*, *Populus* × *canadensis*) species were quite frequent as well. Alien richness (i.e. the number of alien plants per site/basin) and relative alien richness (i.e. the proportion of alien plant species in relation to all plant species occurring in a given site/basin) were used as measures of the level of invasion. By means of generalised linear mixed models (GLMM) we found that the level of invasion at site scale was influenced by environmental variables such as the thermicity index, the river width and the number of plant communities and by human-related variables such as the distance to the nearest town and the proportion of surrounding urban land. At the basin scale, Mann-Whitney's U test showed that urbanised/industrialised river basins were more heavily invaded than agricultural/forested basins. Furthermore, non-metric multidimensional scaling (NMDS) pointed out that both types of basins differed in their alien plant composition. Differences in the level of invasion observed with increasing scale suggest that both the scale of the study and the local per-site level of invasion should be taken into account in order to gain a more complete picture of the invasion process.

Gasimova K.

Poster G-05 (young scientist)

Investigation of marginal lands and rehabilitation potential of plant species in Kur-Araz lowland of Azerbaijan

Special session: Species and plant community responses along soil gradients

Khatira Gasimova

Institute of Botany, Azerbaijan National Academy of Sciences, Baku, Azerbaijan Republic

xsemedova@bk.ru

Soil salinity is one of the major problems for agricultural and socio-economic development in many countries. Intensive development of industrial units and agro-technical approaches resulted in serious ecological problems over large areas of the Kur-Araz lowland of Azerbaijan. This region is known as the largest irrigated agricultural territory and faces with the multiplicity of problems, in particular, surplus of salts and desertification. However, significance of the territory for the economy of this region calls for improving the quality of the saline-prone arid lands. To compare the degree of marginalization in the lowland soil samples at various distance from the intensive road, around plants and in bulk sides samples from different regions were collected and analyzed for the fertility of soils and content of pollutants. The humus content was found to be different depending on the region and soil layers ranging from 0.5 to 4%. Sum of salts and TDS (total dissolved solids) were also measured for all tested soil samples. The highest values for both parameters in soils were 5.7% and 6.5 g/l, respectively, accompanied by the highest EC values in these regions. pH values for all soil samples tested were similar, being higher than 7. Analysis of heavy metal content in plant samples tested revealed that Co and Pb were accumulated by some plants in the range of critical toxicity level. Cr, Cu, Mn and Zn found in the shoots of plants were close to the toxic level depending on their growing habit. In particular *Salsola nodulosa*, *Suaeda dendroides* and *Halocnemum strobilaceum* were distinguished by their heavy metal accumulation capacity. However, high levels of these metals were not observed in soil samples collected around the investigated species. *Salsola dendroides*, *S. ericodes*, *S. crassa*, *Halocnemum strobilaceum*, *Kalidium caspicum*, *Kochia prostrata*, *Capparis spinosa*, *Glycyrrhiza glabra*, *Convolvulus persicus*, *Limonium meyeri* prevail in the floristic composition of different regions in the lowland. Some of them have also industrial significance. The caloric values of the shoots of *Artemisia*, *Salsola*, *Suaeda* and *Halocnemum* from these regions were found to be high, ranging from 3644 cal/g to 4262 cal/g. High adaptation capacity of these species to the stressed environmental conditions can be used for the phytorehabilitation of the territory and improvement of marginal lands.

Gavilán R.G.

Poster with lightning talk P-16

Calcareous alpine areas of central Spain: how connected are they?

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Rosario G. Gavilán

ENVIROVEG Group, Department of Vegetation Biology II, Faculty of Pharmacy, Complutense University of Madrid, Madrid, Spain

rgavilan@ucm.es

Not very long ago (1995) an alpine area rich in marble outcrops was discovered in the Sierra de Guadarrama National Park (Sistema Central). It is a small area close to Flecha peak. Its flora is a mixture of siliceous and calcareous plants. We are developing different works to declare it as a "flora and vegetation micro-reserve". In the present work we show the relationships of this territory with the nearest ones: Sistema Ibérico (Sierras de Gúdar y Javalambre). To do that we have sampled the vegetation and the temporal and permanent seed banks of dominant vegetation (*Astragalus nevadensis* subsp. *muticus* grasslands). Vegetation showed the relationships between both territories but also differences and we have distinguished a new community (association).

Analysing the temporal banks we found more species in the Guadarrama bank than in the Gúdar bank probably due to the mixture of substrata in the first. The families that dominate these two sites are basically the same: *Caryophyllaceae*, *Poaceae* and *Umbelliferae* and also *Boraginaceae* in the case of the Guadarrama. In the permanent bank results are similar but in the Gúdar other families like *Cruciferae* or *Scrophulariaceae* also appear.

The predominant life forms for the seasonal bank are therophytes, hemicryptophytes, chamaephytes and nanophanerophytes in the Guadarrama and therophytes, hemicryptophytes and geophytes in Gúdar. In the permanent bank the dominant sequence is hemicryptophyte, therophytes and chamaephytes in the Guadarrama and therophytes, hemicryptophytes and chamaephytes in the Gúdar.

We found weak relationships between the plant cover and the seed banks as in other similar works. The seasonal seed bank in the Guadarrama showed a similar number of therophytes and hemicryptophytes, typical of grasslands in alpine areas. This idea is reinforced in the permanent bank with many more hemicryptophytes than phanerophytes. In the Gúdar the number of therophytes in the seasonal bank is much higher in both seed banks that we related to a stronger grazing pressure in the area. The results also highlight that these areas are a reservoir of shrub seeds that now dominate the landscape of lower areas and that could be activated if climate changes happened as is expected.

Gazol A.

Oral presentation

Species-rich temperate grasslands on five continents show consistent community assembly patterns

Antonio Gazol [1,2,*], Jodi N. Price [2,3], Riin Tamme [3,4], John W. Morgan [5], Steve Leonard [5], Claire Wainwright [6], Gisela C. Stotz [7], James F. Cahill [7], Juan José Cantero [8], César Núñez [8], Ricardo Ibáñez [9], Inga Hiiesalu [10], Ülle Reier [2] & Meelis Pärtel [2]

[1]Instituto Pirenaico de Ecología (IPE – CSIC), Zaragoza, Spain; [2]Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia; [3]School of Plant Biology, University of Western Australia, Perth, WA, Australia; [4]Evolution & Ecology Research Centre, School of Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, NSW, Australi; [5]Department of Ecology, Environment and Evolution, La Trobe University, Melbourne, Australia; [6]Mayfield Lab, The Ecology Centre, School of Biological Sciences, University of Queensland, Queensland, Australia; [7]Department of Biological Sciences, University of Alberta, Edmonton, AB, Canada; [8]Universidad Nacional de Río Cuarto, Río Cuarto, Córdoba, Argentina; [9]Departamento de Biología Ambiental (AMBIUN), Universidad de Navarra, Navarra, Spain; [10]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic

* Presenting author: agazol@ipe.csic.es

Temperate grasslands can be very diverse at small spatial scales and this raises questions about how species coexist given that all plant species are competing for the same limiting resources. We aim to discover if there are limits to the number of co-occurring species in temperate grasslands (i.e. communities are saturated) and to determine potential biotic limitations generating such limits. We sampled ecologically similar species-rich temperate grasslands in seven floristic regions on five continents with different evolutionary histories. We collected data in 48 grassland sites in Canada, Estonia, Spain, Mongolia, Argentina, Western Australia and South Eastern Australia (Tasmania and Victoria). In each site, we established a transect (0.1 × 10 m), consisting of 100 quadrats (10 × 10 cm). We estimated quadrat- and transect-scale species richness (i.e. alpha and gamma diversity, respectively) and their relationships (community completeness – ratio between species present and absent in each quadrat). The relationship between community completeness and gamma diversity indicates whether species richness is limited in different regions. We applied assembly tests and compared the observed patterns of richness variance, C-scores (species segregation within communities) and guild proportionality (proportion of forbs and grasses) to that expected from null models to further explore richness patterns and potential limitations to species coexistence. The largest values of alpha diversity were found in grasslands near the Mediterranean region in Spain with an average of 15.3 species in 10 × 10 cm quadrat, and a maximum value of 23. Highest gamma diversity was found in Argentina (59 species per transect). We found that with increasing gamma diversity, communities became more saturated, i.e. had a higher proportion of available species present in the small-scale quadrats. Richness variance and guild proportionality were lower than expected at random in all of the regions (excluding Western Australia and Spain), indicating some limits to the number of species occurring in a quadrat, and deviations in the relative proportion of forbs and grasses. Additionally, we found significant species segregation patterns at most sites. Our study suggests that small-scale species richness is limited and differs from random. Despite high variation in species richness values, similar processes may be influencing patterns of diversity in temperate grasslands around the globe.

Gazol A.

Poster K-01

The upward advance of the treeline ecotone influences plant functional diversity at intra- and inter-specific levels in the southern Urals

Special session: Vegetation patterns, processes and dynamics of timberlines

Antonio Gazol [1,*], Pavel Moiseev [2] & J. Julio Camarero [1]

[1]Instituto Pirenaico de Ecología (IPE – CSIC), Zaragoza, Spain; [2]Institute of Plant and Animal Ecology, Yekaterinburg, Russia

* Presenting author: agazol@ipe.csic.es

Upward treeline shift and encroachment, usually related to warmer temperatures, is a global phenomenon although its strength and intensity varies across regions. This upward movement could be accompanied by an expansion of understory plant species towards the alpine grasslands and tundra, which can result in a reduced performance of typical tundra plant species by increasing the competition for key resources. We studied changes in tree growth and vegetation patterns along an altitudinal gradient in the Iremel Masif (Southern Urals, Russia). We designed a sampling scheme with three altitudinal levels to cover the entire extent of the treeline ecotone: closed forest (> 50% tree cover), treeline ecotone (including trees up to 2 m high) and treeless alpine zone dominated by mosses and dwarf shrubs. Dendrochronological methods were used to quantify the changes in growth along the altitudinal gradient of trees (*Picea obovata*) and two dwarf shrubs (*Salix glauca*, *Vaccinium uliginosum*). Vegetation composition and cover were sampled twice in 2004 and then in 2014 by re-sampling 48 1-m^2 plots along three altitudinal level (144 plots in total). Additionally, in 2014 several plant traits (height, leaf size and specific leaf area) were measured for the most frequent species found in each elevation level (*Polygonum alpinum*, *Salix glauca* and *Vaccinium uliginosum*). The variation in intraspecific functional diversity was assessed by comparing the traits of these plant species. To assess changes in community assembly, we calculated and compared niche overlap for each trait in each sampling date (2004 vs. 2014). In the Iremel Masif there has been an upward expansion of the treeline ecotone that has induced changes in vegetation patterns. We did not observed an improvement in tree growth during the last decade but the canopy cover has increased in the sampled plots. The three species sampled along the entire gradient showed higher values of height, leaf size and SLA in the lower level. Intra-specific trait variation of *S. glauca* decreased with altitude whereas that of *V. uliginosum* and *P. alpinum* showed no clear patterns. We found changes in community composition between the two sampling dates that resulted in an increase in vegetation niche overlap in the tundra and a decrease in the lower forest plots. Our results suggest that treelines advances influences vegetation patterns by altering species performance and increasing competition for key resources.

Geange S.

Poster with lightning talk A-03 (young scientist)

Plasticity in water use traits in Australian alpine plants

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Sonya Geange [1,*], Veronica Briceno Rodriguez [1], Nicola Aitken [1], Jose Alberto Ramirez-Valiente [2] & Adrienne Nicotra [1]

[1]Research School of Biology, Australian National University, Canberra, ACT, Australia; [2]Department of Ecology, Evolution, and Behavior, University of Minnesota, Saint Paul, USA

* Presenting author: sonya.geange@anu.edu.au

The Australian alpine ecosystem is particularly vulnerable to the effects of climate change. In part, because it covers < 1% of mainland Australia, and also has a limited elevational range. Alpine plants have limited options for range migration, therefore response to climate change is expected to be primarily determined by their ability to survive in situ through local adaptation or phenotypic plasticity. Models for this region project increasingly variable precipitation and snow cover, thus we expect water use traits and phenotypic plasticity therein to become increasingly important. Lower elevation plants experience a more variable environment as earlier snow-melt results in more frequent frosts and greater temperature extremes. Theory predicts that individuals from more variable environments exhibit greater phenotypic plasticity, however, empirical results are equivocal. Here we investigated the extent of plasticity and intraspecific variation in water use traits in three Australian alpine herbs; *Wahlenbergia ceracea*, *Aciphylla glacialis* and *Oreomyrrhis eriopoda*. We assessed whether patterns of morphological and physiological plasticity differed between species, or between elevations within species under two contrasting glasshouse water treatments. Based on previous studies, we hypothesised that plants from lower elevations would exhibit characteristics consistent with greater plasticity in water use traits. Plastic response to water availability was widespread in most traits and followed expected patterns. Previous work in the same environment and for two of the same species demonstrated that low elevation populations had greater plasticity in response to temperature than those from higher elevations. Our results suggest that this not equivalent within species variation in plasticity in response to water availability. We found few differences between high and low elevation populations within species, and elevation-by-treatment interactions were even less common. Further, where elevation effects were found they were not consistent with respect to trait, species, or elevation. Our results suggest that patterns of plasticity, and within species differentiation, vary greatly depending on the resource under consideration and generalising a response based on one environmental variable is not possible. Furthermore, the low intra-specific variation displayed by these study species may limit adaptive evolution in response to changing precipitation regimes.

Gerhold P.

Poster B-05

Broad-scale patterns and determinants of phylogenetic community structure

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Pille Gerhold * & Meelis Pärtel

Department of Botany, Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: pille.gerhold@ut.ee

Global patterns and determinants of plant species richness are well studied whereas the patterns and drivers of phylogenetic community structure (PCS) are not. We believe that PCS has a potential to reveal the broad-scale processes of ecosystems because it reflects evolutionary and historical factors that have formed vegetation. Evolutionary drivers include the radiation of lineages whereas historical drivers include their dispersal into other regions. We conducted global meta-analysis to reveal broad-scale patterns and determinants of PCS. We studied PCS by the means of net relatedness index (NRI) which is intrinsically independent of species richness. Higher than random NRI shows phylogenetic clustering whereas lower than random NRI shows phylogenetic over-dispersion. We correlated NRI to latitude and environmental parameters reflecting latitudinal gradients such as temperature and precipitation. Negative correlation between NRI and latitudinal gradients would support (1) the Cradle Hypothesis: due to high radiation rates of phylogenetic lineages and numerous endemic species, communities can be phylogenetically clustered at low latitudes. Positive correlation would support (2a) the Museum Hypothesis: high environmental stability (minor effects of global cooling) supports low extinction rates and therefore phylogenetically over-dispersed communities at low latitudes. Negative correlation would also support (2b) the hypothesis of phylogenetic niche conservatism, which predicts that global species richness increases with temperature and precipitation because the niches of most contemporary species were formed under these conditions (i.e. during the time when the planet was predominately under tropical environments); therefore, only a few clades possess traits to cope with cool temperatures which results in phylogenetically clustered communities at high latitudes. Our preliminary findings support (2a) the Museum Hypothesis and (2b) Niche Conservation Hypothesis: there was significant positive correlation between NRI and latitude which indicates that communities tend to be phylogenetically clustered towards equator. We also found significant negative correlations between NRI and temperature and between NRI and precipitation which support the latitudinal gradient in PCS. Our findings suggest that there is broad-scale variation in PCS which cannot be explained by local and contemporary ecological factors but by evolutionary and historical factors.

Gerz M.

Oral presentation (young scientist)

Does mycorrhizal symbiosis affect plants' realized niche?

Special session: Species and plant community responses along soil gradients

Maret Gerz [1,*], Wim A. Ozinga [2,3], C. Guillermo Bueno [1], Martin Zobel [1] & Mari Moora [1]

[1]Department of Botany, Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia; [2]Experimental Plant Ecology, Institute for Water and Wetland Research, Radboud University Nijmegen, Nijmegen, The Netherlands; [3]Team Vegetation, Forest and Landscape Ecology, Alterra, Wageningen University & Research Centre, Wageningen, The Netherlands

* Presenting author: maret.gerz@ut.ee

The mechanisms driving plant species coexistence and diversity has long fascinated plant ecologists, yet it still remains a question in need of a definite answer. Niche theory supports the idea that each plant species requires a specific range of environmental conditions – a niche – to grow and reproduce and species can coexist only if they occupy different niches. This could be achieved if plants are able to broaden their realized niche breadths along various niche axes and hence enlarge their realized niche volume. One possible way of using a wider gradient of environmental conditions can be through soil microorganisms, including mycorrhizal fungi. Mycorrhizal fungi forming a symbiosis with plant roots help the majority of terrestrial plants to increase the access to nutrients of various sources, as well as aid coping with stressful abiotic conditions. Therefore plants' ability to form mycorrhizal symbiosis, either in terms of their status (whether or not a plant species forms mycorrhiza) or their flexibility (the ability to grow with or without mycorrhiza), is expected to influence plants' ability to expand their niche through mycorrhizal symbiosis. Although previously hypothesized, there is still almost a complete lack of knowledge about how mycorrhizal symbiosis affects the realized niches of plant species. In this study we will address the association between mycorrhizal traits (status and flexibility) and plant realized niches on a large species-set at a regional scale using the Dutch flora. In particular, we ask whether and how plants with different mycorrhizal strategies differ in their realized niches with respect to several environmental factors (soil nitrogen, moisture, pH, salinity, light, temperature). Getting to know the answers to these questions is a step forward in understanding plant species coexistence and possible mechanisms behind diversity distribution.

Giarrizzo E.

Poster with lightning talk C-04 (young scientist)

How do alpha and beta diversity shift in relation to changes in vascular plant species composition in the Apennine semi-natural grasslands?

Session: Patterns and drivers of alpha and beta diversity in plant communities

Eleonora Giarrizzo *, Sabina Burrascano, Laura Zavattero & Carlo Blasi

Department of Environmental Biology, Sapienza University of Rome, Roma, Italy

* Presenting author: eleonora.giarrizzo@gmail.com

In Europe, semi-natural grasslands are extremely species rich and their conservation value is highly prioritized by the Habitat Directive (92/43/CEE). However, in the last decades these ecosystems have faced dramatic changes due to the modification of agricultural practices. Our study focused on *Bromus erectus* communities, using multi-temporal data across seven study sites along the Apennines (Italy). We explored shifts in species composition and diversity addressing the following questions: (i) Have changes in plant species composition occurred during the last decades? (ii) Did these changes affect alpha diversity and compositional heterogeneity? (iii) Which are the drivers of the occurred changes? In 2013–2014, we revisited grasslands sites sampled between 1965 and 1990 and associated to simultaneous and detailed vegetation maps, which were used jointly with the topographic information reported in the plots' tables for the designation of the new sampling sites. We carried out both a phytosociological sampling using the same approach of the previous authors, and the sampling of vegetation specifically aimed at comparing community diversity levels. After assessing if changes in species composition have occurred, we quantified these by measuring the distances of the new plots from the centroids of the historical groups of plots in the multivariate space. We analyzed the relationship between these distances and diversity indices through regression analyses to evaluate if the degree of compositional change is associated to different levels of alpha diversity. We quantified the compositional heterogeneity within both historical and new groups of plots as the multivariate dispersion around centroids, and performed mixed effect models to identify the drivers of the shifts in composition and diversity. Different degrees of change in species composition occurred and these modifications substantially affected species diversity levels, especially compositional heterogeneity of groups. Landscape metrics and topography strongly influenced the degree of change in species composition. Through our approach, we made evident that revisitation studies are a sound strategy to assess changes of species composition in time. This approach may be extremely useful if coupled with current species diversity data since it allows associating composition change to community diversity levels providing useful insights for the conservation of semi-natural habitats.

Giesecke T.

Oral presentation

Patterns and dynamics of vegetation change over the last 15,000 years – an analysis based on the European Pollen Database

Special session: Long-term perspectives on vegetation change

Thomas Giesecke [1,*], Walter Finsinger [2], Michelle Leydet [3] & Simon Brewer [4]

[1]Department of Palynology and Climate Dynamic, Albrecht-von-Haller-Institute for Plant Sciences, University of Göttingen, Göttingen, Germany; [2]Institut des Sciences de l'Evolution-Montpellier (ISEM; UMR 5554 CNRS/UM/IRD/EPHE), Montpellier, France; [3]IMBE, Aix-Marseille University, Batiment Villemin Europole de l'Arbois – BP 80, Aix-en-Provence, France; [4]Department of Geography, University of Utah, Utah, USA

* Presenting author: tgiesec@gwdg.de

Using the pollen diagrams in the European Pollen Database (EPD) we constructed interpolated maps of pollen deposition for the last 15,000 years for the most abundant pollen taxa at 500 years intervals. We classified interpolated pollen proportions into four classes with the lowest indicating the area of presence and the highest depicting the area of co-dominance or highest Holocene values. The different areas occupied by these abundance classes as well as their position relative to the Mediterranean and the Atlantic coast were computed. *Abies*, *Picea*, *Fagus* and *Carpinus* show a slow mid to late- Holocene growth in area and abundance. For *Picea*, *Fagus* and *Carpinus*, the distributions of all abundance classes shifted their center towards the Atlantic coast. The area covered by different abundance classes changed in parallel for most species and periods. Assessments of the apparent shifts in the distribution limits show the largest distance jumps exceeding 1000 m/a right after the onset of the Holocene for *Ulmus* and *Corylus*, but also for *Quercus* we find average shifts in distribution limits of 400 m/a. This range filling follows logistic growth models and the inflection point in the logistic increase emerges as convenient parameter to describe the difference in timing of the major expansion phases of European trees. The overall dynamics of the area increase for the different abundance classes can be obtained from the rate of increase or its reciprocal, the time needed to double the area covered by the respective abundance class. For the higher abundance classes the dynamics of area increase is often similar between early and late spreading species indicating that intrinsic biological drivers limit the rate of expansion for all species in a similar way. As a consequence the late expansion of some species cannot be explained by intrinsic, biological processes, but may be explained by extrinsic divers like climate and land-use change. Difference maps between two consecutive periods were computed based on the original values and the results classified as positive and negative quantiles highlighting the area and strength of abundance change. An index combining the strength and area of change for North and South Europe (divided at 46°N latitude) shows symmetric population expansions with the onset of the Holocene particularly for *Corylus*, *Ulmus* and *Tilia*.

Gigante D.

Poster D-11

Habitat red-listing: the pattern of spatial occupancy does matter

Session: Vegetation science serving nature conservation

Daniela Gigante [1,*], Bruno Foggi [2], Roberto Venanzoni [1], Daniele Viciani [2], Edy Fantinato [3] & Gabriella Buffa [3]

[1]Department of Chemistry, Biology and Biotechnologies, University of Perugia, Perugia, Italy; [2]Department of Biology, University of Florence, Florence, Italy; [3]Centre for Estuarine and Marine Studies, DAIS, University Ca' Foscari of Venice, Venice, Italy

* Presenting author: daniela.gigante@unipg.it

In terrestrial systems, the plant community concept has acquired a central role in land planning as a key approach for biodiversity conservation above the species level. In this frame, Red Lists of habitats and plant communities are increasingly arising interest at the global level and also in Europe (see, e.g., Rodwell et al. 2013). Starting with the analysis of recently proposed protocols for the red-listing of habitats and ecosystems, we discuss and test some emergent properties of species assemblages, providing cues for reflection. Each habitat and vegetation type owns intrinsic, ecologically based, spatial features, which affect its spatial distribution in natural conditions. We hypothesize that the cogent relationship between vegetation and environmental heterogeneity accounts for an intrinsic property of any plant community, i.e. its "pattern of spatial occupancy" (pso), which might have a role in red-listing when applying quantitative criteria – above all those based on the "Area of Occurrence" (AOO). We discuss a model where the possible types of pso are referred to three basic types: areal, linear and point. Some case studies are then discussed using, as assessment units, the Annex I habitats as defined by the European Habitat Directive 92/43/EEC, whose description stems from plant communities and which are usually identified, and even mapped, based on phytosociological syntaxa. Data reported by the Italian Ministry of the Environment and Protection of Land and Sea (2013) for Article 17, freely downloadable at *http://www.sinanet.isprambiente.it/it/Reporting_Dir_Habitat*, are here used to show how shape and size are intrinsic properties of habitats and plant communities, and how they might affect the results of red-listing assessment protocols. Our approach is proposed as a tool to discriminate among different broad categories of habitat types and optimize their assessment in red-listing processes, demonstrating by simple observations that habitats with linear and point distribution are more susceptible to bias in the evaluation of their threat status, compared to those with an areal pso. A habitat-tailored approach, e.g. adopting different grid-cell sizes and thresholds for the three main pso's proposed here, might certainly reduce this risk for the assessments based on AOO.

References

Rodwell, J., Janssen, J., Gubbay, S. & Schaminée, J., 2013. *Red List Assessment of European Habitat Types – A feasibility study*. SC No. 070307/2012/624047/SER/B3, Report for the EC, DG Environment, Brussels.

Gillet F.

Oral presentation

Recent vegetation changes in montane grasslands: a diachronic resampling study

Special session: Global change and vegetation dynamics: the use of historical data sets

François Gillet [1,2,*], Leslie Mauchamp [1], Arnaud Mouly [1] & Pierre-Marie Badot [1]

[1]UMR 6249 Chrono-environnement, University of Franche-Comté – CNRS, Besançon, France; [2]Ecological Systems Laboratory, Ecole Polytechnique Fédérale de Lausanne, Ecublens, Switzerland

* Presenting author: francois.gillet@univ-fcomte.fr

Recent studies highlighted a reduction of plant species richness in European permanent grasslands during the last decades. Species-poorer contemporary communities are more dominated by mowing-tolerant grass species with high nutrient requirements. As an explanation to this change, an increase of nutrient supply due to agricultural practices and atmospheric depositions is commonly mentioned. In this resampling study, we investigate the recent changes in grassland vegetation of the French Jura Mountains, a region with a long tradition of pastoralism. We compared the floristic composition of 150 grasslands recorded between 1990 and 2000 with new relevés made in 2012 on the same sites. We considered alpha taxonomic, phylogenetic and functional diversity as well as ecological characteristics of the plant communities derived from Landolt ecological indicator values and Grime's CSR strategies. A principal component analysis of the whole dataset revealed a significant general trend linked to the sampling year. Wilcoxon paired tests showed that contemporary communities are more dominated by grass species, present a higher tolerance to defoliation, a higher pastoral value and are more adapted to higher nutrient availability. Comparisons revealed a decrease of phylogenetic and functional diversity. However, we did not record any significant decrease of taxonomic diversity, but even a slight increase of local species richness. The intensity of changes in species composition, measured by Hellinger distances between pairs of relevés, was neither dependent on the time lag between the two surveys, the author of the first relevé nor its location or altitude. Nevertheless, the most important changes were observed in grasslands that previously presented low pastoral value, low grass cover, low tolerance to defoliation and high proportion of stress-tolerant species. This trend is likely linked to the intensification of grassland management reported in the region. A previous diachronic study based on the comparison of historical and recent phytosociological maps within the same region has shown that important changes happened since the 1950s, including a strong regression of mesotrophilous grasslands to the benefit of species-poor eutrophilous pastures and hayfields. Consequences for habitat conservation and ecosystem services in mountain areas are discussed, as well as methodological challenges of such resampling or remapping studies.

Gillet F.

Poster P-17

Phytobase: a tool for the integrated synusial approach of vegetation classification at regional to national scale

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

François Gillet [1,2,3]

[1]UMR 6249 Chrono-environnement, University of Franche-Comté – CNRS, Besançon, France; [2]Ecological Systems Laboratory, Ecole Polytechnique Fédérale de Lausanne, Ecublens, Switzerland; [3]Soil and Vegetation Laboratory, University of Neuchâtel, Neuchâtel, Switzerland

francois.gillet@univ-fcomte.fr

Phytobase is a relational database management system devoted to the management of vegetation survey data, following the concepts of the integrated synusial phytosociology. This 4D application has been developed from the 1990s and applied to various ecosystems (wood-pastures, forests, floodplains, wetlands and grasslands) in various regions, mostly in Switzerland and France. Integrated synusial phytosociology considers that vegetation is organized in nested hierarchical levels, each of them being potentially described in a typological and classification system. The first, finest level is the synusia, a concrete plant community composed of plant species co-occurring in a local similar environment, with comparable size and habitat use. Phytobase distinguishes three categories of synusiae, i.e. tree, shrub, herb and moss synusiae, classified into elementary syntaxa. They are eventually integrated into phytocoenoses, the second level of vegetation description, based on a list of synusial syntaxa co-occurring in a given phytocoenosis, such as a forest stand with its different layers, sylvogenetic phases and dependent (e.g. epiphytic) communities. Phytocoenoses are classified into elementary coenotaxa according to their synusial composition. Higher organization levels (tesela/sigmataxa and catena/geosigmataxa) are included in Phytobase as well, but only used so far for floodplain vegetation. The classification of synusiae is based on Julve's "baseveg" system. An automatic diagnostic of plot records is implemented in Phytobase, including classification in Julve's system, assignment to an elementary syntaxon, ecological indicator values (Landolt, Ellenberg, Julve), life forms, Grime's CSR strategies, functional traits, taxonomic diversity indices, pastoral value, etc. Each elementary syntaxon or coenotaxon is described by the centroid of all plot records that were assigned to it, and Phytobase includes various diagnostics for species (or elementary syntaxon) fidelity (IndVal, Phi, etc.), compositional homogeneity and ecology. Phytobase is freely available from the Tela-botanica website (*http://www.tela-botanica.org/page:liste_projets?id_projet=18&act=documents&id_repertoire=16428*), including a sample of relevés. It is used by more than two hundred registered users in Europe. The current version 8.3 has a user interface in French language but an English version is planned to allow a broader diffusion to the international community of vegetation scientists.

Giorgini D.

Poster D-12 (young scientist)

Predicting the habitat type distribution to assess the representativeness of the Natura 2000 network

Session: Vegetation science serving nature conservation

Daniele Giorgini [1,*], Stefano Chelli [2], Giandiego Campetella [2], Alessandro Chiarucci [3] & Roberto Canullo [2]

[1]Department of Life Sciences, University of Siena, Siena, Italy; [2]School of Biosciences and Medicine, University of Camerino, Camerino, Italy; [3]Department of Biological, Geological and Environmental Sciences, University of Bologna, Bologna, Italy

* Presenting author: dan.giorgini@gmail.com

The Natura 2000 sites based on the Habitats Directive are considered the cornerstone of European Union nature conservation policy. They are the main tools that European nations have to conserve biodiversity across Europe. Therefore, assessing the effectiveness of the Natura 2000 network is a demanding topic in conservation biology. As defined in the Annex I of the Habitat Directive, the site selection is based on habitats, therefore as accurate information as possible about the extent and distribution of habitats is needed. Several scientific efforts has been made in this direction, mainly for large-scale habitat monitoring through traditional and remote sensing approaches. However, large-scale species assessments suffer of the lack of standard procedures and data heterogeneity. Here the ICP Forests LI dataset, the first harmonized assessment of European biodiversity on representative basis, is used as baseline information to predict the extent and distribution of habitats types. This data set includes about 3200 plots sampled in European forests using a probabilistic sampling, therefore represents an opportunity to achieve a representative picture of the EU forest habitat types. Predictive models of habitat types are developed combining information of the vegetation relevés with environmental predictors. As a result, maps representing European habitat type distribution are obtained. In order to assess the appropriateness of the Natura 2000 sites, the degree of spatial overlap between them and the distribution map of habitat types is calculated.

Goldstein K.

Poster with lightning talk A-04 (young scientist)

Functional diversity of fen and fen meadow communities of the Biebrza Valley

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Klara Goldstein *, Łukasz Kozub, Tomasz Wyszomirski, Agata Klimkowska & Wiktor Kotowski

Biological and Chemical Research Centre, Department of Plant Ecology & Environmental Conservation, Institute of Botany, Faculty of Biology, University of Warsaw, Warszawa, Poland

* Presenting author: klara.goldstein@biol.uw.edu.pl

Functional diversity (FD) analysis has been proposed as a method to uncover mechanisms structuring plant communities, particularly to distinguish between the competition filters, which typically increase the functional divergence through limiting functional similarity between species, and the habitat filters (stress and disturbance), which cause trait convergence towards a narrow subset of optimal values. Competition for light and root anoxia have been identified as the two most important filters in fen vegetation. Here we explore the functional structure of fen communities, focusing on: (1) how do light competition and root anoxia interact in controlling fen communities, (2) which functional traits are subject to the strongest filtering and (3) which FD indices are the best descriptors of functional variation in the fen vegetation. Biebrza Valley (NE Poland) is one of the largest European fen systems, with ca. 1200 km^2 of diverse fens and varying degree of human impact. The variation in species composition among communities within the whole valley is considered as an effect of the environmental filters acting on the regional species pool. Functional analysis covered nine communities obtained from TWINSPAN classification of 465 relevés. In addition to intact and drained fens, we also sampled *Molinia* meadows on mineral soil, as a reference to the syntaxonomically similar vegetation on degraded peat soil. The functional traits used were: canopy height, specific leaf area (SLA), leaf dry matter content, seed mass, clonal spread, start of flowering and Ellenberg moisture indicator value. Community weighted means and seven FD indices were computed for all relevés. Three of them: Functional Range, Richness and Divergence allowed to infer the differences in the functional characteristics among the analysed communities. We found trait divergence to be lower in low-productive sedge-moss fens than in more productive tall-sedge fens and tall-sedge meadows on drained peat, denoting a greater influence of habitat stress in the former and a stronger competition in the latter. In *Molinia* meadows we observed high SLA values and their low ranges within a sample, indicating strong filtering of this trait. Investment in SLA optimises the efficiency of photosynthesis and is considered an adaptation to light competition. This outcome suggests that the importance of competition can result in the convergence of traits related to light acquisition instead of the divergence caused by limiting similarity.

Götzenberger L.

Oral presentation

Biogeographical community assembly and its dependence on spatial and environmental scales

Lars Götzenberger [1,*], Yasuhiro Kubota [2] & Francesco de Bello [1,3]

[1]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [2]Faculty of Science, University of the Ryukyus, Okinawa, Japan; [3]Department of Botany, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic

* Presenting author: lars.goetzenberger@gmail.com

In recent years, community assembly studies have moved into the territory of biogeographical scales. By studying trait composition and diversity of local assemblages compared to that of regional assemblages at larger geographical scales, researchers have tried to identify niche-based and neutral processes. However, the interpretation of such patterns is theoretically dependent on the spatial and environmental extent of the study. In other words, it makes a difference if the trait structure of a local assemblage, e.g. 100 × 100 m in size, is compared to the trait structure of an entire national flora, or to the plants occurring in a 10 × 10 km grid around the local assemblage. In many cases, the definition of what comprises the regional assemblage is arbitrary. Here we show that the degree of trait diversity can indeed be systematically related to the relative size of the local and regional assemblages. We used a comprehensive data set on forest tree plots and accompanying trait data spanning the whole Japanese archipelago. After grouping into hemiboreal, deciduous, evergreen, and subtropical forests, the plots were further categorized into clusters by environmental and spatial distance with increasing numbers of clusters, representing groups of plots with increasing spatial proximity and environmental similarity. The clusters were then used as the regional assemblage from which the local assemblage is a subset that is either equally, more, or less similar in traits than the regional assemblage. In general, all eleven studied traits showed trait convergence for most forest types (ca. 75 % out of all trait/forest type combinations), whereas divergence was found for few trait/forest type combinations. In most cases convergence and divergence became less strong with decreasing size of the regional species pool. Contrastingly, in hemiboreal forest plots some traits had maximum convergence or divergence when compared to regional assemblages of intermediate size, pointing to niche-based assembly processes dominating at different scales for different forest types. In conclusion, our approach can identify the spatial and environmental scales at which patterns of trait divergence and convergence dominate for a given set of local assemblages. It therefore provides a more comprehensive picture of trait assembly than when using a static concept of the regional assemblage.

Greulich S.

Oral presentation

Established vegetation, seedbanks and exotics in urban wastelands – which impacts of climate change?

Special session: Urban vegetation

Sabine Greulich [1,2,*], Maëva Hirsch [1], Marion Brun [1], Francesca Di Pietro [1], Sébastien Bonthoux [1,3] & Sabine Bouché-Pillon [1,3]

[1]University of Tours – CNRS UMR 7324 CITERES, Tours, France; [2]Department Environment, Regional and Urban Planning, Polytech' Tours, Tours, France; [3]National School of Higher Studies in Nature and Landscape Architecture, Blois, France

* Presenting author: greulich@univ-tours.fr

Urban wastelands are the places with the most spontaneous vegetation within the urban context. They can harbor different types of vegetation according to local factors such as area size, soil type, site history, or according to the landscape matrix (Bonthoux et al. 2014). Ruderal sites, to which many urban wastelands belong, are also known to be first stepping stones for the spread of exotic and invasive plant species. The rare seedbank studies in urban wastelands have revealed a higher part of exotic and invasive species in the seedbank then in the established vegetation (Albrecht et al. 2011). Some of these exotics may presently encounter sub-optimal climate conditions and could therefore become more abundant with global warming (Hellmann et al. 2007). The present study examines established vegetation and seedbanks in wastelands from two cities in the French Center region. It addresses the question to what extent the expression of exotics from the seedbanks will be favored by climate change. In order to study that question, vegetation relevés were realized on 179 wasteland sites in summer 2013. Seedbanks were sampled in spring 2014 from a subsample of 15 wastelands with three degrees of invasion in their established vegetation. Samples were submitted during 24 weeks to an experiment with controlled light, humidity and temperature conditions. Two types of temperature regimes were applied: one simulating present temperatures and one simulating temperature regime under climate change by the end of the century. Seedlings were monitored weekly and seedling number, seedling identity, as well as first flowering date per species and treatment were recorded. The study thus allows to (i) quantify present representation of exotic and invasive species in the urban wastelands, (ii) compare seedbank composition and established vegetation, (iii) compare impacts of temperature regime on seedling composition and on phenology of seedling development and flowering.

References

Albrecht, H., Eder, E., Langbehn, T. & Tschiersch, C. 2011. The soil seedbank and its relationship to the established vegetation in urban wastelands. *Landscape and Urban Planning* 100: 87–97.

Bonthoux, S., Brun, M., Di Pietro, F., Greulich, S. & Bouché-Pillon, S. 2014. How can wastelands promote biodiversity in cities: a review. *Landscape and Urban Planning* 132: 79–88.

Hellmann, J.J., Byers, J.E., Bierwagen, B.G. & Dukes, J.S. 2007. Five potential consequences of climate change for invasive species. *Conservation Biology* 22: 534–543.

Grytnes J.-A.

Oral presentation

Vegetation shifts along elevation and latitude: is it two different stories?

Special session: Global change and vegetation dynamics: the use of historical data sets

John-Arvid Grytnes

Department of Biology, University of Bergen, Bergen, Norway

grytnes@bio.uib.no

A general tendency for species and communities to move upwards in elevation and polewards in latitude has been observed during the last decades. These observations have generally been interpreted to be a result of the ongoing climatic warming. The distances between climatic zones are much shorter along elevation than along latitude. Due to the rapid climatic warming and dispersal limitation of species we expect species to track their climatic niches much more readily along elevation than latitude. I used a data base with more than 10,000 historical relevés sampled in Norway since 1930s to compare the elevational shifts of communities with the latitudinal shifts. To do this a weighted average approach was used to establish a transfer function between community composition and elevation or latitude for the plots prior to 1960 and subsequently predicting the elevation or latitude (respectively) for all other plots in the data set. The difference between the predicted and observed elevation or latitude is taken as an indication of community shift along the respective gradient. Elevational shifts were studied separately in regions large enough to contain enough relevés for analyses. The results show that communities are shifting statistically significant along elevation in most of the regions studied but no statistically significant shifts are found along the latitudinal gradient. This indicates that dispersal limitations might be a serious obstacle for species trying to track their climatic niches when the only option for doing so is to move along the latitudinal gradients. As long as there are space further up along the elevational gradients species will be better able to track the climatic changes and less susceptible to extinction.

Guido A.

Poster D-13 (young scientist)

How are grassland communities affected by the periodic suppression of forbs or graminoids?

Session: Vegetation science serving nature conservation

Anaclara Guido * & Valério D. Pillar

Department of Ecology and Graduate Program in Ecology, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

* Presenting author: anaclara.guido@ufrgs.br

Predicting the effect of certain functional group suppression on the remaining community is particularly important in threatened and neglected ecosystems, such as southern Brazilian grasslands. We report the results of a removal experiment in natural grassland vegetation in southern Brazil to evaluate the effect of repeated clipping of aboveground biomass of target functional group(s) on remaining community, in terms of community composition, richness and functional group interactions. The experiment had a randomized block design with 18 blocks of 2 × 2 m within which four 0.2 × 0.2 m plots were selected. The mean richness per 0.2 × 0.2 m plot was 15 species before the experiment. In each block four treatments were randomly allocated among plots: forb removal, graminoid removal, total removal and no removal as control treatments. Removal was produced by repeated clipping of total aboveground biomass at the ground level. Data analyses considered the initial (2012 survey, pre-treatment application) and the final state (2013 survey, post-treatment application) of the same plot for each treatment. Repeated clipping changed community species composition and richness. The effect of suppressing a plant functional group depended both on the identity of the clipped group and on the remaining group in the community. Forb and graminoid cover decreased in response to their own suppression, as expected, but only graminoids increased their cover when forbs were clipped. Losses and gains of plant cover indicated competition interaction between forbs and graminoids only when graminoids were suppressed, which reveals an asymmetric competition between groups. We conclude that forb suppression has a stronger effect on grassland plant community than graminoid suppression, suggesting high competition exerted by the remaining graminoid species, which increased their cover in the released bare space and restricted colonization of new species after clipping. This study provides experimental evidence of early responses of functional group clipping at fine spatial scale in natural grassland plant communities.

Guuroh R.T.

Poster with lightning talk J-10 (young scientist)

Land-use pressure is more important than climate for herbaceous vegetation patterns in West Africa's Sudanian savannas

Session: Patterns of vegetation change across landscapes

Reginald Tang Guuroh [1,*], Anja Linstädter [2] & Sebastian Schmidtlein [3]

[1]Centre for Remote Sensing of Land Surfaces, University of Bonn, Bonn, Germany; [2]Botanical Institute, University of Cologne, Cologne, Germany; [3]Institute of Geography and Geoecology, Karlsruhe Institute of Technology, Karlsruhe, Germany

* Presenting author: guuroh@yahoo.co.uk

During the past decades, West Africa's tropical savannas have experienced dramatic increases in land-use pressure and considerable changes in climatic conditions. However, we still have a limited understanding of how these global change agents interactively affect current (and future) herbaceous vegetation patterns in this region, which hampers the design of appropriate land management strategies. This study explores the relative role of climate, land-use, topography and soil conditions for herbaceous vegetation in West Africa's Sudanian savannas. It is part of an interdisciplinary project addressing climate change adaptation and mitigation in West Africa (*www.wascal.org*). We collected soil and vegetation data and recorded proxies for grazing pressure in a study area of 530 x 200 km, reaching from northern Ghana to central Burkina Faso, and spanning almost the entire climate gradient within Sudanian savannas (UNEP aridity indices 0.31 to 0.69). Sample sites covered major geological units and steep gradients of land-use pressure. At sites, we stratified sampling by topographic position (upslope, midslope and lowland). We used multivariate statistics to relate herbaceous community composition on 450 relevés to environmental drivers, and to delineate vegetation types. NMDS axes together accounted for 58.8% of variation in the data with axis 3 explaining 27.6%, axis 2 (19.5%) and axis 1 (11.7%). Comparing the arrangement of vegetation relevés in ordination space with relevé-level characteristics, we think that axis 3 might be related to land-use and anthropogenic disturbances, axis 2 might be indicative of climatic variations while axis 1 was most likely related to topographic variations. Soil conditions (texture, chemistry) were less important. Our observation that climate effects on herbaceous vegetation patterns may be partly masked by land-use is of great value for land management planning in the region.

Hahn A.

Poster A-05 (young scientist)

Plant trait responses to key environmental drivers in mountain grasslands

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Annett Hahn [1,2,*], Sylvia Haider [2] & Ingolf Kühn [1,2]

[1]Helmholtz Centre for Environmental Research – UFZ, Halle, Germany; [2]Institute of Biology, Department of Geobotany/Botanical Garden, Martin-Luther University of Halle-Wittenberg, Halle, Germany

* Presenting author: annett.hahn@ufz.de

Climate and land-use change are believed to alter ecosystems including changes in species composition and functional diversity. In the last years, research on plant traits usually focused on single drivers, either land-use or climate. Results of recent studies are heterogeneous, because trait responses seem to vary on different scales of analysis and along gradients varying in lengths. We assume that climate and land-use have an interacting effect on plant traits at species and community scales. To answer our research questions we choose mountains as model system, because of their strong temperature gradients over short distances, the high biodiversity of mountain grasslands and grazing as consistent land-use type with varying intensity. We use data from 31 plots along gradients of elevation and grazing to identify (1) changes in traits of single species, (2) changes in the functional trait composition of communities along the gradients and (3) the main drivers for these changes and (4) their interaction. Vegetation surveys and in situ trait measurements were conducted on grasslands located in the Northern Limestone Alps (Germany) from 600 to 1700 m a.s.l. Seven functional leaf traits (SLA, LDMC, C, N, CN-ratio, leaf toughness, stomatal conductance) were measured. The influence of elevation and grazing on different functional traits was determined using linear models and linear mixed models. According to our hypothesis we found changes in plant traits along the gradients, with various directions on species and more consistent directions on community scale. Contrary to our expectations altitude and grazing intensity did not show interacting effects on all plant traits and at all levels of analysis. Instead, we found that the interaction of both drivers only become visible at species scale. At community scale, our results indicate that temperature is a more important driver than grazing intensity.

Hájek M.

Oral presentation

Changes in landscape variability of Central-Eastern Europe during the last 15,000 years

Eva Jamrichová [1,2,3], Michal Hájek [1,*], Libor Petr [1], Vlasta Jankovská [1,2], Lydie Dudová [1,2], Valentina Zernitskaya [4], Piotr Kołaczek [5], Eva Břízová [6], Petr Pokorný [7], Malvína Čierniková [8], Borja Jiménez-Alfaro [1] & Petra Hájková [1,2]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Vegetation Ecology, The Czech Academy of Sciences, Brno, Czech Republic; [3]Department of Botany, Charles University in Prague, Prague, Czech Republic; [4]Institute of Nature Management, National Academy of Belarus, Minsk, Belarus; [5]Institute of Geoecology and Geoinformation, Adam Mickiewicz University, Poznań, Poland; [6]Czech Geological Survey, Prague, Czech Republic; [7]Center for Theoretical Study, Charles University in Prague, Prague, Czech Republic; [8]Department of Soil Science, Comenius University in Bratislava, Bratislava, Slovakia

* Presenting author: hajek@sci.muni.cz

Intense palaeobotanical research in the Western Carpathians and adjacent regions during the last decade has brought pollen records from dozens of sites equally distributed across the landscape types. We collected all available well-dated pollen data for six crucial periods (late glacial, onset of the Holocene, middle Holocene before the Neolithic, late Neolithic including Eneolithic, late prehistory and the Wallachian/Kopanice colonisation) and synthetised them using unconstrained ordination methods and geographical modelling. The number of involved sites was 40–80 for each period. We found that during the late glacial and early Holocene, uneven representation of temperate deciduous trees was the principal factor diversifying the landscape: pollen of these trees was found mostly in wet, base-rich hilly regions and their foothills. Other sites were diversified especially by its continentality, with larch-rich inter-Carpathian basins differing from lowlands and wet mountains. During the Middle Holocene, landscape openness was the most contrasting factor, with Morava and Dyje river valleys and inter-Carpathian basins (plus single sites in Danube lowland and northern Carpathian foothills in Poland) being the most open. This diversification was probably crucial for survival of light-demanding species and for Neolithic colonisation. Forests were diversified into oak (lowlands), lime/maple/elm/beech (hilly regions) and spruce forests (high mountains; spruce was abundant also at large fens at middle altitudes). In late prehistory, when human affected higher altitudes, the major gradient followed representation of deciduous versus spruce forests, and secondary gradient separated lower altitudes with oaks, dry grasslands and disturbed habitats from mountains with beech, hornbeam and mesic grasslands. In the youngest period, major gradient sorted open grassland landscape of middle altitudes, affected by the Wallachian/Kopanice colonisation, from forested mountain landscape with summit pastures; lowlands were intermediate. The second gradient followed increase of spruce and decrease of grasslands with altitude. Subalpine sites played negligible role in all analyses, perhaps because of large pollen source areas. The presented analysis helps to understand the most important milestones of historical development of Central-Eastern European landscape, which are crucial for understanding current distribution patterns of species and vegetation types.

Hájková P.

Oral presentation

Contrasting successional pathways of calcareous fens and relict status of some refugial fen-specialist populations in the Western Carpathians

Special session: Long-term perspectives on vegetation change

Petra Hájková [1,2,*], Michal Horsák [2], Michal Hájek [2], Vlasta Jankovská [1,2], Eva Jamrichová [1,2] & Jitka Moutelíková [2]

[1]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: buriana@sci.muni.cz

Calcareous fens are unique environments whose history is almost unexplored. The radiocarbon dates of the basal layers of 70 undisturbed calcareous fens showed that in the Western Carpathians (central Europe) many of the extant fen sites originated fairly recently, mostly in the High Middle Ages, corresponding to human-induced changes of the landscape. Conspicuous number of fens also appeared in the Late Glacial and later in the Bronze Age owing to suitable environmental conditions. The Late-Glacial fens contained open-fen plant and snail communities, but they were overgrown by alder and spruce carrs in the Middle Holocene. A high number of Middle- and Late-Holocene fens started their development as wooded wetlands or originated de novo after human-induced deforestation. In one case, we revealed a unique reversed succession from an early-Holocene *Sphagnum fuscum* bog to a Late-Holocene calcareous fen. The distribution pattern of relict and specialised species in calcareous fens was revealed to be non-stochastic, with ancient fens harbouring more of these species than younger ones. This phenomenon could be caused by long-lasting in situ survivals over millennia, but direct palaeoecological evidence was lacking. We identified three old fens in the Western Carpathians, where several postglacial relict species have recently been found. We reconstructed their histories with respect to sedimentary processes, vegetation structure and dynamics of relict species involving proxies with different taphonomies (pollen, vascular plants, bryophytes, molluscs) into analyses. The development at all the sites started with a (semi-)open fen community dominated by sedges and brown mosses. The site with the highest recent number of relict species was reconstructed to harbour open patches continually since the late Glacial to the present, including the middle Holocene when open-fen patches were restricted. By contrast, at the site with the lowest recent number of relict species, a large sedimentary hiatus suggested peat mineralisation or erosion that prevented the survival of light-demanding species. The probability of a relict species being present in a modern fen community increases with fen age, but it also depends on the continual existence of open-fen patches and peat accumulation throughout the middle Holocene.

Hattab T.

Oral presentation (young scientist)

Modelling of habitat suitability and population dynamics of an invasive plant with advanced remote sensing data

Special session: Remote sensing for vegetation science

Tarek Hattab [1,*], Duccio Rocchini [2], Ben Somers [3], Emilie Gallet-Moron [1], Decocq Guillaum [1], Hannes Feilhauer [4], Jens Warrie [3], Michael Ewald [5], Olivier Honnay [3], Pieter Kempeneers [6], Raf Aerts [3], Ruben Van De Kerchove [6], Sandra Skowronek [4], Sebastian Schmidtlein [5] & Jonathan Lenoir [1]

[1]Edysan (FRE 3498 CNRS), Jules Verne University of Picardie, Amiens, France; [2]Fondazione Edmund Mach, San Michele all'Adige, Italy; [3]University of Leuven, Leuven, Belgium; [4]University of Erlangen-Nuremberg, Nürnberg, Germany; [5]Karlsruhe Institute of Technology, Karlsruhe, Germany; [6]Flemish institute for technological research (VITO), Mol, Belgium

* Presenting author: hattab.tarek@gmail.com

Plant invasions contribute significantly to global changes by affecting biodiversity and ecosystem processes. The development of spatially realistic modelling tools incorporating colonization, establishment, and dispersion processes are urgently needed to predict future spread of invasive species and to propose efficient management strategies. Species distribution modelling (SDM) is an important approach to predict the current and potential distributions of invasive plant species. However, to ensure robust predictions of species distribution it is important to develop a multi-scale SDM given that the drivers of species distributions are hierarchically structured: climatic variables are among the most important drivers across large spatial extents of coarse resolutions, followed by land use, landscape structure, topographic complexities and biotic conditions across smaller spatial extents of finer resolutions. Beside, SDM is mostly carried out to characterise the suitability of a given environment for a species without taking into account the demographic dynamics of invasive species after their establishment. Addressing all these issues requires a better integration of SDMs with ecological theory. In this study, we propose the following hybrid model combining (i) a hierarchical SDM to model species-climate and species-habitat relationships and (ii) a demographic model to explore the local population dynamics of an invasive species. The invasion of a European temperate forest (i.e. the forest of Compiègne, France) by the American black cherry (*Prunus serotina*) has been chosen as a case study to assess the ability of this modelling framework to reconstruct the invasion dynamic of this long-lived species with a complex life cycle. The establishment of such an approach has always been limited by the availability of fine-resolution data appropriate for most species response. In this study we used high-resolution light detection and ranging (LiDAR) data to derive biotic, topographic and solar energy predictors at landscape scale. These data were combined with global and regional scale climatic predictors and species-specific data on demographic parameters. Here, we present the various components of the hybrid model, input data, and first results of our study. We suggest new avenues for incorporating population dynamics, dispersion and environmental filtering into SDMs at multiple spatial scales.

Hay J.D.

Oral presentation

Will Brazil´s New Forest Code have a negative effect on conservation of plant communities in the Cerrado?

Gustavo Bediaga de Oliveira [1], John Du Vall Hay [2,*], Ricardo Machado Bomfim [3], Marinez Ferreira de Siqueira [4] & Renata Dias Françoso [5]

[1]Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, Brasília, Brazil; [2]Departamento de Ecologia, Universidade de Brasilia, Brasília, Brazil; [3]Departamento de Zoologia, Universidade de Brasilia, Brasília, Brazil; [4]Instituto de Pesquisas do Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Brazil; [5]Laboratório de Planejamento para Conservação da Biodiversidade, Departamento de Zoologia, Universidade de Brasilia, Brasília, Brazil

* Presenting author: johnduvallhay@gmail.com

According to Brazilian legislation every rural property has to maintain some of its native vegetation and this preserved area is called the Legal Reserve (LR). In the situation where the rural property lacks the LR, the landowner can acquire a preserved area through a mechanism called Legal Reserve Compensation (LRC). In 2012 the Brazilian Forest Code was modified, through the edition of the New Forest Code (NFC), altering some of the LRC rules. In the old legislation the acquired area should be located in the same watershed, but this was altered to be within the same biome. We analyzed if this rule change in LRC could ensure biodiversity conservation in the Cerrado biome, considering that the new rule permits an offset LR up to 2400 kilometers away from the farm with no LR. To simulate the floristic composition of LRs in the biome we used Climate Niche Modeling (CNM) with 17,720 points of occurrence data for 119 tree species and 16 environmental variables. The models were converted into binary data, projected for three different watersheds levels and using these data we performed a cluster analysis to indicate watershed groups with high floristic similarity. Using three levels of similarity we generated nine proposed scenarios for LRCs. Watershed areas that had high floristic similarity were named Group of Interchangeable Watersheds (GIWs) and in these the LRC could be made without a significant loss of species. The exchange of LRs without adopting any similarity index (simulating the rule of the NFC) had a mean loss of up to 53 ± 30.3% of species, reaching 100% in some cases. When using scenarios including the similarity index the largest loss observed was 11.3 ± 7.2%, with a maximum loss of 50% of species. Our results highlight how the current LRC rule may lead to situations where the offset LR does not have a single species in common with the original area. We also created metrics to compare our scenarios: one of cost (area to be recovered in each scenario to fulfill the NFC) and two of environmental benefits (reduction of landscape fragmentation and the number of water bodies protected). The scenario that presented the best cost/benefit was Ottobacia 5 with 80% similarity. We concluded that the actual LRC rule does not ensure biodiversity conservation and the adoption of a spatial scale for LRC should incorporate a similarity criterion in order to guarantee that the offset area has the maximum number of common species with the original area.

Hédl R.

Oral presentation

You cannot step twice into the same river: the transformation of Central European temperate forest communities over the past century

Special session: Global change and vegetation dynamics: the use of historical data sets

Radim Hédl [1,2,*], Markéta Chudomelová [1,3], Martin Kopecký [1,4], Martin Macek [1,4], Vladan Riedl [1,5], Péter Szabó [1] & Ondřej Vild [1,3]

[1]Institute of Botany, The Czech Academy of Sciences, Průhonice and Brno, Czech Republic; [2]Department of Botany, Faculty of Science, Palacký University Olomouc, Olomouc, Czech Republic; [3]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [4]Department of Botany, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [5] Nature Conservation Agency of the Czech Republic, Brno, Czech Republic

* Presenting author: radim.hedl@ibot.cas.cz

Temperate forests have been profoundly influenced by human activities of various forms and intensity. In Central Europe, they have been co-formed by humans for the past 8000 years. Systematic forest management, as documented at least for the past millennium, has shaped current forest environments and vegetation. Both direct and indirect anthropogenic influences triggered changes in the vegetation of temperate forests in the past century as well. Biodiversity decline has been traditionally interpreted as a consequence of nitrogen deposition, and shifts in species composition as effect of ongoing climate warming. A somewhat neglected topic is the most obvious anthropogenic factor – forest management. The aim of this presentation is to outline the long-term effects of management on forest vegetation in the Czech Republic. Our analysis is based on a database of 1100 resurveyed semi-permanent vegetation plots from 16 forested areas, covering the period from 1941 to 2014. Common trends can be observed in vegetation change, following long-term trends in forest policy. However, each site follows a somewhat different scenario, which is largely dependent on local forest management. Forest management has changed these forests in two equally important ways: these concern overall trends as well as local stories. An almost universal trend is eutrophization, which is probably a combined effect of forest succession resulting from the decreasing intensity of forest management and the relatively recent effect of nitrogen deposition. Eutrophization is further enhanced by increased game density, which is also triggered by forest management. Biotic invasions have affected the Czech forests relatively little, in contrast to the pronounced decline of light-demanding oligotrophic species following abandonment of traditional forms of forest management. Strong decline was observed in plant groups sensitive to changes in geochemistry, especially orchids and mycoheterotrophs. In conclusion, forest vegetation in the Czech Republic has undergone profound changes in the past century and the forest management was likely the most significant driver of these changes.

Hegedüšová K.

Poster P-18

Plant communities of Slovakia. 5. Grassland vegetation

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Katarína Hegedüšová [1,*], Iveta Škodová [1], Daniel Dítě [1], Daniela Dúbravková [1], Pavol Eliáš, jun. [2], Michal Hájek [3], Petra Hájková [3], Monika Janišová [1], Ján Kliment [4], Zuzana Melečková [1], Marcela Řezníčková [3], Lubomír Tichý [3], Eva Uhliarová, Karol Ujházy [5], Milan Valachovič [1] & Marica Zaliberová [1]

[1]Institute of Botany, Slovak Academy of Sciences, Bratislava, Slovakia; [2]Faculty of Agrobiology and Food Resources, Slovak University of Agriculture in Nitra, Nitra, Slovakia; [3]Department of Botany and Zoology, Masaryk University, Brno, Czech Repulic; [4]Botanical Garden, Comenius University, Blatnica, Slovakia; [5]Faculty of Forestry, Technical University in Zvolen, Zvolen, Slovakia

* Presenting author: katarina.hegedusova@savba.sk

This study presents the fifth volume of the edition *Plant communities of Slovakia* which summarizes the results of the syntaxonomical revision of dry grasslands (*Festuco-Brometea*), fringe communities (*Trifolio-Geranietea*), lowland and mountain hay meadows and pastures (*Molinio-Arrhenatheretea*, *Nardo-Agrostion tenuis*, *Violion caninae*), acidophilous heathlands (*Calluno-Ulicetea*) and saline vegetation (*Crypsietea aculeatae*, *Festuco-Puccinellietea*, *Scorzonero-Juncetea gerardii*). The present publication comprises a total of 118 associations, belonging to 26 alliances, 16 orders and 8 classes. The dataset used in the syntaxonomical revision contained 48,432 relevés; 13,064 of which were classified by the original authors in the studied alliances of non-forest vegetation. We have used the method of formalized classification as in Janišová et al. (2007) to complete the published Electronic expert system for identification of grassland vegetation with formal definitions of other associations. Synoptic tables for the classes and alliances were generated from a non-stratified data set to contain all available phytosociological relevés which satisfied the conditions of the formal definitions. Descriptions of syntaxa are arranged from the classes to orders, alliances and associations (communities). The text on unit description includes information on species composition and structure, phenology, dynamics, ecology, syntaxonomy, distribution in Slovakia and the level of endangerment. Distribution of the communities in Slovakia is expressed using the orographic units. Where necessary, notes on the syntaxonomy and/or nomenclature complete the syntaxon description. Formal definition with precise criteria which relevé must fulfil is given for each association. The presented results are important not only for scientists (botanists, zoologists, and ecologists), but also for nature conservation institutions.

Heinrichs S.

Oral presentation

Thermophilization versus homogenization: dynamics of two contrasting beech forest communities over 50 years

Special session: Global change and vegetation dynamics: the use of historical data sets

Steffi Heinrichs * & Wolfgang Schmidt

Department Silviculture and Forest Ecology of the Temperate Zones, Georg-August-University Göttingen, Göttingen, Germany

* Presenting author: sheinri@gwdg.de

Increasing temperatures promote warm-adapted species around the globe causing a thermophilization of communities. Thermophilous beech forests are characterized by a high number of such species that might benefit from global warming by expanding their frequency and cover. Mesophilous forest communities on the other hand might show a delayed or even no response increasing the distance between different beech forest communities. To test this hypothesis, we investigated understorey vegetation dynamics in two contrasting beech forest communities in a forest region in central Germany (51°30'–51°36'N, 9°56'–10°03'E): a characteristic thermophilous (n = 26) community on sun-exposed dry slopes and a mesophilous (n = 25) community on nutrient rich and moist plateaus. We compared vegetation relevés sampled between 1955 and 1960 and resurveyed between 2009 and 2012 on semi-permanent plots. Our results indeed show a more pronounced change in community composition in the thermophilous compared to the mesophilous beech forest within fifty years. Thermophilous species, however, almost showed no response. Instead shade-tolerant, nutrient-demanding mesophilous species expanded, whereas light demanding, drought-tolerant, oligotrophic, often red-list species, decreased. Although the mesophilous community changed less, nutrient-demanding species benefitted in this community as well. Overall the thermophilous community became more similar over time, whereas the mesophilous community showed a slight diversification. Opposite to our initial hypothesis, though, these changes led to an increasing similarity between the two contrasting communities. Beta diversity partitioning revealed that this homogenization was caused by a reduction of species turnover between communities and not by changes in species richness over time. Responsible for the detected patterns are atmospheric nitrogen depositions and microclimatic changes mediated by an increasing shrub layer in the past fifty years that mitigate the impact of global warming on understorey vegetation. The drastic changes in the thermophilous community underline the higher susceptibility of marginal sites – that often hold a high conservation value – to local environmental changes. An adequate forest management is necessary to counteract the ongoing biotic homogenization of beech forest communities.

Hennekens S.M.

Oral presentation

Turboveg v.3 – A gateway to EVA and other databases

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Stephan M. Hennekens

Alterra, Wageningen, The Netherlands

stephan.hennekens@wur.nl

Although Turboveg v.2 is acceptable for many users, the call for a better database model has been growing over the last few years to overcome the current version's shortcomings. Since the Dutch National Vegetation Database provides information on the distribution and range of Natura 2000 habitats to report every 6 years to the EU, a "quality status A" is nowadays required. Therefore a proper database model had to be set up. Because v.2 normally deals with multiple databases, and potentially different databases structures and different taxonomies, it was challenging to be able to deal with all these differences in a single SQL-based database (SQLite for locally stored databases). A new Turboveg v.3 is now underway. The prototype not only is able to import Turboveg v.2 databases, but also contains basic functions to select data and to export selected plot observations to various formats for further processing with other programs. For example, plots observations can already be exported for use in JUICE, GIS and Excel. Moreover, editing of plot data is already build in, including sophisticated localisation by means of an integrated Google Maps. Storage of metadata is also now integrated on almost every level in the database. Information on data providers (custodians), and the accessibility of data can be stored on the level of plot observation. A clear distinction between plots and plot observations is also supported in the database model and the software. Versioning is also included, meaning that deleted data is never physically removed from the database, as is unfortunately the case with Turboveg v.2. A prototype of the European Vegetation Archive (EVA) currently comprises almost 1,000,000 plot observations and much different taxonomy. By integrating a crosswalk between the many different taxonomies (already more than 40), an analysis of such large heterogeneous data sets has now become feasible. For the dissemination of the data the EVA Data Property and Governance Rules will be followed (*http://euroveg.org/download/eva-rules.pdf*).

Herben T.

Oral presentation

Species traits and disturbance regimes in Central European vegetation

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Tomáš Herben [1,*] & Jitka Klimešová [2]

[1]Department of Botany, Charles University in Prague, Prague, Czech Republic; [2]Department of Plant Ecology, Institute of Botany, Czech Academy of Sciences, Třeboň, Czech Republic

* Presenting author: herben@site.cas.cz

Disturbance is often assumed to favour species that disperse well and possess traits of clonal growth. We examine this hypothesis using an extensive data set on 1200+ species for which following data are available: (i) seed traits, namely seed mass, and anemochory end epizoochory dispersal indices, (ii) data on bud bank and clonal growth from the CLOPLA database, and (iii) information of their ability to survive disturbance asssessed using a database of vegetation records (Czech National Phytosociological Database). This assessment is based on a habitat classification of the database records. For each of the habitat types disturbance regime (frequency and intensity of disturbance) was assessed by field experience. Using these data mean disturbance regimes of each species can be calculated, which are then used to identify a set of traits associated with different types of disturbance regimes. We show that while dispersal traits enable species to occur in disturbed habitats, clonal traits (namely bud bank size) show unimodal relationship, with maximum bud bank sizes at intermediate disturbances, and few species with bud bank (i.e. clonal species) occurring at both low and high disturbance frequencies. Within clonal species proper, highly disturbed habitats are associated with long lateral spread distances. These data indicate that plants employ two different strategies to cope with disturbance: (i) either long distance dispersal by seed after a disturbance event, or (ii) continuous survival due to the capacity to resprout.

Hiiesalu I.

Oral presentation (young scientist)

Belowground vs aboveground plant richness in a long-term grassland management experiment

Special session: The relevance of “dark diversity” for theoretical and applied ecology

Inga Hiiesalu *, Vojtěch Adamec, Jitka Klimešová, Štěpán Janeček & Francesco de Bello

Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic

* Presenting author: inga.hiiesalu@ut.ee

Changes in the management regime of semi-natural grasslands, like abandonment or fertilizing often decrease aboveground plant richness. The decrease is explained by increased productivity leading to competitive exclusion. However, the majority of biomass in temperate grasslands occurs belowground as roots and rhizomes. Belowground structures are often more long-lived than shoots, possibly contributing to higher persistence of species belowground. Whether the well-known richness patterns described for aboveground vegetation also hold for the large below-ground component is still unknown. We measured above- and belowground plant richness on two semi-natural grassland sites (Hubský and Maršálka) in the central Czech Republic. Each site consisted of four plots with different treatments (mown, fertilized, mown-fertilized, abandoned) that lasted for seven years. Species richness on each plot was measured on 12 small quadrats (0.1 × 0.1 m). Aboveground plant species were identified conventionally, whereas belowground plant richness was detected using 454 pyrosequencing of roots, utilizing the plant trnL intron. We hypothesized that (i) plant species richness is higher belowground compared to aboveground in the mown plots; (ii) the difference between above- and belowground richness increases with fertilizing and abandonment and (iii) the species composition aboveground differs between treatments, but belowground composition is similar between treatments. We found higher species richness belowground in mown plots of both sites. The difference between above- and belowground richness was largest in mown-fertilized and fertilized treatment in Hubský, but not in Maršálka. In Hubský, species composition aboveground changed significantly due to treatments over time, whereas species composition belowground resembled to the original state of the grassland. In Maršálka, however, species compositions within treatments were similar above- and belowground, and did not resemble the original state of the grassland anymore. Our results indicate that in less productive grasslands like Hubský, decline in species richness aboveground due to changes in management regime can be still buffered belowground after seven years. However, in more productive grasslands, like Maršálka, changes in management regime could reduce species richness and alter species composition more quickly.

Hirata R.

Poster C-05

Changes in species diversity along 30 years of stand dynamics of an old evergreen broad-leaved forest in southwestern Japan

Session: Patterns and drivers of alpha and beta diversity in plant communities

Ryoko Hirata *, Kazuhiro Yamashita, Satoshi Ito & Yasushi Mitsuda

Department of Forest and Environmental Sciences, University of Miyazaki, Miyazaki, Japan

* Presenting author: r.hirata@cc.miyazaki-u.ac.jp

Coppice forests in Japan have been suffering degradation of biodiversity after abandonment associated with the fuel revolution in the 1960s; species diversity in understory declined due to dense canopy of coppice stems in abandoned secondary forests. In order to recover species diversity in these coppice forests, appropriate management should be applied based on evaluation of the stand status in the entire stand development process. This study aimed to evaluate the developmental stage of the *Castanopsis sieboldii*-dominated old coppices, a typical evergreen coppice in warm-temperate Japan, based on observation of 30 years of stand dynamics. We analyzed the stand development according to the stage classification proposed by Oliver (1981): the stages of stand initiation, stem exclusion, understory re-initiation and old growth, and compared with those of another common coppice dominated by *C*. *cuspidata* which has shorter longevity than *C*. *sieboldii*. The results showed that *C*. *sieboldii*-dominated coppice slightly declined its species diversity and number of single-stem saplings of evergreen trees in spite of the increase of total basal area during 86 to 116 year-old stages. This suggested that the surveyed *C*. *sieboldii*-dominated coppice was still in the “stem exclusion” stage, and “understory re-initiation” was severely limited. On the other hand, *C*. *cuspidata*-dominated coppice showed the recruitment of single-stem saplings of evergreen trees with high species diversity associated with high mortality of coppice stems in canopy layer from 50 to 60 year-old stand age, indicating earlier shift of stages than those of *C*. *sieboldii*-dominated coppice. We concluded from these results that the shift of developmental stages in coppices of the region varies by life-history characteristics represented by longevity of dominant species.

Hölzel N.

Oral presentation

Determinants of diversity in ancient and restored grasslands of the Western-Siberian forest steppe

Norbert Hölzel [1,*], Wanja Mathar [1], Immo Kämpf [1,2], Igor Kuzmin [3], Sergey Tupitsin [3], Andrey Tolstikov [3], Till Kleinebecker [1] & Kathrin Kiehl [2]

[1]Biodiversity and Ecosystem Research Group, Institute of Landscape Ecology, University of Münster, Münster; Germany; [2]Vegetation Ecology and Botany, University of Applied Sciences Osnabrück, Osnabrück, Germany; [3]Tyumen State University, Tyumen, Russia

* Presenting author: nhoelzel@uni-muenster.de

Mesic meadow steppes as typical constituents of the forest steppe ecotone in continental Eurasia belong to the most species-rich plant communities world-wide. In Ukraine and European Russia an almost complete conversion into cropland has taken place until the beginning of the 20th century which makes it difficult to study natural patterns and drivers of diversity at landscape scale. East of the Ural Mountains, in the south of Western Siberia, the forest steppe zone is much better preserved, which gives chance to study diversity patterns under more natural conditions. Here we present data of a vegetation survey from the forest steppe zone in Western Siberia covering ancient grasslands as well as successional grassland on ex-arable land. More than 265 quadrats of 100 m² were sampled in three test areas using stratified random sampling. A particular focus was given to the relative importance of local site conditions, management and landscape configuration as controlling agents of plant diversity in meadow-steppe grassland. As revealed by GLMs litter cover, soil moisture, salinization and grazing intensity all exhibited a negative effect on species richness in ancient meadow steppe grassland at plot level whereas only dry matter yield was positively related. At landscape level meadow size had a negative and the proportion of forest and cropland within a radius of 250 m had a positive effect on alpha diversity. The positive effect of cropland can be explained by the fact that arable fields were in past preferentially established at well drained sites with Chernozem soils, which harbour also the most species-rich meadow-steppe communities. The particularly high species-richness of meadow steppes in small scaled forest-grassland mosaics can be attributed to spatial mass effect and the lower grassland management intensity associated with small patch size. Ancient meadow steppes and successional grasslands on ex-arable differed only marginally in average species richness per plot. However, even after 15–24 years of abandonment, there were still profound differences in species composition, especially in typical meadow-steppe species. Overall plant available soil phosphorus and grazing had negative whereas grazing and time since abandonment had a positive effect on target species enrichment. Despite a high proportion of near-natural grassland area in the landscape, the establishment success of typical meadow steppe species on ex-arable land was still comparatively low.

Homolová L.

Poster with lightning talk M-01

Are we ready for Sentinel-2? Estimation of chlorophyll content of a beech forest from imaging spectroscopy

Special session: Remote sensing for vegetation science

Lucie Homolová [1,*], Růžena Janoutová [1] & Zbyněk Malenovský [2]

[1]CzechGlobe – Global Change Research Centre, The Czech Academy of Sciences, Brno, Czech Republic; [2]School of Biological Sciences, University of Wollongong, Wollongong, Australia

* Presenting author: lucie.homolova@gmail.com

New remote sensing satellite Sentinel-2 (European Space Agency) will be launched this year. Sentinel-2 will offer unique capabilities for monitoring of vegetation changes as it combines good spectral (13 bands), spatial (10–60 m) and temporal (5 days) resolutions. Therefore our objective was to test a quantitative retrieval of forest chlorophyll content from simulated Sentinel-2 images. For this study we selected a broadleaf forest dominated by European beech at the ecosystem research station Štítná nad Vláří (Global Change Research Centre, CAS). Field data of beech leaf chlorophyll content and high resolution airborne hyperspectral images (AISA Eagle) were acquired synchronously on this site in summer 2013. Airborne images were used to simulate the forthcoming Sentinel-2 data. We used an advanced canopy radiative transfer model DART (Discrete Anisotropic Radiative Transfer) coupled with a leaf-level model PROSPECT for interpretation of the RS images. Radiative transfer models provide physically-based explicit links between vegetation biochemical and structural properties and canopy reflectance. PROSPECT-DART was used to build up a spectral database of simulated canopy reflectances. This database was subsequently used to train a machine learning algorithm, namely support vector machines, to estimate chlorophyll content from the airborne hyperspectral images, as well as from Sentinel-2 simulated images. Preliminary results using the spectral database confirmed that support vector machines can be used as a robust tool for estimation of forest chlorophyll content. Although the chlorophyll retrieval accuracy decreased when applied on real or simulated images due to their inherent noise and calibration artifacts, yet the accuracy expressed as root mean square error calculated between field measured and retrieved chlorophyll content was typically below 10 $\mu g.cm^{-2}$. The outreach of this retrieval method is that it can be used on wide range of beech-dominated forests and can be easily adapted to other forest types. Moreover, well-validated results from the airborne hyperspectral data can be used to verify retrievals from satellites, as for their spatial resolution it is more difficult to collect reference field data. We hope that with this preliminary study and the upcoming Sentinel-2 data we can open door for national-level assessment of forest health status using quantitative indicators such as chlorophyll content.

Horvat V.

Poster with lightning talk C-06 (young scientist)

Is plant diversity an indicator of management in silver fir-beech forests?

Session: Patterns and drivers of alpha and beta diversity in plant communities

Vlatka Horvat [1,*], Idoia Biurrun [1], Patxi Heras [2] & Itziar García-Mijangos [1]

[1]Department of Plant Biology and Ecology, University of the Basque Country (UPV/EHU), Bilbao, Spain; [2]Museo de Ciencias Naturales de Àlava, Vitoria, Spain

* Presenting author: vlatkahorvat0@gmail.com

Conservation of biological diversity has become an important aspect in forest management, particularly since forest exploitation has been high in the past. Historical events, such as land-use history and forest management, may have determined the diversity of understorey vegetation. Many studies reveal the importance of unmanaged forests for the maintenance of biological diversity. Silver fir-beech forests have their distribution limit in the Western Pyrenees, where they have been intensively exploited for centuries, mainly for livestock grazing and forest harvesting. In this area, we can find forests where different types of management have been practiced and with management histories not clearly defined. Nevertheless, there are still some well conserved forests that have been declared strict reserve and we have considered them as old-growth forests because there are no data on their management or use. The aim of this study is to analyze the effect of different types of management on plant diversity, taking existing old-growth forest as a reference. In the distribution area of silver fir-beech forest in the Pyrenees 16 stands were selected. All of them were under similar climatic conditions, facing north, on the same type of substrate and belonged to the same association, *Scillo lilio-hyacinthi-Fagetum sylvaticae*. The average size of each stand was 96 ha. Inside these stands 71 quadrats of 20 × 20 m were randomly arranged. For each quadrat species presence of vascular plants and bryophytes was recorded. Due to high management variability within each stand, data on forest management observed in the field were registered. Several categories were distinguished according to management type and history, i.e. the length of time since the last disturbance. Each plot was considered as independent and was assigned to one of the established categories of management type and history. Subsequently, several richness estimators were applied in order to determine sufficiency of samples. A total of 126 vascular plants and approximately 80 bryophyte species were identified. Diversity indices were calculated to test the effect of different types of management.

Hoshino Y.

Poster with lightning talk B-06

Comparison of plant species composition of forest community and local species pool in the Izu Islands, Japan

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Yoshinobu Hoshino [1,*], Yosuke Makiguchi [2] & Haruka Ohashi [3]

[1]Institute of Agriculture, Tokyo University of Agriculture and Technology, Tokyo, Japan; [2]Graduate School of Agriculture, Tokyo University of Agriculture and Technology, Tokyo, Japan; [3]Forestry and Forest Products Research Institute, Tsukuba, Japan

* Presenting author: hoshino@cc.tuat.ac.jp

It is generally agreed today that plant community is assembled from local species pool by abiotic and biotic filters. Understanding the causal factors of certain plant community, comparison of species composition of actual communities and local species pool is essential. Islands is suitable objects for these studies because of the advantage of objective determination of local species pool in the target territory. We analyzed community assembly pattern of forest communities of the Izu Islands, one of volcanic islands located in the Pacific Ocean. We conducted vegetation survey in three forest communities (*Daphniphyllo-Trochodendretum aralioides*, *Clethra barbinervis-Rhododendron kaempferi* var. *macrogemma* community and *Ilex crenata* var. *hachijoensis* community) in the summit area of six islands: Ohshima, Toshima, Niijima, Kozushima, Mikurajima and Hachijojima. Local species pool was defined as species which occurred in at least one of the surveyed communities in the whole islands and were listed in the existing flora list of each island. We also calculated the ratio of life types in the local species pools and actual communities. We used non-metric multidimensional scaling (NMDS) to compare compositional relationships of local species pool and communities in each island. We compared the species composition of actual communities with a null model, a species assembly selected randomly from the local species pool. As a result of NMDS, compositional differences in local species pool of each island were affected by distance from the mainland (Honshu island). Positive correlation was observed between the distance of the island and the distance in the ordination space of the local species pool. On the other hand, differences in species composition among communities were related to the type of volcanic rock (basalt vs. rhyolite) and eruption ages. Size of the local species pool in each island was not related to island area. Similarities of local species pools among islands were significantly higher than that of actual communities. This implies that divergence in species composition of actual communities among islands is caused by environmental filters and interspecific interactions in each island. Similarity index among islands in species composition of actual communities was significantly higher than that of the null model. This indicates that more deterministic process is superior in the forest community assembly.

Huang L.

Poster with lightning talk A-06

The role of growth phenology on large sets of species

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Lin Huang [1,*], Tomáš Koubek [1], Martin Weiser [1] & Tomáš Herben [1,2]

[1]Department of Botany, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [2]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic

* Presenting author: huangli@natur.cuni.cz

Phenology of plant growth is an important axis for niche differentiation in plants. However most studies have either focused on reproductive phenology, or examined one or a few species only. Few data on growth phenology have been published because of the difficult data collection especially for large sets of species. Here we overcome this difficulty by using a unique plant collection in the Botanical Garden of Charles University in Prague. The garden is close to species' natural habitats and it makes it possible to collect frequent recordings over a huge number of species during the vegetation season. In a preliminary test, three individuals of each of 54 species were selected, and their height (H) and width (W) were recorded once every 1–2 weeks from April to October. Then, a logistic curve using growth trajectory of plant size (L) was calculated. This preliminary analysis shows, expectedly, a strong phenological differentiation among species. Interestingly, there is no pronounced phylogenetic signal in either parameter; high values of Pagel's delta indicate that phenological parameters evolve fast. There are strong differences among communities in the phenological patterns of their component species.

Islamgulova A.

Poster with lightning talk M-02

Time changes and the assessment of steppe vegetation conditions in Kazakhstan with satellite imagery

Special session: Remote sensing for vegetation science

Anastasya Islamgulova [1,*], Irina Vitkovskaia [2] & Madina Batyrbaeva [2]

[1]Laboratory of Geobotany, Institute of Botany & Phytointroduction, National Center for Space Research and Technology, Almaty, Kazakhstan; [2]National Center for Space Research and Technology, National Space Agency, Almaty, Kazakhstan

* Presenting author: aislamgulova@gmail.com

Remote sensing data provide an opportunity to quickly assess the state of the underlying surface area, and the involvement of archived data allows us to follow the trend of the changes for a certain time period. The transect (width of 100 km and a length of 730 km), located in the northern part of the Republic of Kazakhstan, has been defined as case study. This area contains natural vegetation of the northern deserts and steppes. Test sites were selected for each sub-zone, where the expert analysis of LANDSAT data has been provided. Landcover map and compiled list of 27 basic species forming communities was produced for each test site and scenarios of potential changes in vegetation cover were developed. Ten-day NDVI composites (TERRA/MODIS) were used to calculate values during the growing seasons of 2000–2014 from the first decade of February to early November for each test site. These values demonstrate that the of the peak growing season $NDVI_{max}$ decrease southward. In addition, we find that NDVI values resembling the peak of the vegetation season tend to decrease during the observation period, suggesting an earlier onset of the vegetation season. The duration of period when NDVI passing through such values as 0.2, 0.3, 0.4 can be considered an important indicator of the state of vegetation. Due to the fact that the various zones of maximum NDVI values are different, these thresholds contact conventionally adopted for the evaluation of vegetation. The duration of the period for each zone is different and can be an indicator of adverse or dry year. Thus, it was found that for the forest and moderately arid steppe sub-zones, dry year will be considered if the NDVI = 0.3 – less than six decades ten-day periods; for dry and moderately dry steppe – NDVI = 0.3 – less than three ten-day periods; for the desert – NDVI = 0.3 – less than one ten-day period or NDVI has not reached a value of 0.3; for desert steppes and deserts of northern – NDVI = 0.2 – less than one ten-day period or NDVI values under 0.2. The state of the vegetation of the steppe zone of Kazakhstan as a whole was determined by the values of IVI, normalized to multi-year maximum. Since 2003, the growth of areas with low productivity vegetation located between 48°N and 53°N parallels has been recorded. The information presented is important in the study of the processes of desertification and aridity, allowing to determine the displacement of low productivity of vegetation in the northern direction.

Ito S.

Poster B-07

Factors limiting distribution of deciduous broadleaved trees in warm-temperate mountainous riparian forests in southern Japan

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Satoshi Ito *, Chika Shinohara, Ryoko Hirata, Yasushi Mitsuda & Osamu Shimizu

Department of Forest and Environmental Sciences, University of Miyazaki, Miyazaki, Japan

* Presenting author: s.ito@cc.miyazaki-u.ac.jp

We examined the difference in responses of deciduous and evergreen broadleaved trees to the gradients of fluvial disturbance and light regimes from the forest edge in order to clarify the factors limiting the distribution of deciduous trees, an important element of species diversity in warm-temperate mountainous riparian forests. Deciduous trees tended to be distributed at lower terraces less than 2 m in relative elevation from the water level, which corresponded to the sites suffering strong bank erosion due to high flood frequencies. On the other hand, evergreen trees showed opposite trends of distribution, indicating that high flood frequencies associated with strong erosion-dominated soil disturbances might be a constraint for establishment of evergreen trees. Furthermore, crowns of deciduous trees tended to be positioned in canopy layer at forest edge, and less individuals were observed beneath the canopy of evergreen trees even at forest edge. In contrast, evergreen trees were concentrated in the understory of forest interior. These results suggest that light environment is the predominant factor of establishment and survival for deciduous trees in warm-temperate mountainous riparian forests; the canopy layer rather than understory at the forest edge is a more favorable condition for deciduous trees in terms of avoiding the heavy suppression by evergreen canopies. We concluded that the erosion-dominated soil disturbance at lower terraces provide suitable habitats for deciduous trees by facilitating them to reach the canopy layer through limiting the establishment of evergreen trees.

Jafarova A.

Poster G-06 (young scientist)

The study of land degradation and its effect on vegetation composition in some regions of Azerbaijan

Special session: Species and plant community responses along soil gradients

Aynura Jafarova

Institute of Botany, Azerbaijan National Academy of Sciences, Baku, Azerbaijan Republic

cef_aynure@hotmail.com

Land degradation increases every year owing to intensification of agricultural use and the development of industry. Contamination by heavy metals and petroleum hydrocarbons as well as salinity are the main reasons of land degradation and pose a serious threat to ecosystems in some regions of Azerbaijan. The current ecological situation, distribution of toxic elements, salinity level of soils and their effect on vegetation composition in the degraded areas were studied. Some widespread plant species and soil sampled around these plants were analysed for the content of salt anions and cations. The results of soil analyses revealed that there was not significant difference between anions, while Na^+ ions were high in soil samples except the one collected around *Suaeda confusa* where concentration of Ca^{2+} ions was higher. Na^+ ions were mainly concentrated in shoots of plant samples. Among plant species tested, *Suaeda dendroides*, *S. confusa* and *Halocnemum strobilaceum* accumulated high concentrations of Na^+ ions in their shoots. However, these species differed in their selectivity to anions: while SO_4^{2-} ions were highly accumulated by *S. dendroides* in both investigated regions, *S. confusa* mostly accumulated Cl^- ions. Among all soil samples tested, the side in Hajigabul region had the highest amounts of cations and anions. They were also found to be increased with the deepening of soil layers, except the Gobustan region where values for cations and anions decreased towards lower layers. The value of electric conductivity (EC) of soil samples was very different around plant species growing in different regions. In the soil samples collected around plants the highest EC value was found in the soil associated with *S. confusa*. As a result of monitoring, *Salsola nodulosa*, *Suaeda dendroides*, *Artemisia fragrans*, *Atriplex tatarica* and *Tamarix ramosissima* are dominant plants in these regions, which grow vigorously on degraded land without showing any toxicity symptoms. Some of them are fodder storage stocks and main components of the pastures, and serve as food or medicinal plants. Their large biomass and high adaptation ability makes them important for improving degraded lands.

Jamoneau A.

Oral presentation

Thirty years of vegetation survey in shallow-lake ecosystems: dynamics of macrophyte communities

Aurélien Jamoneau *, Vincent Bertrin, Sylvia Moreira, Christophe Laplace-Treyture, Gwilherm Jan & Alain Dutartre

UR EABX, IRSTEA, Bordeaux, France

* Presenting author: aurelien.jamoneau@irstea.fr

Shallow lakes play a major role in European landscapes and provide multiple ecosystem services, such as biodiversity, human amenities and resource supplies. Macrophytes are key elements of these ecosystems and understanding the processes behind their species assemblages is essential for lake management. In this study, we surveyed macrophyte communities of 14 lakes and ponds in South-Western France since 1984 and explored their structure and composition change with time. We used a set of physical, anthropogenic and landscape variables to understand processes driving local species assemblages. Abundance of invasive species was also included as explanatory variables. Species richness, rank-abundance curves and non-metrical multidimensional scaling were used to investigate macrophyte diversity, and the coefficients of these metrics were correlated with previous explanatory variables. We did not find a common temporal response of communities, each lake experiencing its own path. However, some variables, such as residence time, watershed and lake areas were found to be important factors in explaining community changes across time and led to suggest either an important influence of physico-chemistral variation or regional-dispersion processes. Also, the presence of invasive species and their abundance explained some patterns of macrophyte diversity underlying the importance of biotic interactions. These results suggest that both biotic and abiotic processes influence local macrophyte assemblages and provide new insights in terms of lake management for biodiversity conservation.

Jamrichová E.

Poster I-05 (young scientist)

Spread of temperate trees during the Allerød period to the northern part of the Pannonian plain (Southern Moravia, Czech Republic)

Special session: Long-term perspectives on vegetation change

Eva Jamrichová [1,2,3,*], Petr Kuneš [1,2], Helena Svitavská-Svobodová [1] & Lydie Dudová [1]

[1]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [2]Department of Botany, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [3]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: eva.jamrichova@ibot.cas.cz

Presence of pollen of temperate forest during the Late Glacial in the profiles from the northern part of the Pannonian plain was traditionally interpreted as long-distance pollen transport from the southern regions. However, new pollen records from the northern part of the Pannonian plain confirm very early Holocene expansion of temperate trees, which might indicate existence of cryptic glacial refugia in northern regions than was suggested previously. In 2012 an organic sediment was recovered near Lanžhot in the northern part of Pannonian plain (Southern Moravia, Czech Republic). Radiocarbon dating of the basal layers (14,670 cal. BP) confirmed Allerød interstadial of the Late Glacial (GI 1) of the peat accumulation. Pollen analysis suggests that the vegetation was dominated by coniferous trees such as *Pinus* with steppe and tundra herbs species during this period. Surprisingly, continual higher abundances of pollen of temperate trees (*Corylus*, *Ulmus*, *Quercus*, *Fraxinus*) occurred in the lower layers suggesting that the landscape was covered by cold forest steppe with patches of temperate trees. At around 13,140 cal. BP (Allerød/Younger Dryas – GI 1/GS 1 transition) the amount of temperate trees markedly declined. A similar picture can be seen in other pollen profiles from this region dated to the Younger Dryas/early Holocene periods, where lower amount of pollen of temperate trees was recorded. We conclude that the increase in temperature and precipitation recorded at around 14,700 cal. BP (Allerød) triggered a spread of temperate forest species to northern areas, whereas short-time climate cooling (Younger Dryas) caused reduction of these populations. In our study, the presence of temperate trees during the Allerød implies their Late-glacial immigration to this region from their glacial refugia situated elsewhere in the Pannonian plain, where their survival was recorded in the Last Glacial Maximum. Another explanation of such early occurrence of temperate trees is an existence of their cryptic glacial refugia close to the study region.

Acknowledgements: This research was funded from the European Research Council under the European Union's Seventh Framework Programme (FP7/2007–2013)/ERC Grant agreement no. 278065 and by long-term research project RVO 67985939 from the CAS.

Jandt U.

Oral presentation

The advantage of playing by the rules: species with highest co-occurrence probability outperform those with certain trait values

Ute Jandt [1,2,*], Eva Breitschwerdt [1] & Helge Bruelheide [1,2]

[1]Department of Geobotany and Botanical Garden, Institute of Biology, Martin Luther University Halle-Wittenberg, Halle, Germany; [2]German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany

* Presenting author: ute.jandt@botanik.uni-halle.de

Functional traits are being considered as a key tool to understand community assembly rules. We challenged this view by testing whether species that are more likely to co-occur with the resident species show higher survival rates and better performance than those that are more similar/dissimilar to the resident community or randomly chosen species. During a two-year field experiment in German grasslands of different levels of diversity and land-use intensity we investigated the survival and RGR of species transplanted into the community. The added transplant species were selected according to four different scenarios: species with highly similar or dissimilar traits to the resident community, species with the highest degree of empirical co-occurrence to resident species (derived from vegetation records held in the German vegetation reference database) and species chosen randomly from the local grassland species pool. Using linear regressions, survival rates and RGRs were related to land-use intensity, climate, community weighted mean trait values and functional diversity of key functional traits. Individuals of species selected by the scenario based on co-occurrence probability of added and resident species survived best and performed in most cases better than those selected based on trait information and on random selection. Of all climate variables, soil moisture had the highest influence on plant growth. The single most important environmental driver of RGR of transplants was land use. Among all traits, community weighted mean and functional diversity of specific leaf area were the most frequent predictors for the transplants' RGR of most response variables over the whole study period. In consequence, there is a high and so-far untapped potential of using vegetation databases to predict community assembly and individual performance from vegetation databases.

Janečková P.

Oral presentation (young scientist)

Drivers of functional and taxonomical diversity within fragmented grasslands

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Petra Janečková [1,2,*], Štěpán Janeček [1,3], Jan Horník [2], Duccio Rocchini [4] & Francesco de Bello [1,2]

[1]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [2]University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [3]Charles University in Prague, Prague, Czech Republic; [4]Fondazione Edmund Mach, San Michele all'Adige, Italy

* Presenting author: petra.janeckova@ibot.cas.cz

Seminatural grasslands are biodiversity hotspots in the increasingly fragmented Central European landscape. In consequence vegetation scientists and conservationists are looking for factors maintaining such diversity under the threat of land-use changes. In our study, we surveyed around 1200 grassland patches within a region of 400 km^2 in the Železné hory Mts. (Czech Republic). According to field measures and remote sensing information these patches varied in terms of productivity, wetness, disturbance, size and connectivity and different historical trajectories. We evaluated the effects of these factors on both taxonomical and functional biodiversity, and community functional properties. As expected, taxonomic diversity was positively correlated with grassland area and connectivity and was also higher on traditionally managed meadows. This effect of management is nevertheless meadow type specific and is much more pronounced on wet compare to dry meadows. Functional diversity, such as taxonomical, is positively affected by meadow size, but on the contrary, is higher on dry meadows. Mown meadows host less clonal, smaller, earlier flowering species with lighter seeds, however there are considerable differences among habitat types. In addition, the decrease in meadow size has more negative effect on species richness in unmanaged meadows in contrast to managed ones. This indicates the high importance of traditional management for maintaining species diversity of smaller grassland patches which often represent important landscape elements maintaining connectivity but are mostly omitted in conservation planning.

Janicka M.

Poster J-11 (young scientist)

Long-term changes in meadow vegetation of the Kraków Jura (southern Poland)

Session: Patterns of vegetation change across landscapes

Maria Janicka

Department of Plant Ecology, Institute of Botany, Jagiellonian University, Kraków, Poland

mania.janicka@gmail.com

Deep valleys built of Jurassic limestone are one of the most important element of the Kraków Jura landscape. They are biodiversity hotspots. Hay-meadows (*Arrhenatheretum elatioris* association, *Molinio-Arrhenatheretea* class) dominating valley bottoms were ones of the most species-rich plant communities in the 1950s. Cessation of traditional management led to changes in these meadows. The main patterns of community changes over the period of 55 years was studied in the Ojców National Park. The vegetation in 17 semi-permanent plots was recorded using the Braun-Blanquet method three times: in 1958–60, 1986–87 and 2011–12. 212 relevés were made as chronosequences in 2009–2014. Data analysis showed that three main trends of changes in meadow vegetation can be distinguished. They are connected with three main types of management systems: intensification, extensification/active protection and abandonment. As a result of these management systems, communities with different species composition, proportion of ecological groups (meadow, pasture and tall-forb plants) and proportion of species with different ecological strategy according to Grime have been formed. Intensively used meadows (permanent mowing with hay-making 2(3) times a year and mineral fertilization) represent impoverished communities of the *Arrhenatheretalia* order. They are characterized by higher frequency of pasture and proportion of stress-tolerant species and lower frequency of meadow and nitrophilous species than in the 1980s. Extensively used meadows (irregular mowing without hay removal) where active protection has started ca. 10 years ago (regular mowing with hay removal) represent diverse stands of *Arrhenatheretum* association. They are characterized by higher number of species, higher frequency of meadow, pasture and mowing-tolerant nitrophilous species than in the 1980s. In abandoned meadows *Urtica dioica* community has developed. Those plots are characterized by higher number of species, higher average frequency of nitrophilous and forest (*Querco-Fagetea* class) species and higher cover of bryophytes (mainly *Brachythecium rutabulum*) than in the 1980s. The study provides strong evidence that cessation of traditional management led to far-reaching modifications in alpha diversity, species composition, community structure and phytoclimate. The results can be extrapolated to similar habitats important for vegetation protection in the study area.

Janišová M.

Poster P-19

Broad-scale vegetation patterns in *Carex humilis*-dominated grasslands of the Pannonian Basin and the Carpathian Mts

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Monika Janišová [1,*], Norbert Bauer [2], Milan Chytrý [3], János Csiky [4], Jürgen Dengler [5], Tomáš Hlásny [6], Eszter Ruprecht [7], Iveta Škodová [1], Wolfgang Willner [8] & David Zelený [6]

[1]Institute of Botany, Slovak Academy of Sciences, Bratislava, Slovakia; [2]Department of Botany, Hungarian Natural History Museum, Budapest, Hungary; [3]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [4]Institute of Biology, University of Pécs, Pécs, Hungary; [5]Plant Ecology, BayCEER, University of Bayreuth, Germany; [6]National Forest Centre, Forest Research Institute, Zvolen, Slovakia; [7]Department of Taxonomy and Ecology, Babeș-Bolyai University, Cluj Napoca, Romania; [8]Vienna Institute for Nature Conservation & Analyses, Wien, Austria

* Presenting author: monika.janisova@gmail.com

Carex humilis is a species with Eurasian distribution inhabiting nutrient-poor and dry rocky grassland habitats from the colline to the alpine belts. It frequently dominates in plant communities, determining their specific spatial structure due to its compact growth form and long tussock longevity. Some of *Carex humilis* stands have developed and survived as relic communities at topographically and micro-climatically suitable sites. Using phytosociological data we studied vegetation dominated by *C. humilis* (covering > 20% of plot surface) in a large area including the Pannonian Basin and the Carpathian Mts within five countries (Austria, Czech Republic, Hungary, Romania and Slovakia). We asked whether the broad-scale compositional variation of this vegetation matches the variation in climatic (mean annual temperature, precipitation during the growing season, intra-annual temperature range and solar radiation) and topographical variables (altitude and slope). Using the PCNM (principal coordinates of neighbour matrices) method, we separated the variation explained by the geographic distance from the variation due to other explanatory variables. We examined the variation in selected species characteristics (proportion of species groups differing in chorology and selected functional traits) along the altitudinal, latitudinal and longitudinal gradients. We also investigated representation of species with narrow geographical (endemics) and coenological (habitat specialists) ranges. In 809 selected plots, the dominant *Carex humilis* co-occurred with more than 750 vascular plant taxa in communities ordered to seven alliances within two phytosociological classes. Geographic distance alone explained 55% of total explained variation while climatic and topographic predictors explained only 20% and the remaining 25% were explained by both, spatial and environmental predictors. The first ordination axis was strongly correlated with altitude and precipitation during the growing season, the second axis with longitude and intra-annual extreme temperature range and the third axis with latitude and solar radiation. The occurrence of endemic taxa was concentrated in the Central Western Carpathians while the plots in the Pannonian Basin were poor in endemics. Plots with the lowest average niche breadth were also concentrated in few regions including the Veľká Fatra Mts and the Transylvanian Basin.

Acknowledgements: Financial support was provided by VEGA 2/0027/15.

Jansen F.

Oral presentation

New ideas for international vegetation plot databases

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Florian Jansen

Institute of Botany and Landscape Ecology, University of Greifswald, Greifswald, Germany
jansen@uni-greifswald.de

Significant organisational and technical progress has been achieved concerning the development of platforms for sharing vegetation plot data. The Global Index of Vegetation Plot Databases has greatly enhanced the visibility of important data sources for biodiversity science and vegetation analyses. International projects like the European Vegetation Archive (EVA), the Arctic Vegetation Archive (AVA), and other continental wide data aggregators have joined millions of vegetation plot records and share them mostly within their member groups. Also the global vegetation-plot project sPlot has collected meanwhile more than 1.2 million plot records from all world biomes. However, parallel to these already successful international initiatives other projects have developed some important ideas to further enhance the exchange of vegetation plot data, to use them in scientific analyses and to overcome some of the remaining shortcomings. These enhancements include: (1) diverse data licensing policies, (2) direct access to plot data through web portals, (3) global identifiers and URI's to reference individual plots, making repetition of analyses and data citation indices possible, (4) workflows to automate negotiation processes for data sharing. The talk will highlight these issues on concrete examples like *vegbank.org*, the Australian Network *aekos.org.au*, or the national database for Germany *vegetweb.de*.

Jelaska S.

Oral presentation

Do invasive plants behave differently from native ones in the same environmental conditions, with respect to shares of Grime's CSR strategies?

Sven D. Jelaska *, Nina Vukovic & Toni Nikolic

Department of Biology, Faculty of Science, University of Zagreb, Zagreb, Croatia
* Presenting author: sven.jelaska@biol.pmf.hr

It is well known that disturbed areas are more prone to invasion by alien plant species than those with well preserved natural vegetation. Consequently, according to Grime's CSR theory, it is expected that former areas will be overall dominated by ruderal species, while latter will be dominated by species with prevailing competitor strategy. Here, we tested whether this rule can be applied to invasive plants solely as well. We gathered available data on CSR strategies on invasive plants present in Croatia, and designated CSR strategies for those with missing information in the databases used. Surprisingly, it seems that invasive species do not follow the pattern expected based on native species. Because of various number of CSR types in different databases we harmonised all data to three basic types (C, S and R) with appropriate shares of values being equal to one when summed, for each particular species. Amongst native species in the Croatian flora, based on available data on 1452 species, C strategy was the most frequent one (49%) followed by 27% and 25% of ruderal and stress tolerant species, respectively. Amongst 57 invasive plant species, share of competitor species was the highest with as much as 58%, followed by 37% of ruderals and just 6% of stress tolerators. We analysed observed shares of CSR strategies per 10 km ETRS grid spatial units in the dependence on spatial habitat/landcover heterogeneity and Grime's CSR type shares, as well as on basic environmental variables (e.g. elevation, precipitation, mean temperature). Although, in general, there were significant positive correlations between shares of CSR strategies amongst native and invasive plants, when analysed at 10 km spatial units, significant correlations between shares of native CSR types with environmental variables, were mostly not reflected within invasive plant species. Nevertheless it seems that among invasive plants, competitor strategy prevails, indicating that, among other plant functional traits, Grime's CSR type can contribute to identification of alien plants that can be invasive as well.

Jiménez-Alfaro B.

Oral presentation

Beyond the species-pool effect: broad-scale drivers of local species richness in European beech forests

Borja Jiménez-Alfaro [1,*], Jens-Christian Svenning [2], Milan Chytrý [1], Marco Girardello [2], Wolfgang Willner [3] & data contributors

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Bioscience, Aarhus University, Aarhus, Denmark; [3]Vienna Institute for Nature Conservation and Analyses, Vienna, Austria

* Presenting author: borja@sci.muni.cz

A key theory of biodiversity states that the regional species pool influences the diversity of local communities. However, the role of regional pools in determining local species richness is still debated, and multi-regional studies are needed to assess how broad-scale factors shape species pools and how they interact with local environmental factors. Here, we assess this issue for beech-dominated plant communities in Europe. The distribution of beech (*Fagus sylvatica*) and the constituent species of beech-dominated habitats are expected to be driven by postglacial colonization from refugia and also by current ecological conditions. Our main hypothesis is that broad-scale factors related to both historical and current conditions account for much of the variation explained by the regional species pool. We analyzed 12,000 plot samples of beech-forest communities in Europe, covering the whole distribution range of this habitat type, and modeled local species richness using broad-scale and local-scale predictors. We find that precipitation, bedrock and the distance to refugia are the main broad-scale factors influencing local species richness. We also find congruent patterns between the spatial distribution of local richness and the species pools calculated for 40 regions across Europe. However, the correlation between local richness and the regional species pool cannot provide information about the causes behind the observed patterns. We show that broad-scale factors can partially explain the species-pool effect, and they can also complement the influence of local-scale factors.

Jin S.N.

Poster B-08 (young scientist)

Development of ecological model of vegetation for isolated former floodplains in the Mangyeong River, Korea

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Seung-Nam Jin * & Kang-Hyun Cho

Department of Biological Sciences, Inha University, Incheon, Republic of Korea

* Presenting author: jinseungnam@empal.com

Most rivers in South Korea were channelized by artificial levee constructions for flood protection and thus many floodplains were isolated by levees and were used as agricultural land and residential areas. The river rehabilitations have been attempted to restore lateral connectivity in the Korean rivers. This research describes the concept, methodology and simulated results of the classification tree models (CART) that are used to simulate the effect of hydrological alteration by restoration of the lateral connectivity on the vegetation dynamics in isolated former floodplains. The vegetation dynamics are simulated based on the observed field data in the Korean rivers. Vegetation communities were classified into free-floating macrophytes, submerged macrophytes, emergent macrophytes, *Phragmites* spp., *Salix* spp., annual and biennial plants and perennial grasses. The model simulates the changing vegetation patterns based on distributed physical parameters such as water level, velocity, flooding duration, topography and disturbance. The vegetation model was developed using digital elevation model (DEM) and raster data set of physical parameters based on geographic information system (GIS). The model was applied at the isolated former floodplain in the Mangyeong River, Korea. Topographical changes by restoration of lateral connectivity were simulated using GIS virtually, and then hydrodynamic alteration was calculated by numerical model. The result of vegetation model showed that free-floating and submerged macrophytes were distributed mainly in water channel and *Phragmites* spp. was dominant while *Salix* spp. and perennial grasses also occurred in the floodplain. The floodplain vegetation model developed in this study is a step forward in modeling riparian vegetation dynamics and can be used for bioassessment and restoration projects of river and floodplain ecosystems.

Acknowledgements: This research was supported by a grant (12-TI-C02) from Advanced Water Management Research Program funded by Ministry of Land, Infrastructure and Transport of the Korean government.

Jung S.Y.

Poster with lightning talk B-09

Survival rates and vegetation structure of evergreen broad-leaved tree species distributed in warm temperate forest zone in South Korea

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Su-Young Jung *, Kwang-Soo Lee, Yong-Bae Park, Byung-Oh Yoo, Joon-Hyung Park & Nam-Gyu Ju

Southern Forest Resources Research Center, Korea Forest Research Institute, Jinju, Korea

* Presenting author: syjung@forest.go.kr

Evergreen broad-leaved tree (EBLT) species are the most probable replacement plants for black pine (*Pinus thunbergii*) and red pine (*P. densiflora*) stands that suffered from the natural disturbances, mainly caused by pine wilt disease and typhoon, in the warm temperate forest zone in Korea. In this study, survival rates in plantations and vegetation structure of EBLT species in South Korea were surveyed. The survival rate of containerized and bare-root EBLT seedlings of *Castanopsis cuspidata* var. *sieboldii*, *Quercus acuta*, and *Q. glauca* was monitored and compared in 2013 plantations. At the end of the first growing season, the highest survival rate of these three species seedlings was 93.9% 73.7%, and 96.5% of containerized seedlings in coastal plantations. Within the sites, there was no difference between two planting seasons, but the only significant difference was in the different crown density of the upper pine stands (HCD 65.7%, LCD 27.0%, $p < 0.01$). As a result of this study, overall tree survival rates were significantly different based on the type of containerized and bare-root seedling. One year after planting, the average survival rate of containerized seedlings was decreased from 78.7% to 50.9%. In a series of experimental studies of the restoration of warm temperate forest in the southern coastal area, vegetation structure survey was conducted in natural EBLT community. *C. cuspidata* stands consist of 6 tree-layer species, 8 sub-tree-layer species, 21 shrub-layer species and 20 herb-layer species. *Q. acuta* stand consist of 15 tree-layer, 14 sub-tree layer, 36 shrub-layer and 29 herb-layer species. The species diversity of *C. cuspidata* stand in the tree layer was 0.172, in the sub-tree layer 0.432, in the shrub layer 0.650 and in the herb layer 0.891. In the *Q. acuta* stand in the tree layer it was 0.123, in the sub-tree layer 0.633, in the shrub layer 0.736, and in the herb layer 0.827. The total number of vascular plants surveyed in the *C. cuspidata* stand was 95 taxa (38 families, 24 genera, 33 species). In the *Q. acuta* stand it was 134 taxa (30 families, 44 genera, 60 species). The warm temperate forests showed higher species diversity than those in the EBLT plantations.

Kalníková V.

Poster J-12 (young scientist)

Succession on gravel bars of small temperate streams

Session: Patterns of vegetation change across landscapes

Veronika Kalníková * & Milan Chytrý

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: v.kalnikova@seznam.cz

Vegetation succession was monitored for four years on river gravel bars in the northeastern Czech Republic, focusing on four small streams in the Moravskoslezské Beskydy Mountains and their foothills. Floods of different frequency and force are the main disturbing but also creating factor of the gravel bar habitats. In the natural cyclic succession disturbance events are followed by initial successional stages, which are subsequently overgrown and change into shrubby vegetation. Rivers with gravel accumulations are a significant landscape phenomenon and their habitats are endangered in many areas of the world. There were extreme floods in the northeastern Czech Republic in May 2010 corresponding to a 50-year flood event on the studied streams. Vegetation on gravel bars was removed by the flood, some gravel bars were covered by new sediments and some new bars were created. The first vegetation plots were sampled on gravel bars two months after this flood and resampled in the next three years. They were distributed on an altitudinal gradient along the entire length of the streams. Different environmental factors possibly influencing succession were recorded. There were distinct successional patterns on gravel bars even on small streams. In the first two years the number of species and Shannon-Wiener diversity were strongly increasing. From the third year number of species was still slightly increasing but diversity and evenness were decreasing. Initially sparse and very species-rich vegetation developed into denser stands with strongly increasing total cover, in which competitive and shade-tolerant species started to dominate. Tall herbs such as *Urtica dioica*, *Phalaris arundinacea*, *Mentha longifolia* and invasive *Impatiens glandulifera* formed monodominant communities in the last two years. Shrub vegetation started to develop only in few places.

Kalusová V.

Oral presentation (young scientist)

Intercontinental comparison of habitat levels of invasion

Veronika Kalusová [1,*], Milan Chytrý [1], Robert K. Peet [2] & Thomas R. Wentworth [3]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Biology, University of North Carolina, Chapel Hill, NC, USA; [3]Department of Plant Microbial Biology, North Carolina State University, NC, USA

* Presenting author: kalveron@tiscali.cz

Previous studies have shown that floras of the New World contain more alien species than floras of the Old World, but finer patterns of invasions in habitats shared by both regions have not been investigated in detail. Therefore, we performed an intercontinental comparison of the habitat levels of invasion between temperate parts of North America and Europe. Twelve habitats occurring in both regions were identified based on vegetation classification systems used in two comprehensive vegetation-plot databases from the two continents. Within a set of vegetation plots assigned to the defined habitats, 4165 plots were randomly selected, native and alien vascular plant species were identified and habitat levels of invasion calculated as a proportion of alien species in a habitat. A positive relationship in the habitat levels of invasion was found between the continents (R^2 = 0.908; P < 0.001). A consistent intercontinental pattern in the habitat levels of invasion occurs in spite of the differences in biogeographical and socioeconomic features between the regions, which indicates similar mechanisms influencing the invasion in habitats. On both continents, the most invaded habitats were alluvial forests, riverine fringes and freshwater marshes, whereas the least invaded habitats were mires and waterlogged and mesic coniferous woodlands. Habitats with high levels of invasion had high resource availability, experienced frequent disturbances, strong human impact and had large alien species pools. In contrast, habitats in sparsely populated areas with low nutrient availability, disturbance and limited pool of alien species showed low proportions of aliens. On average, however, higher levels of invasion were found across habitats in eastern North America, indicating higher level of invasion of the New World at the scale of habitat types. At the same time, higher proportions of alien species provided by European habitats to North America than vice versa suggest biased introduction rates between the continents contributing to the observed difference in the level of invasion.

Kambach S.

Oral presentation (young scientist)

Niche breadth estimates derived from species co-occurrence and geographic distribution: How well do they match across spatial scales?

Stephan Kambach [1,2,*], Jonathan Lenoir [3], Erik Welk [2,10], Gunnar Seidler [2], Jens-Christian Svenning [4], Stefan Dullinger [5], Harald Pauli [5], Wolfgang Willner [6], Antoine Guisan [7], Pascal Vittoz [7], Thomas Wohlgemuth [8], Niklaus Zimmermann [8], Jean-Claude Gégout [9], Guillaume Decocq [3] & Helge Bruelheide [2,10]

[1]Department of Community Ecology, Helmholtz Centre for Environmental Research – UFZ, Halle, Germany; [2]Department of Geobotany and Botanical Garden, Institute of Biology, Martin-Luther-University Halle-Wittenberg, Halle, Germany; [3]Ecologie et Dynamique des Systèmes Anthropisés (FRE3498), UR "Ecologie et Dynamique des Systèmes Anthropisés" (EA 4698), Plant Biodiversity Lab, Jules Verne University of Picardie, Amiens, France; [4]Department of Bioscience, Aarhus University, Aarhus, Denmark; [5]Department of Conservation Biology, University of Vienna, Vienna, Austria; [6]Vienna Institute for Nature Conservation and Analyses, Vienna, Austria; [7]Department of Ecology and Evolution, University of Lausanne, Lausanne, Switzerland, [8]Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Birmensdorf, Switzerland; [9]AgroParisTech-ENGREF, UMR1092, Laboratoire d'Etude des Ressources Forêt-Bois, Nancy, France; [10]German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany

* Presenting author: stephan.kambach@ufz.de

Habitat specialists, in contrast to generalist species, exhibit a small niche breadth, for example they grow only under a restricted set of environmental conditions, and are considered particularly vulnerable to changing climates. Large vegetation databases offer the potential to simultaneously estimate niche breadths of a large number of plant species based on either the co-occurrence with other species or the abiotic conditions around species' incidences. However, these databases usually only cover a fraction of the species' global distributions. Thus, it is an open question whether niche breadth estimates calculated at the small scale (co-occurrence) and the regional scale (abiotic conditions) offer a good proxy of species' global abiotic niche breadths and range sizes. We estimated the realized niche breadth for more than 300 non-woody plant species that are widely distributed according to the European Alps Database. Niche breadths were calculated on: (i) the local scale, based on species co-occurrences, (ii) the regional scale, based on climatic conditions of incidences and (iii) the global scale, based on global range maps from the Chorology Database Halle. We found a moderate correlation between the local and the regional estimates of species niche breadths (Kendall's τ = 0.2885). Both, the local as well as the regional approach yielded only weak correlations with species global niche breadths (τ = 0.11 and 0.12, respectively) and species global range sizes (Kendall's τ = 0.18 and 0.13, respectively). We conclude that using even large vegetation databases can still lead to misclassifications regarding habitat specialist and generalist species. Our results clearly show that a species' degree of specialization is scale-dependent, and scales have to match when comparing different types of niches. When aiming at estimating a species niche breadth and vulnerability to climate change, we advise to a take the species' global distribution into account.

Kamiński D.

Poster J-13

Floristic diversity of small habitat islands as effect of past and present human activity (on the example of early medieval earthworks of Chełmno Land/NE Poland)

Session: Patterns of vegetation change across landscapes

Dariusz Kamiński

Chair of Geobotany and Landscape Planning, Faculty of Biology and Environment Protection, Nicolaus Copernicus University, Toruń, Poland

daro@umk.pl

Earthworks (remains of early historical fortified settlements) in the agricultural landscape are specific environmental islands and refugia of rich flora, which results from the habitat diversification and anthropogenically transformed physico-chemical properties of soils. Due to difficulties with the transformation of the steep slopes of embankments into arable land, they were used for grazing, or simply left as wastelands, and then successively colonized by forest vegetation. Succession processes are taking place without disturbances or have been inhibited as a result of extensive agricultural use. Changes in the intensity of human pressure could cause fluctuation changes in the earthwork vegetation cover. This study aimed at comparing the flora of 29 early medieval earthworks, characterized by various degrees of anthropogenic transformation. Collected data were analyzed by multivariate analysis (DCA, CCA and RDA methods). The highest floristic diversity was observed on the earthworks exposed to long-term moderate human impact. The high floristic diversity and sites of rare heliophilous species are threatened by the discontinuity of traditional forms of land use, e.g. grazing.

Kang D.

Poster D-14

The comparative studies on the urban and rural landscape for the improvement of plant diversity in stream ecosystem, Korea

Session: Vegetation science serving nature conservation

Donghyeon Kang [1,*], Namchoon Kim [2], Jinkwan Son [1], Minjae Kong [1] & Joungku Kim [1]

[1]National Academy of Agricultural Science, Rural Development Administration, Jeonju, Korea; [2]Department of Landscape Architecture, Dankook University, Suji-gu, Korea

* Presenting author: son007005@korea.kr

Streams are a source of drinking water for human consumption, and can perform a variety of functions, including diversion of flowing rainwater. Urban areas are threatened when the ecological function of streams is reduced; thus, stream restoration has become important. In this study, we analyzed the characteristics of four rural natural streams and compared them to the functional improvement measures of four urban streams. We investigated plant taxonomy, life forms, naturalized species, and soil properties. There were no significant differences in soil properties such as pH (Urban: 6.27 ± 0.37, Rural: 6.97 ± 0.24), EC (Urban: 0.48 ± 0.23 dS/m, Rural: 0.17 ± 0.04 dS/m), OM (Urban: 21.48 ± 20.31 g/kg, Rural: 23.58 ± 11.27 g/kg), average P_2O_5 (Urban: 15.15 ± 6.82 mg/kg, Rural: 24.08 ± 7.66 mg/kg), and TN (Urban: 0.09 ± 0.09%). In the vegetation survey, 61 taxa in 25 families were found in urban streams, whereas rural streams had 102 taxa in 39 families. Compared to the urban areas with 26.8 (17–36) taxa per stream, the rural areas had 40.8 (36–45) taxa. Among life forms, hemicryptophytes had significantly fewer taxa in urban areas (9 taxa, 1–6 per site, average: 4.0) than in rural areas (34 taxa, 9–17 per site, average: 12.8). In general, hemicryptophytes are common in Korea, because it is located in the temperate zone. However, the climate zone of urban streams is believed to be different from that of the temperate zone because cities are under heat-island effects with high summer temperatures and large diurnal temperature fluctuations in the winter. For the naturalized species, we found 4 (3–4, average: 3.8) families and 15 (6–10, average: 7.5) taxa in urban areas, 8 (3–5, average: 4.0) families and 17 (6–10, average: 7.8) taxa in rural areas. The naturalization ratios of cities are higher with 24.6% (21.4–41.2, average: 29.3) than those of rural areas with 16.7% (16.9–23.3, average: 18.9). There is a need to increase the presence of native species in cities. We expect the results of this study to be useful in informing efforts to restore, improve, or create streams which can play a major role in the promotion and improvement of plant diversity in urban areas.

Acknowledgements: This study was carried out with the support of the Project No. PJ010957, National Academy of Agricultural Science, RDA, Republic of Korea.

Kapfer J.

Oral presentation

Vegetation dynamics or stability in the High Arctic?

Special session: Global change and vegetation dynamics: the use of historical data sets

Jutta Kapfer [1,*] & John-Arvid Grytnes [2]

[1]Norwegian Forest and Landscape Institute, Tromsø, Norway; [2]Department of Biology, University of Bergen, Bergen, Norway

* Presenting author: jka@skogoglandskap.no

Arctic and alpine ecosystems are assumed to be highly vulnerable to environmental change, especially to temperature changes. Due to this great vegetation changes are expected, but long-term studies documenting such changes are rare for these areas. Here, we present the results of three plant sociological resurveys conducted on the archipelago of Svalbard, arctic Norway, in 2009 up to 80 years after the first surveys by J. Lid, E. Hadač, and O.I. Rønning. In their samplings, the vegetation (species composition and coverage) has been recorded using plots of 1 m^2 size, and soil pH has been measured. We applied similar methods in 2009 to document vegetation change over several decades. We used restricted permutation tests to test if observed changes in species' diversity, frequency, coverage, and co-occurrences and soil pH are statistically significant, accounting for the use of non-permanent plots and unequal number of plots in the datasets compared. Total number of species was 75 in both the original survey and the resurvey. Of these, 10 species each were found in one of the surveys only. We find no significant change in average number of species per plot (richness = 9, $p = 0.750$). Of 64 species tested for abundance change, 17 species have significantly increased (e.g. *Bistorta vivipara*, *Equisetum scirpioides*, *Alopecurus borealis*) or decreased (e.g. *Saxifraga cernua*, *S. foliolosa*, *Minuartia rubella*) in occurrence frequency. Species coverages have significantly decreased for 9 species (e.g. *Trisetum spicatum*, *Alopecurus borealis*, *Cassiope tetragona*) and increased for 1 species (*Dupontia fisheri*). The species found to have changed most in co-occurring with other species are *Bistorta vivipara*, *Saxifraga cernua* and *Alopecurus borealis*. Observed changes in species co-occurrence were significantly correlated with changes in species coverages ($r = 0.58$, $p = 0.001$). Soil pH has increased from 6.34 to 6.47, but this was not statistically significant ($p = 0.182$). Compared to other studies from arctic and alpine areas and given the relatively large recent climate warming of ca. 1 °C during the past 30 years our results suggest that recent climate change has had rather low impact on the studied vegetation. This is indicated by stable species richness and relatively few species observed to have slightly changed in co-occurrence or abundance over the past decades. The observed changes in species diversity may not be explained by soil pH either, which has been stable over time.

Kasari L.

Oral presentation (young scientist)

Does habitat size influence the functional diversity similarly to species richness?

Liis Kasari *, Aveliina Helm et al.

Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: lkasari@ut.ee

Habitat loss is commonly known to reduce the biodiversity, although several studies have shown also significantly increased total richness in small degraded habitat fragments, but mostly on account of the colonization of generalist species. Therefore, it is important to consider the fact that habitat specialists and generalists differ in their susceptibility to habitat loss. It is also quite well studied, which functional traits characterise species disappearing from small and isolated habitat patches, mostly being habitat specialists. However only few studies have examined how the functional traits diversity changes along with a decrease in habitat area? Does functional diversity changes similarly to species richness and are there differences between total number of species, habitat specialist and generalist species? To answer these questions we use extensive dataset consisting of 546 calcareous grasslands from 12 separate regions and from eight different countries (Belgium, Finland, Estonia, Germany, Latvia, Russia and Sweden). For each grassland we have location (longitude, latitude), total plant species lists, and habitat area, which varies considerably between the regions, being noticeably smaller in western Europe. Additionally, for each region, data contributors separated grassland generalist and specialist species according to their expert knowledge and local background information. To detect the effect of habitat size on functional traits diversity of different species groups, we calculate the mean pairwise distance for plant life-history traits particularly important to explain plant species competitive, persistence and dispersal ability, and reproduction, in the context of habitat loss. Linear mixed effect models will be used in further analysis. Such a large dataset makes this study especially valuable, allowing us to identify possible dissimilar relationships across regions and understand the overall patterns in current plant communities better, which in turn let us make wiser decisions for biodiversity conservation.

Kawada K.

Poster with lightning talk D-15

A study on the resource selection of sheep in Hustai National Park, Mongolia

Session: Vegetation science serving nature conservation

Kiyokazu Kawada [1,*], Narangerel Batamgalan [2], Diimaa Sangi [2] & Undarmaa Jamsran [2]

[1]Faculty of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Japan; [2]Center for Ecosystem Studies, Mongolian State University of Agriculture, Ulaanbaatar, Mongolia

* Presenting author: kawada.kiyokazu.gu@u.tsukuba.ac.jp

Desertification of the steppes has become a serious problem in China and Mongolia. Specifically, overgrazing is seen as a cause of desertification. Overgrazing introduces pressure from livestock activities such as grazing or trampling. Previous studies of the responses of vegetation to differences in grazing pressure have compared study sites with different densities of sheep. However, measurements of grazing pressure in large study sites are underestimated, because plants re-grow during the research periods. In addition, sampling bias occurs due to the animals' behavior patterns. To solve these problems, grazing pressure must be evaluated without the effects of plant regeneration and without sampling bias. The aim of this study was to clarify structural changes in the plant community caused by sheep grazing pressure using a new survey method that addresses the aforementioned problems. Field surveys were conducted from July to August, 2014, in the Hustai National Park, Mongolia. Five study sites were established in the park with three replicate study plots at each site. Each study plot measured 6 m in diameter. Sheep were tethered by wires connected to a central pole. For each of the three replicated vegetation surveys, four quadrats were established in each study plot. The first survey was conducted before the start of grazing (0 h). The second survey was conducted after about 6 h of grazing and the third survey was conducted after 12 h of grazing. All species' names were recorded and the cover and height of each species were measured. Aboveground biomasses were estimated by v-value. The estimated biomass, species richness, species diversity and evenness were compared between sampling times. In total, 43 species, including 12 unidentified species, were found in this study. Results showed that the estimated biomass differed significantly between 0 h and 12 h ($P < 0.05$). The estimated biomasses of *Allium tenuissimum*, *Cymbaria dahurica* and *Kochia prostrata* differed significantly between each survey time ($P < 0.05$). The estimated biomass of *Allium tenuissimum*, in particular, was significantly different between 0 h and 12 h ($P < 0.05$). The method enabled detailed description of grazing effects despite the very short survey period. The results clarified that the effects of sheep grazing differ depending on plant species, suggesting that the characteristics or influence of plant species should not be ignored.

Keizer-Sedláková I.

Poster D-16

Long-term vegetation dynamics after sod removal in a Central European dry heathland (Podyjí National Park)

Session: Vegetation science serving nature conservation

Iva Keizer-Sedláková [1,*], Ching-Feng Li [2] & David Zelený [2]

[1]Alterra Wageningen UR, Wageningen, The Netherlands; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: sedlakovai@centrum.cz

Heathlands in the southern Czech Republic (*Euphorbio cyparissiae-Callunetum vulgaris* Schubert 1960) on ranker soil type are characterised by a high species diversity of vascular plants with many rare and endangered species. However, invasion of grasses causes losses in biodiversity. In this study, we focus on long-term effects of small scale sod-cutting as a management measure, using observations of species composition changes in permanent plots for 22 years after the experimental treatment. The study site is located in the Podyjí National Park, 3 km SE of the town of Znojmo, in the southern part of Moravia (Czech Republic) at 48°49´N, 16°01´E. Our data consist of three permanent plots (4 × 4 m, subdivided into 0.25 × 0.25 m subplots). In two plots the vegetation was removed by sod-cutting during the experimental treatment in 1992 and one control plot was not treated. After the treatment, the plots were continuously revisited every year for 22 years, and changes in species composition in each subplot were recorded. During 22 years the recovery of the vegetation was recorded in all subplots; species trends were expressed as changes in percentage frequencies. In the first year some recovery of plants from root remains and germination of species of disturbed soil was observed. In the following years species characteristic of species-rich grassland communities as well as heathland species appeared. After 22 years, the frequency of chamaephytes such as *Calluna vulgaris* and *Genista pilosa* and some lichen species have increased. We also studied the changes in small-scale beta diversity between subplots within each plot during the course of succession. The beta diversity sharply increased after the treatment and decreased back to the level of control plot after approximately six years. The data suggest that succession to heathland proceeds slowly in this environment. We conclude that small-scale sod-cutting is the most successful method for maintaining species diversity in this area. The reason seems to be that in patches with small-scale soil disturbances seeds from nearby vegetation can easily invade and germinate.

Kelemen A.

Poster with lightning talk O-07 (young scientist)

Common milkweed (*Asclepias syriaca*) as a threat to the natural flora

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

András Kelemen [1,*], Orsolya Valkó [2], György Kröel-Dulay [3], Balázs Deák [1], Péter Török [2], Katalin Tóth [2], Tamás Miglécz [2] & Béla Tóthmérész [2]

[1]MTA-DE Biodiversity and Ecosystem Services Research Group, Debrecen, Hungary; [2]Department of Ecology, University of Debrecen, Debrecen, Hungary; [3]Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary

* Presenting author: kelemen.andras12@gmail.com

Common milkweed (*Asclepias syriaca*) is a "super species" which invaded extended areas in Europe forming stable novel ecosystems. However, no study to date has focused on the effects of common milkweed on invaded vegetation. A few previous papers partly dealing with the effects of common milkweed reported no effects of this invader on the native flora. However, it is unlikely that the effects of this competitor species with effective propagation remain neutral to local flora and vegetation. To explore its effect on the species of natural sand-grassland flora, we studied the vegetation of seven sandy old-fields invaded by common milkweed, and to identify the most sensitive species groups we performed a trait-based analysis. We detected no effect of common milkweed on total species richness; however, we revealed a negative effect on the cover of species of the natural grasslands. The negative effect of common milkweed was the most pronounced on the cover of species with low specific leaf area, low seed weight and low clonal spreading ability. However, species with high competitive ability could maintain their cover in spite of the invasion of common milkweed. Our results suggest that milkweed can delay the colonisation of species of native flora and hamper old-field succession towards natural-like grasslands. Therefore, habitats invaded by milkweed are such undesirable novel ecosystems which can have significant negative impacts on the native flora. Thus, the eradication of milkweed is crucial for the protection of the native flora of the sandy regions.

Khanina L.

Poster with lightning talk C-07

Incomplete and heterogeneous data in statistical estimation of vegetation diversity

Session: Patterns and drivers of alpha and beta diversity in plant communities

Larisa Khanina * & Vadim Smirnov

Institute of Mathematical Problems of Biology, Russian Academy of Sciences, Pushchino, Russia

* Presenting author: khanina.larisa@gmail.com

We often have to deal with incomplete and heterogeneous field data when we analyze historical phytosociological records to assess dynamics of vegetation or when we compare species richness between plant community types in which different numbers of relevés were sampled with various design by different authors. We applied techniques of preliminary analysis and quality assessment of vegetation data as well as techniques of statistical estimation of alpha, beta and gamma diversity of vegetation on several sets of relevés: we assessed 80-years dynamics of vegetation diversity in the Voronezhskiy State Nature Reserve and performed comparative analysis of diversity in plant communities in the Kaluzhskie Zaseki State Nature Reserve (both area are located in Central European Russia) and in old-growth *Picea obovata*(-*Abies sibirica*) forests located in plain part of the Komi Republic. Plant diversity was estimated for each community type by calculating (1) species richness per square unit (species density) as the average number of vascular and cryptogamic species per sample plot of a fixed size within a plant community type. Pairwise randomization tests were conducted for comparison of species density between the types. We also calculated (2) species richness as the total number of vascular and cryptogamic species per the community type. To compare species richness between the types we constructed species accumulation curves by the approach of Colwell et al. (2012) and 95% confidence intervals around them. The approach allowed us to obtain comparable interpolated and extrapolated estimates of species richness for different sample sizes on the base of the unified theoretical framework and the species accumulation curves conception. We used non-overlap confidence intervals around the curves as a rough criterion of statistical difference in species richness. Finally, for the each community type we calculated (3) the average Jaccard dissimilarity and a number of half compositional changes corresponding to the average dissimilarity (McCune and Grace 2002) as measures of beta diversity. Incidence data were analyzed. We used the EstimateS program (Colwell 2013) for the curve construction and R environment for all other calculations. For the each study area, we obtained statistical estimations of plant diversity and could correct the previously made estimations which were received without taking into account the sample sizes and other variations in the field data.

Kiedrzyński M.

Poster I-06

Regional climate and geology affecting habitat availability for a relict plant in a plain landscape: the case of *Festuca amethystina* L. in Poland

Special session: Long-term perspectives on vegetation change

Marcin Kiedrzyński [1,*], Katarzyna M. Zielińska [1], Edyta Kiedrzyńska [2,3], Agnieszka Rewicz [1] & Janina Jakubowska-Gabara [1]

[1]Department of Geobotany and Plant Ecology, Faculty of Biology and Environmental Protection, University of Łódź, Łódź, Poland; [2]European Regional Centre for Ecohydrology Polish Academy of Sciences under the auspices of UNESCO, Łódź, Poland; [3]Department of Applied Ecology, Faculty of Biology and Environmental Protection, University of Łódź, Łódź, Poland

* Presenting author: kiedmar@biol.uni.lodz.pl

The distribution of refugial habitats is the main factor affecting the existence of cold-adapted species in the lowlands. In addition, regional climatic conditions could have an influence on relict species. Co-occurrence of environmental factors determining the distribution of the glacial relict *Festuca amethystina* was examined in Poland. Climatic data, richness of habitat indicator species, parent material of soils and range of glaciations were analysed, using ecological niche modelling (Maxent). Prediction of *F. amethystina* occurrence was modelled for different sets of data: only climatic, only habitat and all data. The distribution of *F. amethystina* was related to the presence of open oak forests (*Potentillo albae-Quercetum*), to moderate subcontinental climate, but not to the distribution of loess soils. In addition, variables related to temperature and precipitation in the driest quarter of the year, isothermality and a mean diurnal range had the strongest influence on the occurrence of *F. amethystina* within the *Potentillo-Quercetum* range. Climate acts as a regional filter and habitat availability as a local filter for the distribution of the species. In Poland, the distribution of subcontinental oak forests is wider than that of *F. amethystina*, whose range is restricted by regional climate and geology. Therefore, the habitat can act as microrefugium for the species only in some parts of its range. We conclude that, in a flat landscape, relicts can persist together with specific vegetation types where environmental conditions are simultaneously favourable for: (i) the persistence of refugial vegetation patches and (ii) the functioning of relict populations. Oak forests harbour adequate microclimatic conditions: sufficient light and moisture with less extreme amplitudes than those that occur, for example, at open sites. They are also examples of refugial habitats which have been preserved by the activities of humans and herbivores, which counteract the transformation of open forest to closed.

Kigel J.

Poster B-10

Testing Taylor's power law for abundance – variance relationship in a semi-arid annual plant community

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Jaime Kigel [1,*], Irit Konsans [1] & Marcelo Sternberg [2]

[1]Faculty of Agriculture, Food and Environment, Hebrew University of Jerusalem, Jerusalem, Israel; [2]Faculty of Life Sciences, Tel Aviv University, Tel Aviv, Israel

* Presenting author: jaime.kigel@mail.huji.ac.il

Ecology is often defined as the study of the distribution and abundance of species. We studied temporal stability of Taylor's power law relationships between abundance and variance during 10 years in a semi-arid Mediterranean annual plant community. Effects of year conditions and rainfall manipulations on the abundance-variance relationship were analyzed at the inter-specific and intra-specific levels. Rainfall manipulation treatments applied were 30% reduced rainfall, 30% increased rainfall (by irrigation), and compared to a Control treatment, with five 10 × 25 m replicate plots in each treatment. The highly rich annual vegetation was sampled within 20 × 20 cm quadrats in open spaces between shrubs. Protection from grazing and a trend of decreasing annual rainfall during the study period caused large changes in vegetation composition, plant density and aboveground biomass production. The relationship between abundance and variance in spatial distribution corresponded to Taylor's power law at both the inter-specific and intra-specific levels. These relationships were practically unaffected by the wide inter-annual variation in rainfall and vegetation productivity and by the rain manipulation treatments. Stability of Taylor's power law relationship indicates high constancy in patterns of spatial distribution despite large temporal variation in environmental conditions in this Mediterranean semi-arid annual plant community.

Kim H.R.

Poster G-07

Interaction of soil moisture, elevated CO_2 concentration and temperature on the growth responses of *Quercus serrata* and *Q. aliena*

Special session: Species and plant community responses along soil gradients

Hae-Ran Kim [1,*], Sung-Cheol Jung [1], Hyung-Soon Choi [1], Chan-Soo Kim [1] & Young-Han You [2]

[1]Warm-Temperate and Subtropical Forest Research Center, Korea Forest Research Institute, Jeju-do, Republic of Korea; [2]Department of Life Sciences, Kongju National University, Gongju-si, Republic of Korea

* Presenting author: ecoran85@forest.go.kr

This study was conducted to determine the effects of soil moisture, elevated CO_2 and temperature on growth responses of *Quercus serrata* and *Q. aliena*. Two oak seedlings were cultivated along the soil moisture gradients (low, medium and high moisture) at ambient and elevated CO_2 and temperature levels. As a result, the two oak species seem to have different growth response to soil moisture. In ambient CO_2 and temperature conditions, shoot biomass of *Q. serrata* was the greatest in the high moisture, but the rest of growth parameters were not significantly affected by moisture gradients. In contrast, R:S ratio, root and total biomass of *Q. aliena* were the highest in the medium moisture. Elevated CO_2 and temperature modified the overall pattern of responses of two oak species to the soil moisture gradients. After exposure to elevated CO_2 and temperature, shoot, root and total biomass of *Q. serrata* were the greatest in the high moisture, but for *Q. aliena*, all growth parameters were not significantly affected by moisture gradients. Also, when grown under elevated CO_2 and temperature conditions, *Q. serrata* showed marked reductions in shoot biomass under all moisture gradients, but *Q. aliena* showed increase in root and total biomass under low moisture conditions. Thus, *Q. aliena* may be more tolerant to drier habitats than *Q. serrata* in a future high CO_2 concentration and temperature environments.

Kim M.J.

Poster O-08 (young scientist)

Management and distribution characteristics of *Sicyos angulatus* in Korea

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Mi-Jeong Kim [1,2,*], In-Chun Hwang [1], Chang-Woo Lee [1], Hyohyemi Lee [1] & Hae-Ryong Song [1]

[1]National Institute of Ecology, Seocheon, Republic of Korea; [2]Department of Urban Systems Engineering, Gyeongnam National University of Science and Technology, Jinju, Republic of Korea

* Presenting author: lina98@nie.re.kr

Bur cucumber (*Sicyos angulatus*) is indigenous in North America, and is known to be introduced to Korea in the late 1980s. It spreads around Hangang, Nakdonggang and Geumgang basins over the country, and has been designated as an ecosystem-disturbing species since 2009. It rapidly withers a tree of more than 10 m in height and severely disturbs the ecosystem in the invaded region. It is distributed particularly around rivers, therefore it adversely affects river ecosystems. Its influence is extended to forest edges or even to arable land. Currently, it is being legally controlled (as ecosystem-disturbing species) in Korea. National Institute of Ecology is carrying out a monitoring project to control Bur cucumber. Utilizing a drone (Remote sensing), the changes in its distribution and the direction of spread have been surveyed. Te estimated further spread to new areas, a prediction was made using spatial distribution modeling. Results from climate change modeling showed that it seemed to be concentrated in the Geumgang Basin. It prefers a slightly moist soil and sunny secondary grassland, while it avoids dry places. It is also shown that its influence may be reduced by arrowroot or its spread may be suppressed by the dense population of large herbaceous plants and shrubs.

Kirchheimer B.

Oral presentation

Niche differentiation in di- and tetraploid plants based on environmental niche modelling at macro- and micro-environmental scales

Bernhard Kirchheimer [1,*], Christoph C.F. Schinkels [2], Elvira Hörandl [2] & Stefan Dullinger [1]

[1]Department of Botany and Biodiversity Research, University of Vienna, Vienna, Austria; [2]Department of Systematics, Biodiversity and Evolution of Plants, Georg-August-University of Göttingen, Göttingen, Germany

* Presenting author: bernhard.kirchheimer@univie.ac.at

Polyploidization, the doubling of genomic content, is an important mechanism of adaptation and speciation in plants but the establishment of new polyploids might be thwarted by competition with surrounding diploids. Niche differentiation has been suggested to be important for overcoming competitive resistance of ancestral cytotypes but the importance of this mechanism has recently been challenged. In our study we ask whether (1) diploids and polyploids differ in the position of their niche optima and/or in their niche breadths across their respective ranges; (2) whether these differences vary when comparing sympatric and allopatric cytotypes; (3) whether results based on GIS-derived coarse-grained environmental data are consistent with results based fine-grained environmental data derived from a large set of vegetation plots. We focus on one particular model system (*Ranunculus kuepferi*) to develop an in-depth study of niche differentiation between di- and polyploids, which is based on recent methodological progress using data from consistent sampling and cytotype determination across (nearly) the whole spatial range of the species complex. Our study is the first to assess detailed niche changes between di- and polyploid cytotypes of a given species by contrasting sympatric with allopatric situations and by comparing results obtained with coarse- and fine-grained environmental variables. Our results demonstrate that the environmental niche of tetraploid *R. kuepferi* differs from the niche of its diploid ancestor. When focussing on the entire geographical ranges of both cytotypes, this difference appears to be mainly driven by a shift of the niche optimum without a significant change in niche breadth. Analysing the subset of sympatric and allopatric populations separately shows that the tetraploids' realized niche is narrower in the sympatric region, but was significantly broadened in the allopatric range. Finally, our analysis revealed partly inconsistent results at macro- and micro-environmental scales, in particular with respect to changes in niche breadth and to the net balance of niche parts unique to tetraploids and diploids. As a corollary, basing analyses of niche differences on large-scaled climatic data might lead to erroneous conclusions, particularly in the rugged relief of high mountain areas. We hence strongly recommend basing any inferences from niche comparison analyses for mountain plants on appropriate, fine-scaled environmental data.

Klaus V.H.

Oral presentation

A large-scale seeding and disturbance experiment in temperate grasslands – lessons learned for conserving and restoring plant diversity and ecosystem services

Valentin H. Klaus [1,*], Daniel Prati [2], Till Kleinebecker [1], Deborah Schäfer [2], Barbara Schmitt [2], Markus Fischer [2] & Norbert Hölzel [1]

[1]Institute of Landscape Ecology, University of Münster, Münster, Germany; [2]Institute of Plant Sciences and Botanical Garden, University of Bern, Bern, Switzerland

* Presenting author: v.klaus@uni-muenster.de

Grassland biodiversity still drastically declines in many countries in the temperate zone. Intensive land management and the use of commercial seed mixtures generate species-poor, monotonous grasslands. This reduced plant diversity is not only a biodiversity concern, but it may also restrict certain ecosystem services. During the recent past, the management intensity of several grasslands has been significantly reduced either for economical or ecological reasons. However, due to seed and dispersal limitation, current low-intensively used grasslands remain species-poor over decades. Nevertheless, these grasslands hold a vast but untapped biodiversity potential. Here, we present a large-scale seeding and disturbance experiment in agricultural grasslands in Germany. We tested the application of topsoil disturbance and seed addition using a regionally produced mixture of native plants and assessed their effects on plant diversity and ecosystem functioning. As the first results indicate, our treatments were effective to increase plant diversity significantly in all study regions. Thus, we have to stress the relevance of seed and dispersal limitation for grassland vegetation and underline the option to significantly enrich plant communities using locally produced seed mixtures. Additionally, the results indicate a positive effect of enriched plant diversity for grassland productivity, giving a promising example of a win-win situation for nature conservation and agricultural grassland use.

Kleinebecker T.

Oral presentation

Seed bank and above-ground plant functional response to management – lessons from a 25 year field experiment

Till Kleinebecker [1,*], Jutta Klevesahl [1], Frederike Velbert [1], Peter Schwartze [2] & Norbert Hölzel [1]

[1]Biodiversity and Ecosystem Research Group, Institute of Landscape Ecology, University of Münster, Münster, Germany; [2]Biological Station of the County Steinfurt, Tecklenburg, Germany

* Presenting author: till.kleinebecker@uni-muenster.de

The study of functional responses in the above-ground part of grassland communities to management has been a major topic in vegetation science during the past decade. Contrary, little attention has been devoted to effects of management on the functional composition and diversity of the soil seed bank in grassland ecosystems. Most research so far has focused on changes in seed bank species richness and a simple comparison with the above-ground vegetation composition, which lacks the ability to give general indications towards ecosystem and species assembly processes. Here, we analysed the functional composition (community weighted means) and diversity (Rao's quadratic entropy) of wet meadow above-ground vegetation and the soil seed bank subjected to different management for 25 years. Experimental treatments included mowing once (early and late), mowing twice (with and without fertilization) and fallow. Both, functional composition and diversity of above-ground vegetation differed markedly in most traits. Management effects on the functional composition were similar for the seed bank and for the above-ground vegetation. The fallow treatment was characterized by larger canopy height and later onset of flowering indicating strong competition for light, whereas mowing treatments favoured small growing rosette plants and di-cyclic plants that regenerate faster after biomass removal. Diversity in height, leaf and seed traits was mostly higher in the seed bank compared to the above-ground vegetation. In some traits, management effects on the functional diversity of the seed bank and the above-ground vegetation differed remarkably. However, in general treatment effects on functional diversity were less obvious compared with functional composition, but revealed both trait convergence and divergence in mowing treatments for leaf traits and reproduction traits, respectively. Our results demonstrate that the seed bank differ markedly in some traits from the above-ground vegetation and could partly act as insurance for trait convergence above-ground.

Kleyer M.

Oral presentation

Response to disturbances: shifts in correlated traits

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Michael Kleyer [1,*], Miguel Cébrian [1], Anastasia Koch [2], Juliane Trinogga [1] & Martin Maier [1]

[1]Landscape Ecology Group, University of Oldenburg, Oldenburg, Germany; [2]Ecology and Environmental Education Group, University of Hildesheim, Hildesheim, Germany

* Presenting author: michael.kleyer@uni-oldenburg.de

Functional ecology often relates a few selected traits to disturbance by land use. Here we argue that the correlation structure among traits should be considered as response variable, rather than individual traits. Using datasets from grasslands with different grazing and mowing intensities, we show that positive and negative scaling relationships among traits indicate the plants' utilization of light, water and nutrients in response to disturbance gradients. The results confirm the relevance of the plants economics spectrum as a major strategy to cope with disturbance by land use. Relationships among size-related traits provide additional explanation for plant responses to disturbance. Considering the coordination of traits amongst major plant organs improves our understanding of plant strategies ensuring survival in landscapes patterned by disturbance.

Klichowska E.

Poster P-20

Diversity of grasslands with share of *Stipa pennata* (*Poaceae*) in Poland

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Ewelina Klichowska *, Marcin Nobis & Agnieszka Nobis

Department of Plant Taxonomy, Phytogeography and Herbarium, Institute of Botany, Jagiellonian University, Kraków, Poland

* Presenting author: ewelina.klichowska@uj.edu.pl

Dry grasslands from the *Festuco-Brometea* class with great share of *Stipa pennata* in Poland occur only in small areas of the Malopolska Upland and the lower Vistula and Oder River Valleys. Many species occurring there reache their northern distribution limit in Poland. They are often rare and valuable part of Polish flora. They grow in specific environmental conditions, mainly on steep hills (like river valley slopes) with southern exposition and low soil moisture, on sandy or gypsum substrata with high content of calcium carbonate. A specific group are communities developed on anthropogenic habitats such as roadsides and railway embankments. The aim of the study was to compare plant communities with the participation of *Stipa pennata*, occurring in different types of habitats on the territory of Poland. For this purpose 44 phytosociological relevés (according to the Braun-Blanquet method) were made. Statistical analyses were performed using MVSP 3.2 and Statistica 10. Analysis shows that phytocoenoses which developed in anthropogenic habitats are characteristics by the lowest values of the Shannon Diversity Index (average 4.14) and species richness (average of 19 species in the area of 16 m^2) which is a statistically significant difference from the other distinguished groups. Only 35% of all recorded species occurred in the patches of these communities. For comparison the mean Shannon diversity Index for grasslands developed on gypsum is 4.52 and the mean species richness is 25. These communities consists of ca. 70% of all recorded species. In the grasslands developed on sand, the Shannon diversity Index value is 4.67 and the mean species richness is 27 species in relevés. Patches of these communities are composed of ca. 50% of all recorded species. Cluster analysis (UPGMA) resulted in the delimitation of two main groups. First of them correspond to the phytocoenoses developed in antropogenetic habitats, which confirm most distinctive character of this group. In the second cluster we can distinguish separate subclusters reffering to the other groups. Detrend Correspondence Analysis (DCA) also displays a similar pattern as Cluster analysis. A scatter plot shows three distinctive clusters, however, the cluster edges that represent communities developed on sand and those on gypsum overlap to some extent.

Klimešová J.

Oral presentation

How plants respond to disturbance: a view across ecosystems

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Jitka Klimešová [1,*] & Tomáš Herben [2]

[1]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [2]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic

* Presenting author: jitka.klimesova@ibot.cas.cz

Disturbance is affecting numerous ecosystems and shaping strategies of resident plants. Research on plants response to disturbance, however, remain fragmented and plant ecologists studying herbivory, drought, fire, frost or flooding use different terminology, methods and test different hypotheses. Attempts to cover whole diversity of disturbance regimes are rare and general concept is virtually missing. Here we want to provide an overview of different disturbance regimes and plant strategies and propose how to cope with them. Distinguishing tolerance, resistance and avoidance traits relevant to disturbance we aim at facilitation of communication among different fields of ecology and contribute to better understanding of phylogeny of plant traits due to biomass removal.

Knapp S.

Oral presentation

The legacy and future of phylogenetic diversity in urbanising areas

Special session: Urban vegetation

Sonja Knapp [1,*], Marten Winter [2] & Stefan Klotz [1]

[1]Department of Community Ecology, Helmholtz Centre for Environmental Research – UFZ, Halle, Germany; [2]German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany

* Presenting author: sonja.knapp@ufz.de

Human impact on the world's resources has increased to such an extent that research is discussing the "Anthropocene" as present geological epoch. Urban land use has multiplied, concentrating in regions of high biodiversity. Urbanisation drives extinctions of native species and immigrations of non-native species, threatening life's diversity, which developed over millions of years. Phylogenetic distinctness measures species relatedness, i.e., the intrinsic evolutionary history of species assemblages and has been suggested to support ecosystem stability and functioning. Using a unique European urban flora covering 320 years, beginning in the 17th century, combined with a comprehensive plant phylogeny, we show that extinctions of native species and immigrations of non-native species caused non-random loss of evolutionary history. With an average relatedness of 311 myr, extinct species outnumbered immigrated species by 72 myr. Analysing today's red list species and non-native species most likely to immigrate in the future suggests ongoing loss of evolutionary history.

Koch C.

Oral presentation (young scientist)

Impact of changing landuse on plant species composition and vegetation structure in highland grasslands of southern Brazil

Christiane Koch [1,2,*], Julia-Maria Hermann [1], Gerhard E. Overbeck [2], Jonathan M. Jeschke [3,4] & Johannes Kollmann [1]

[1]Restoration Ecology Research Group, Technische Universität München, Freising, Germany; [2]Department of Botany, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil; [3]Department of Biology, Chemistry, and Pharmacy, Institute of Biology, Freie Universität Berlin, Berlin, Germany; [4]Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin, Germany

* Presenting author: c.koch85@gmx.de

Landuse is changing rapidly around the world with a variety of forms and intensities: natural areas are turned into productive agricultural or silvicultural systems, intense management is replacing traditional management, and unproductive land is abandoned. Vegetation science has to evaluate the conservation value of degraded areas and the potential for its enhancement by restoration. Vegetation change indicates which type of management helps conserving an intact ecosystem, and which actions are necessary to restore degraded ecosystems. We investigate the impact of landuse on highland grassland vegetation in Rio Grande do Sul, Brazil. Grasslands in this region are traditionally managed with medium stocking rates and burned at the end of winter to remove dead biomass. Nature conservation here is facing two challenges: (1) slow changes where management of grassland is intensified or extensified, and (2) fast changes where grassland is converted into cropland or pine plantations, which are then abandoned again. We conducted a detailed survey of 80 sites covering five land-use classes to explore changes of soil quality and vegetation in response to different management types and intensities. The main questions are: (1) Does intensification or extensification of grassland management have a stronger impact on species composition or vegetation structure? (2) Does succession of former arable fields or pine plantations converge toward the original grassland vegetation? Our data show that while extensively managed grasslands undergo a decline in species richness with loss of most of the rare species, intensively managed grasslands maintain average species richness albeit with a high proportion of non-native species. Marked changes in the vegetation structure are only occurring during extensification. The structure of re-colonizing vegetation on both former arable fields and pine plantations is very different from typical grasslands and almost all grassland species are missing. We conclude that where fast changes occur, restoration measures such as the reintroduction of species might be necessary to re-establish characteristic plant communities. However, restoration can only be successful if the management afterwards is adequate to maintain the restored site in a desirable state. Thus conservation has to take care that slow changes due to inadequate management do not counteract restoration efforts.

Koch M.

Poster D-17

From meadow to shallow lake: Monitoring secondary succession in a coastal fen after flooding based on aerial imagery and plot data

Session: Vegetation science serving nature conservation

Marian Koch [1,*], Franziska Koebsch [2], Juliane Hahn [1] & Gerald Jurasinski [1]

[1]Landscape Ecology Group, Faculty for Agriculture and Environmental Sciences, University of Rostock, Rostock, Germany; [2]Deutsches GeoForschungsZentrum GFZ, Potsdam, Germany

* Presenting author: marian.koch@uni-rostock.de

Year-round flooding can be a cost-effective measure for rewetting of highly degraded fens and is gaining in popularity for lowland fen restoration in Europe. However, flooding is a heavily destabilizing force on ecosystems, and success control is mandatory. We investigated the short term effects of such permanent inundation on species composition and spatial distribution of vegetation of a formerly drained coastal fen and address the question if re-establishment of peat-forming reed vegetation is foreseeable. For vegetation mapping and monitoring we combined permanent plot data acquired during four years after shallow flooding, high-resolution aerial imagery, a LIDAR-based elevation model and water level data. Vegetation in the years after flooding exhibited clear separation in patches dominated by few or single species with only minor transition zones. Thus, patches could be clearly distinguished in both the ground truthing and the remote sensing dataset, and an object based classification approach could be used. Five vegetation types were distinguished, and we analyzed their spatial distribution and succession patterns throughout the years. Pre-existing vegetation, its spatial arrangement and water levels played a major role in secondary succession. Existing reed belts of *Phragmites australis* showed high stability and spread, but the amount of the latter was not consistent through the years and at all inundation depths. Existing stands of *Bolboschoenus maritimus* were outcompeted by *Schoenoplectus tabernaemontani* or vanished and formed relatively stable ponds of open water with hydrophytic species. We concluded that the expansion of reed as peat forming vegetation will likely proceed slowly, but fluctuations in water levels and edge effects will probably keep a persistent mosaic of vegetation and open water in the near future. The combination of remote sensing methods with classical permanent plot monitoring proved to give valuable additional insights into short-term succession processes.

Kolk J.

Oral presentation (young scientist)

Herb-layer changes in ancient and recent forest stands over five decades indicate failing recovery from agricultural land use

Jens Kolk * & Tobias Naaf

Institute of Land Use Systems, Leibniz Centre for Agricultural Landscape Research (ZALF) e.V., Müncheberg, Germany

* Presenting author: kolk@zalf.de

Resurveys are an appropriate method to investigate changes of plant species richness and composition over time. Initial surveys that range back to more than a few decades are rare and the original plots are mostly difficult to relocate. However, exactly such resurveys are necessary to detect and quantify long-term changes in plant communities e.g. the payment of an extinction debt or colonization credit. There is currently little knowledge on whether changes in species richness are mainly influenced by past land use changes, recent environmental changes or both. Here, we reconstructed the land-use history of all forest patches in the Prignitz region (NW Brandenburg, Germany) and conducted a resurvey of 119 vegetation relevés initially surveyed in 1960. The aim was to quantify the overall changes in species richness, cover and single-species occurrences and to compare changes between ancient (without historical record of agricultural land use) and post-agricultural forest stands. We used generalized linear mixed models with year (1960 vs. 2014) and land-use history (ancient vs. post-agricultural) as predictors for changes in cover and species richness and for changes in the probability of occurrence of single species, i.e. to detect winner/loser species. We found no convergence in species richness between ancient and post-agricultural forests over time. The number of forest specialists was higher in ancient stands, while there were no significant differences in the number of generalists between ancient and post-agricultural stands. Total cover decreased in ancient stands, while it remained constant in post-agricultural stands. We found more winner than loser species. Many winner species increased in frequency in both ancient and post-agricultural stands, while loser species were mainly associated with ancient stands. Our results indicate that changes in species richness were largely independent from land use history. However, there were differences in cover changes and in single species occurrences that may indicate a small payment of the extinction debt. Indications for the hypothesized colonization of post-agricultural stands by forest specialists since 1960 were weak and differences in species richness between ancient and post-agricultural stands still persist today. We conclude that the observed changes were mainly caused by recent environmental changes presumably by a decrease in light availability and an increase in nitrogen availability.

Kook E.

Poster B-11 (young scientist)

Intra-individual polymorphism and hybridization in *Pulmonaria obscura* Dumort and *Pulmonaria angustifolia* L. (*Boraginaceae*)

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Ene Kook *, Kersti Püssa, Rein Kalamees, Ülle Reier & Silvia Pihu

Department of Botany, University of Tartu, Tartu, Estonia

* Presenting author: ene.kook@ut.ee

Interspecific hybridization which is often promoted by community fragmentation and disturbance is a common process in plants. Hybridization may influence the fitness of plants and therefore also the performance of plant species in natural communities. We provide the evidence about interspecific hybridization between two perennial forest herbs *Pulmonaria angustifolia* and *Pulmonaria obscura*. In the study area (Estonia and Latvia), *P. angustifolia* is on the northern border of its distribution range and is represented by only a few small populations. The decline of *P. angustifolia* in the study area is caused by forest management changes of the last half a century. *P. obscura* is a common species in the study area. Individuals from the main area of *P. angustifolia* (Poland) were also examined for comparison. NrDNA ITS sequences were cloned from *P. angustifolia* and *P. obscura* pure populations and a mixed population and putative hybrid specimens from mixed population. Found patterns of intra-individual polymorphism show that all *P. angustifolia* specimens had nucleotides characteristic to both *P. angustifolia* and *P. obscura* in 15 sites. What is more, the identical or nearly identical haplotypes were present in all studied individuals. Separately run neighbour-joining analyses, the first being based on sequence information of ITS1 and the second on sequence-structure information of ITS2, resulted in similar trees where part of *P. angustifolia* sequences clustered into the same clade with *P. obscura* sequences. There were no detectable differences between edge- and central populations of *P. angustifolia* neither in the pattern of intra-individual polymorphism nor in the clustering. Mixed population specimens were more similar to *P. angustifolia* pure population specimens. These results suggest a hybrid origin of all the studied *P. angustifolia* populations. The hybrid origin of *P. angustifolia* as a species is also probable. This idea is supported by the fact that the central population from Poland showed a similar pattern of polymorphism as the populations from the edge of the distribution range did. To find out how the hybrid origin and genetic variability is connected to plasticity and fitness of *P. angustifolia* and its performance in changing communities, future research is needed.

Koorem K.

Oral presentation (young scientist)

Range expanding plant species establishing in the new range: are the effects on native plant communities determined by soil biota?

Kadri Koorem *, Olga Kostenko, Basten Snoek, Stefan Geisen, Kelly S. Ramirez, Rutger Wilschut, Marta Manrubia Freixa & Wim H. van der Putten

Netherlands Institute of Ecology, NIOO-KNAW, PB Wageningen, The Netherlands

* Presenting author: k.koorem@nioo.knaw.nl

Current climate warming has brought about range expansion of plants, animals, and microorganisms to higher altitudes and latitudes. Range shifts of plant species are well documented, but we still know little about the ecological consequences, for example how the establishment of range-expanding plant species influences native plant communities. Plants are living in close association with aboveground and belowground higher trophic level organisms. Research has shown that soil organisms can have major impact on plant community dynamics, but relatively little is known about their role in community organization following plant range expansion. As plants disperse faster than soil organisms, range-expanding plants may in their new range be released from their natural enemies, but also from symbionts and decomposer organisms. However, with time soil organisms may also disperse over long distances and expand their ranges but so far, no studies have investigated how this may influence plant community dynamics in the new range. We established a greenhouse experiment to examine (i) how the addition of range-expanding plant species affects the performance of native plant species and (ii) how range expansion of soil organisms influences plant community composition in the new range. Eight plant individuals, consisting of plants from distinctive ecological strategies (range-expanding plants, native plant species, and their combination), were grown in 7 l mesocosms, which were inoculated with different soil communities (sterile soil, soil community from the original range, new range or a mixture of the original and new range). After 14 weeks of growth, plants were harvested, dried and weighed. Our results show that the addition of range-expanding plant species increases the productivity of plant communities in the new range. However, the effect of range-expanding plant species depends on their relativeness to the native plant community: range-expanders that have no closely related plant species in native plant communities suppress the growth of native plants, whereas range-expanders with closely related species in the native plant community have no negative effect. Interestingly, the effect of soil communities differed also between these two types of range-expanding plants and also between individual species. We will discuss more specific responses in the presentation.

Kopecký M.

Oral presentation (young scientist)

Tree distribution shifts more over ontogeny than during climate change

Special session: Global change and vegetation dynamics: the use of historical data sets

Martin Kopecký [1,*], František Máliš [2,3], Petr Petřík [1], Jozef Vladovič [2], Ján Merganič [2] & Tomáš Vida [2]

[1]Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [2]Forest Research Institute Zvolen, National Forest Centre, Zvolen, Slovakia; [3]Faculty of Forestry, Technical University in Zvolen, Zvolen, Slovakia

* Presenting author: ma.kopecky@gmail.com

Ongoing climate change is expected to change tree species distribution and therefore affect forest biodiversity and ecosystem services. To assess and predict tree distributional shifts triggered by climate change, researchers often compare current distribution of juvenile and adult trees under assumption that differences between these life-stages indicate distributional shifts triggered by climate change. Here we test this crucial assumption with data from 1435 plots resurveyed after more than three decades across Western Carpathians. These large-scale and temporally-replicated data allow us to disentangle ontogenetically fixed differences between tree life-stages from real temporal distributional shifts. Despite climate change, tree species distribution did not change directionally between the surveys. In the same time, distribution of juveniles substantially differed from adults in both surveys. Moreover, the species-specific differences among life-stages were consistent in both periods and the temporal distributional shifts were order of magnitude lower than shifts over ontogeny. Our results show that distributional differences between tree life-stages are ontogenetically fixed. Therefore, they cannot be used to asses and predict the effect of climate change.

Kostrakiewicz-Gierałt K.

Poster A-07

The impact of site conditions on the abundance of populations of *Succisa pratensis* Moench. and spatio-temporal variability of selected individual traits

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Kinga Kostrakiewicz-Gierałt

Department of Plant Ecology, Institute of Botany, Jagiellonian University, Kraków, Poland

kinga.kostrakiewicz@uj.edu.pl

The observations were conducted in the south-west of Kraków (southern Poland), in unmanaged patches of *Molinietum caeruleae*. Patch I was dominated by small meadow taxa, patch II by shrub willows, patch III was overgrown by shrub-willows and common reed, patch IV was overgrown by large-tussocks grasses, patch V was dominated by large-tussocks grasses and common reed, while patch VI was dominated by tall-growing macroforbs, bushes and trees. The average plant canopy height increased in the aforementioned stands, whereas light availability gradually diminished. In the year 2009 in each *Succisa pratensis* population the abundance of individuals (defined as a single vegetative or generative rosette) and ramet clusters (understood as an integral group of rosettes) was examined. The detailed investigations of temporal and spatial variability of (1) number of individuals and ramet clusters, (2) number of rosettes per individual/ramet cluster, (3) number of leaves per rosette, (4) number and height of generative stems, and (5) number of flower heads in each generative stem were performed in permanent plots (measuring 10 m × 10 m) in the years 2009–2013. Furthermore, each season the number of seeds per fruit was surveyed in 30 flower heads randomly collected beyond the study plot. In the statistical analysis the nonparametric Kruskal-Wallis H test was applied. The greatest total number of individuals and ramet clusters was recorded in patch VI. The slight increase iin abundance found only in patch I might be caused by the appearance of openings in continuous plant cover that could serve as safe sites for seedling recruitment. The constant abundance was recorded in patches II, V and VI, while the moderate decrease of abundance was found in patches III and IV. The number of rosettes did not differ in time and space, while the number of leaves showed only spatial variability and dropped significantly in successive patches. The number and height of flowering stems, as well as flower heads and seed production increased in particular patches, as well as in consecutive seasons. Such phenomenon might enlarge the chances for successful pollination and diaspore dispersal in the crowded environment. In the light of these observations it might be concluded that the state of populations of *Succisa pratensis* and their perspectives for persistence in colonized sites worsens gradually from patch VI, through patches I, II and V, to patches III and IV.

Kovalenko O.

Poster P-21 (young scientist)

The classification of the annual herbal vegetation of wetlands of the National Nature Park “Pyryatynsky” (Ukraine)

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Oleksii Kovalenko

National Museum of Natural History, National Academy of Sciences of Ukraine, Kyiv, Ukraine
corydalis@ukr.net

A problem of modern phytosociology is the harmonization of regional classification systems and monographic treatments of individual classes of vegetation. This fully applies to the dynamic and complex composition of the ephemeral floodplain communities of the class *Isoëto-Nano-Juncetea*. We started our work with this type of vegetation in 2010 in the National Nature Park “Pyryatynsky” (Poltava Region, Ukraine). We distinguished seven associations (two of them described as new and three listed for Ukraine for the first time). The sets of diagnostic and constant species, coenotic, chorological, nomenclaturical and syntaxonomical features for every syntaxon are given in our publications (Kovalenko, 2014). The resulting classification includes 1 order, 4 alliances and 7 associations: class *Isoëto-Nano-Juncetea* Br.-Bl. et Tx. ex Br.-Bl. et al. 1952, order *Nano-Cyperetalia* Klika 1935, alliance 1. *Nano-Cyperion flavescentis* Koch ex Libbert 1932, association 1. *Cyperetum flavescentis* Koch ex Aichinger 1933, 2. *Juncetum bufonii* Felföldy 1942, alliance 2. *Eleocharition ovatae* Philippi 1968, association 3. *Cyperetum micheliani* Horvatić 1931, 4. *Eleocharito acicularis-Limoselletum aquaticae* Wendelberger-Zelinka 1952, alliance 3. *Radiolion linoidis* Pietsch 1973, association 5. *Psammophiliello-Juncetum nastanthi* Kovalenko 2014, alliance 4. *Verbenion supinae* Slavnič 1951, association 6. *Polygono recti-Juncetum juzepczukii* Kovalenko 2014, 7. *Eragrostidetum suaveolentis* Golub et al. 2007. Analysis of syntaxa of annual herbaceous wetland vegetation as multivariable systems show a complex picture of their differentiation in the floristic, ecological and geographical coordinates. We determine critical differentiation of alliances *Nano-Cyperion* and *Eleocharition ovatae*, confirm the appropriateness of the alliance *Radiolion linoidis* as a separate syntaxon, as well as the legitimacy of the differentiation of the associations *Eragrostietum suaveolentis* and *Polygono-Juncetum*.

Kozhevnikova M.

Poster P-22

Ordination of plant communities by neural networks

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Tatiana Rogova, Maria Kozhevnikova * & Anatoly Saveliev

General Ecology Department, Institute of Ecology and Environmental Management, Kazan Federal University, Kazan, Russia

* Presenting author: MVKozhevnikova@kpfu.ru

The use of computer technology opens up new possibilities of automated classification and ordination of plant communities. Particularly relevant new methods appeared in connection with the development of GIS and electronic mapping of natural features, including vegetation. The aim of this work was to perform vegetation ordination using the method of neural networks. About 2000 relevés from regional database registered in GIVD (ID EU-RU-011) were used. Kohonen network consisting of 5, 7, 10 neurons was applied for ordination, and Euclidean distance similarity was used to classify species composition. A network of 100 classes (10 neurons) was optimal to use. Data matrix (rows as relevés, columns as species) was created from the original database and matrix nodes contained species abundance. This matrix was used as the input space for the programmed neural network. As a result the network assigns the number of ordination class to each object. Ordinated relevés are arranged in gradient rows. We can distinguish four basic gradients: soil fertility, light and two rows of humidity. It is also possible to identify some transitional objects, for example, the forest-steppe and different stages of anthropogenic successions. For more detailed interpretation of the community ordination results and identification of gradient transitions diagnostic species can be used. To analyze the distribution of diagnostic species in ordination classes a neural network matrix (rows as plant species, columns as ordination classes) was constructed, matrix nodes containing species occurrence. Diagnostic species of different communities have high frequencies in the nearest classes. In order to evaluate the species diagnostic value an index of relative entropy was used. Ecological interpretation of this indicator shows that species having low entropy are rare and occur randomly, so they cannot be used as diagnostic. In contrast the species with the highest entropy are ubiquitous and also cannot be used as diagnostic.

Kozub Ł.

Poster with lightning talk D-18

Diversity-levelling effects of management: functional characteristics and conservation values of mown and unmown fen ecosystems

Session: Vegetation science serving nature conservation

Łukasz Kozub *, Klara Goldstein, Iwona Dembicz, Tomasz Wyszomirski & Wiktor Kotowski

Department of Plant Ecology and Environmental Conservation, Institute of Botany, Faculty of Biology, University of Warsaw, Warsaw, Poland

* Presenting author: lukasz.kozub@biol.uw.edu.pl

Rich fens are important targets of conservation in temperate Europe. While intensive drainage destroyed most of them, the remaining ones are threatened by secondary succession following the cessation of traditional mowing management. Because these changes often lead to the decline of red-listed plant species and wetland birds, regular mowing has now become a standard conservation activity in protected fens in Europe. However, its effects on structure of community and its conservation value are uncertain. Moreover, management may not always be necessary given diverse speed and direction of changes. The present study describes the influence of management on fen ecosystems using the functional traits approach. The sample consisted of 27 pairs of plots 16 m^2 each, chosen within 10 rich and moderately rich fen sites in northern Poland, paired plots were located at both sides of borders between traditionally managed and long-unmanaged areas. Vegetative and generative traits and classification of species into functional groups were used to characterize plots with functional indices. Differences between mown and unmown plots were assessed using Wilcoxon paired-sample test and the relationships between differences and reference values (for unmanaged plots) were analysed. The main finding is that mowing makes vegetation characteristics more uniform as related to between-plot variability of unmown patches. It promotes the presence and dominance of species with more similar functional traits. It can enhance richness in species-poor ecosystems, but species-rich fens become poorer after mowing. Communities with dominants having extreme trait values or with extreme functional indexes values are being “evened” towards the middle values. Our results also confirm that management of fens suppresses growth of trees, shrubs and highly competitive herbaceous species, as well as encroachment of *Sphagnum* mosses. At the same time it enhances the establishment of species from other ecosystems (grasses, ruderal species, species of drier sites) within fens. The results suggest that the effect of management strongly depends on the fen community structure, and in the context of conservation goals this constitutes a warning. Within heavily transformed sites mowing can enhance functional and taxonomical community composition, but within sites sustaining more typical fen species and functional characteristics it can lead to ecosystem deterioration towards fen-meadow communities.

Krestov P.

Oral presentation

Species pool and vegetation diversity in northern Asia: climatic controls at different spatial scales

Pavel Krestov

Botanical Garden-Institute of the Far Eastern Branch of the Russian Academy of Sciences, Vladivostok, Russia

pavel.krestov@icloud.com

Vegetation of northern Asia is developed under the influence of two basic climatic gradients: heat and continentality. General regularities in vegetation distribution and the major driving factors defining vegetation pattern at different scales remain unclear due to extensive mountainous regions, where the local climates strongly differ from regional climates, and habitat diversity is much greater than in plains. Another key to understanding the contemporary vegetation development in northern Asia is a history of formation of plant species pool that involves the evolution of taxa and species migrations. The question of this study was how the environmental factors define spatial distribution of flora and vegetation at different scales. This problem was approached from three major directions: floristic, phytosociological and bioclimatological. The floristic part of study is based on the database for north Asia that includes information on taxonomy and distribution of more that 14,000 species in 105 floristic districts in the Asian part of Russia, northeast China, Korea, Mongolia and Kazakhstan. Phytosociological database includes over 6000 relevés of zonal vegetation. The climatic database currently includes records on 2500 climatic stations. Environmental data from each relevé, including longitude, latitude and elevation, served as proxy variables for regional climatic parameters. Paleoclimatic reconstructions for six bioclimatic variables were obtained from WorldClim. The climatic factors, mainly heat supply, the duration of the growing season and moisture during the growing season largely define the contemporary species pools at regional level. The vegetation boundaries between the arctic, boreal and temperate zones and the boundaries between the continentality sectors are controlled basically by climate. The regional species pools are mostly defined by a number of Pleistocene and Holocene events such as: regression of boreotropical flora due to climate cooling; formation of humid boreal vegetation in the northern latitudes in the early Pleistocene; regression of humid boreal flora and vegetation in the middle and late Pleistocene in Asia due to climate aridification, accompanied with migration of drought- and cold-tolerant species from the interior areas of continent to the coastal areas and islands; expansion of boreal and temperate humid flora and integration of boreal vegetation complexes, due to a general warming and humidification in the early Holocene.

Kricsfalusy V.

Poster P-23

Siliceous alpine grasslands in Europe

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Jozef Šibík [1], Borja Jiménez-Alfaro [2], Mihai Puşcaş [3], Vladimir Kricsfalusy [4,*], Jean-Paul Theurillat [5], Xavier Font [6], Philippe Choler [7], Jens-Christian Svenning [8], Jonathan Lenoir [9], Zuzana Dúbravcová [10] & EVA Database Partners

[1]Institute of Botany, Slovak Academy of Sciences, Bratislava, Slovakia; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]"A. Borza" Botanical Garden, Babeş-Bolyai University, Cluj-Napoca, Romania; [4]School of Environment and Sustainability, University of Saskatchewan, Saskatoon SK, Canada; [5]Laboratoire de Biogéographie, Section de Biologie, Université de Genève, Chambésy, Switzerland; [6]Department of Plant Biology, University of Barcelona, Barcelona, Spain; [7]Laboratoire d'Ecologie Alpine, Université Grenoble, Grenoble, France; [8]Section for Ecoinformatics & Biodiversity, Department of Bioscience, Aarhus University, Aarhus, Denmark; [9]Ecologie et Dynamiques des Systèmes Anthropisés, Université de Picardie Jules Verne, Amiens, France; [10]Department of Botany, Faculty of Natural Sciences, Comenius University in Bratislava, Bratislava, Slovakia

* Presenting author: vladimir.k@usask.ca

Siliceous alpine grasslands of the class *Juncetea trifidi* (syn. *Caricetea curvulae*) represent climax communities on siliceous bedrock or on the nutrient-poor decalcified soils of European mountains. Vegetation is mainly species-poor, formed by xero- to mesophilous, heliophilous and acidophilous graminoids (grasses, sedges and rushes) with significant presence of foliose and fruticose lichens. Dominant role of grasses reflecting different ecology, functional types as well as structure determine the main differences against other vegetation types, which usually create mosaic pattern in the alpine belt. We focused on the variation in species composition and the delimitation of syntaxa at the level of alliance. Data compilation was focused on national, regional and personal databases covering alpine vegetation in Europe. National and regional databases were accessed through the infrastructure of the European Vegetation Database. All the data were exported from Turboveg 3, a prototype version of Turboveg that allows the integration of databases based on different species lists to a unique taxonomic system. For the selection of data from the databases, we generated a list of characteristic species based on the description of the phytosociological alliances that belong to *Juncetea trifidi*. We collected all the species described as characteristics according to the data compiled in the databases and a literature review. The species recognized to predominantly occur in alpine siliceous grasslands with respect to any other habitat were considered characteristics of *Juncetea trifidi*. At the end, we selected a total of 56 characteristic species which are expected to be at least partially represented in most of the acidic alpine grasslands of the European mountains. On the basis of a semi-supervised procedure in JUICE 7.0 and its connection with R using K-MEANS method, a maximum number of 15 clusters with a starting point of 9 clusters representing the known alliances covered by relevés were set up. These clusters were identified as alliances belonging to the class *Juncetea trifidi* and/or to the related alliances represented different vegetation types, respectively. Revised syntaxa have been characterized by diagnostic, constant and dominant species. Their geographical distribution, climatic and ecological characteristics are provided. Each alliance is presented by a distribution map.

Kruse S.

Oral presentation (young scientist)

Investigating the response of arctic-boreal treelines to climate changes: age and population genetic structure of larch stands across the treeline ecotone

Stefan Kruse [1,2,*], Laura S. Epp [1], Mareike Wieczorek [1,3], Inga Jacobsen [1,2], Lyudmila Pestryakova [4], Florian Jeltsch [2] & Ulrike Herzschuh [1]

[1]Alfred Wegener Institute for Polar and Marine Research, Research Unit Potsdam, Potsdam, Germany; [2]Institute of Institute of Biochemistry and Biology, University of Potsdam, Potsdam, Germany; [3]Institute of Earth and Environmental Science, University of Potsdam, Potsdam, Germany; [4]Faculty of Biology and Geography, North-Eastern Federal University in Yakutsk, Yakutsk, Russia

* Presenting author: stefan.kruse@awi.de

Treelines around the world are currently experiencing dramatic changes in external forcing – triggered by global change. Warming, which equates to a release from a heat deficit, allows tree species at arctic treelines to densify and to extend their distribution farther north. This is accompanied by a decrease in albedo of denser and newly inhabited areas and, therefore, constitutes a potential positive feedback mechanism to warming. However, it remains unclear a) how fast these changes have and will occur (time-lag effects) and b) which are the spatial patterns of recruitment and spread (migration patterns). To improve our knowledge about changes in genetic diversity and recruitment patterns through time, we are conducting combined analyses of population genetic structure and tree ages along a number of transects across the arctic-boreal treeline in northern Siberia. We have intensively sampled several tree stands along a 200 km-long north-south and 300 km-wide transect. At each location we surveyed all individual trees growing on two separate plots of 20 × 20 m^2, made vegetation assessments and took increment cores and tree discs from basal and breast height of a representative sample for age and dendrochronological analysis. Needles or cambium samples were taken from all analyzed individuals for later genetic analysis of population structure. All seedlings were taken from central subplot and to conduct parentage analysis we sampled all potentially reproductively active individuals in a surrounding area of 100 × 100 m^2 of one plot at each location. Using assays of 16 microsatellites that we have established to be highly polymorphic in the screened populations, we are currently analyzing sets of individuals from different age cohorts growing on the intensively sampled sites throughout the last 150 years. The age classes were chosen, because they represent trees that got established during historical periods of warming (around 1940 and present) or cooling (around 1880 and 1970), thus, during phases of environmental changes in the past. From the results we aim to assess reactions of tree stands at the border of existence characterized by harsh external forcing compared to those growing more in mild climates.

Ku C.C.

Poster with lightning talk J-14 (young scientist)

Global warming? Insight into aboveground biomass dynamics over 23 years in a subtropical lowland forest at Lanjenchi, Southern Taiwan

Session: Patterns of vegetation change across landscapes

Chen-Chia Ku [1,*], Guo-Zhang Michael Song [2], Jih-Min Chiang [3], Jianwu Tang [4,5] & Wei-Chun Chao [1]

[1]Department of Forest and Nature Resources, National Chiayi University, Chiayi, Taiwan; [2]Department of Soil and Water Conservation, National Chung Hsing University, Taichung, Taiwan; [3]Department of Life Science, Tunghai University, Taichung, Taiwan; [4]The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA, USA; [5]Department of Geological Science, Brown University, Providence, USA

* Presenting author: jjakon11@gmail.com

The response of long-term forest vegetation to a globally changing environment is important to predict the future levels of atmospheric carbon dioxide. To explore the long-term aboveground biomass patterns in spatially heterogeneous habitats, we utilized four census data to calculate the aboveground biomass in Nanjenshen Lanjenshi plot, which was greatly affected by strong northeast monsoon winds in winter season. In addition to the four census data sets, tree heights and wood density for each species were also taken into account when constructing allometric equations. We found that total aboveground biomass increased significantly over time. The leeward habitat had significant higher values of aboveground biomass than the windward habitat in 1991, 1997 and 2005, but vice versa in 2013. This is mainly because the windward habitat showed a significant increase in aboveground biomass between 2005 and 2013 that caused that the windward habitat had much more aboveground biomass than the leeward habitat in the year 2013. Based on this result, our preliminary conclusion is that the global climate change might affect the strength of the southwest monsoon winds, leading to a significant increase in aboveground biomass in the windward habitat. But is it real? To answer this question, long-term meteorological data, on broad spatial and temporal scales, is needed in our future work.

Kubota Y.

Poster B-12

Non-neutrality in forest communities: environmental drivers of tree species abundance distributions

Special session: The relevance of “dark diversity” for theoretical and applied ecology

Yasuhiro Kubota [1,*], Buntarou Kusumoto [1], Takayuki Shiono [1], Werner Ulrich [2] & Franck Jabot [3]

[1]Faculty of Science, University of the Ryukyus, Nishihara, Okinawa, Japan; [2]Chair of Ecology and Biogeography, Nicolaus Copernicus University, Toruń, Poland; [3]Irstea, UR LISC, Campus des Cézeaux, Aubière, France

* Presenting author: kubota.yasuhiro@gmail.com

The neutral theory of biodiversity and biogeography provides a promising framework that can be used to integrate stochastic and ecological processes operating in ecological communities. Based on the mechanistic non-neutral model that can be used to analyze species abundance distributions, we evaluated the degree of deviation from a neutral pattern in tree species abundance distributions and explored the signatures of historical and ecological processes that have shaped forest biomes. We compiled a dataset documenting species abundance distributions in 1217 plots encompassing 16,973 tree species across tropical, temperate, and boreal forests. We tested whether deviations from neutrality of species abundance distributions vary with climatic and historical conditions, and whether these patterns differ among regions. Non-neutrality in species abundance distributions was ubiquitous in tropical, temperate, and boreal forests, and regional differences in patterns of non-neutrality were significant between biomes. Species abundance evenness/unevenness caused by negative density-dependent or abiotic filtering effects had no clear macro-scale climatic drivers, although temperature was non-linearly correlated with species abundance unevenness on a global scale. These findings were not significantly biased by heterogeneity of plot data (the differences of plot area, measurement size, species richness, and the number of individuals sampled). Therefore, our results suggest that environmental filtering is not universally increasing from warm tropical to cold boreal forests, but might affect differently tree species assembly between and within biomes. Ecological processes generating particularly dominant species in local communities might be idiosyncratic or region-specific and may be associated with geography and climate. This study illustrates that neutral-based ecology and its recent extensions to non-neutral processes enable the analysis of the interplay of historical and ecological processes that influence the dynamics of biodiversity.

Kuhn E.

Oral presentation (young scientist)

Which process(es) drive(s) the recent migration of forest plant species in response to climate warming: colonization or local extinction?

Emilien Kuhn [1,2,*], Jean-Luc Dupouey [3], Jean-Claude Pierrat [1,2] & Jean-Claude Gégout [1,2]

[1]AgroParisTech, ENGREF, UMR1092, Laboratoire d'Étude des resources Forêt-Bois, Nancy, France; [2]INRA, Centre de Nancy, UMR1092, Laboratoire d'Étude des resources Forêt-Bois, Champenoux, France; [3]INRA – Université de Lorraine, UMR 1137 EEF Ecologie et Ecophysiologie Forestières, Centre de recherche de Nancy, Champenoux, France

* Presenting author: emilienkuhn@gmail.com

Recent climate change is considered to be responsible for numerous patterns of species migration. These migrations have usually been assessed by studying shifts of species' range margins. Under the niche conservatism assumption, it is expected that changes in climate suitability drive colonization and local extinction and lead respectively to expansion and retraction of species ranges at their cold and warm margins. Despite evidence for recent shifts of species range margins, underlying processes of colonization and local extinction have never been jointly investigated. A two-step approach was used to disentangle the role of colonization and local extinction on recent plant migration. We started by simulating species' potential responses to climate warming and we showed that either colonization or local extinction or both, are able to explain patterns of range margins' shifts due to climate warming. Following this first approach, we investigated forest plant species' responses to recent climate warming in France based on 23,010 forest plots surveyed between 1914 and 2013 and distributed over the whole French territory. We found that, in response to climate warming, colonization played a significant role in observed range shifts whereas local extinction did not. These results show that both colonization and local extinction processes, taken alone or in combination, can induce shifts in both cold and warm margins of species range. This implies that there is no obvious link between range margins shifts and underlying processes, which may explain why observed shifts are difficult to link with changes in environmental conditions. The fact that local extinction of forest plant species was not significantly driven by climate warming questions the high rate of species extinctions predicted for the next century and highlights the potential for persistence of sessile species under contemporary climatic conditions. We conclude that recent climate warming has clearly induced species colonization but not local extinction. This suggests that in addition to limited dispersal, persistence could slow down species migration in response to climate warming and could prevent large scale species extinctions in the next decades.

Kulonen A.

Oral presentation (young scientist)

What plant traits tell about drivers of extinctions on mountain summits

Special session: Global change and vegetation dynamics: the use of historical data sets

Aino Kulonen [1,2,*], Sonja Wipf [1], Christian Rixen [1] & John-Arvid Grytnes [2]

[1]WSL Institute of Snow and Avalanche Research SLF, Davos, Switzerland; [2]Department of Biology, University of Bergen, Bergen, Norway

* Presenting author: aino.kulonen@slf.ch

It is feared that high-alpine plant specialists, which tolerate harsh growing conditions but cannot survive competition, would be among the first losers of climate warming and species' upward shift caused by it. However, even after decades of climate change in Europe we see only few species going locally extinct, since diversity of microhabitats, positive neighbour interactions and longevity of high-alpine species create buffers that enable a high number of species to grow temporarily together. In our study we use a long-term monitoring dataset of mountain summits across Europe. By using plant traits of species that have locally disappeared from summits during last 30–150 years we analyse the drivers behind extinctions. Our results show higher local extinction rate for species that were characterised by a high demand for temperature, soil humus and nutrient content, while species that showed higher tolerance for harsh environmental conditions could persist on summits more often. This result suggests that extinctions on summits have been driven by competition, which is more intense in environmentally less stressful microhabitats. Species of colder and unfertile microhabitats may be facing less competition, and therefore persist on summits. With raising temperatures, summits will likely become more vegetated, also within stressful microhabitats, resulting in higher competition and extinction risk of high alpine specialists in the long term.

Kummel M.

Poster with lightning talk K-02

The spatial structure of the moving edge and treeline migration: detailed study on Pikes Peak (Colorado, USA)

Special session: Vegetation patterns, processes and dynamics of timberlines

Miroslav Kummel

Environmental Science, Colorado College, Colorado Springs, Colorado, USA

mkummel@coloradocollege.edu

Treeline advance is a common, but not ubiquitous response to climatic change, however important questions remain about the role of the spatial organization of the moving front in the migration process. Here we present results from two studies that examine treeline dynamics on Pikes Peak (Front Range, Rocky Mountains, Colorado). The first study establishes the treeline movement, movement rates, and change in the treeline front from abrupt to diffuse. The second study details the spatial pattern of the movement. In the first study we used a combination of GIS analysis of historical aerial photographs, analysis of climatological data and dendrochronological analysis of tree growth and age structure. The climatology showed a century-long trend of regional summer warming (linear trend $R^2 = 0.400$, $n = 116$, $P < 0.0005$), sharp increase of yearly average and spring temperature in the past 35 years, and an absence of any trend in precipitation. The treeline has advanced at all sites on the mountain at an overall rate of 0.182 m in elevation/year between 1938 and 2009. The rate accelerated through time from approximately 1.1 m/decade in 1940's to 5.3 m/decade in 1990's and 2000's. The per-decade rate of migration was significantly related to tree growth ($R^2 = 0.889$, $n = 5$, $P = 0.016$) and average annual temperature ($R^2 = 0.838$, $n = 5$, $p = 0.029$). The forest age structure showed an abrupt step-like change from 400+ year-old trees to trees younger than 150 years, where the step directly coincided with the treeline location in 1938. Based on this we argue that the treeline was originally abrupt. Seedling establishment likely changed the treeline profile from abrupt to diffuse during the period of treeline migration. Tree recruitment continued to increase together with increasing summer temperature through-out the 20th century, and advanced the tree species limit at a rate 6.3 times higher than the rate of treeline/timberline migration based on GIS. Our second study focused the spatio-temporal structure of the movement by analyzing the spatial pattern of 1250 mapped and aged trees in a 50 × 300 m study area located above the 1938 treeline. We found that in the first half of the 20th century the recruitment at the moving edge was preferentially directed into existing tree clusters, where as in the second half of the 20th century recruitment at the moving edge was random. Our ongoing study examines how the spatial pattern of the moving front creates microclimatological feedbacks.

Kuneš P.

Oral presentation

Pollen-based land-cover reconstruction, human activity and climate explain the origin of vegetation patterns at various spatial scales

Special session: Long-term perspectives on vegetation change

Petr Kuneš [1,2,*], Vojtěch Abraham [1], Helena Svitavská-Svobodová [2], Jan Kolář [2,5], Mária Hajnalová [3], Martin Macek [4], Peter Tkáč [2], Eva Jamrichová [2] & Péter Szabó [2]

[1]Department of Botany, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [2]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [3]Department of Archaeology, Constantine the Philosopher University in Nitra, Nitra, Slovakia; [4]Department of GIS and Remote Sensing, Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [5]Institute of Archaeology and Museology, Faculty of Arts, Masaryk University, Brno, Czech Republic

* Presenting author: petr.kunes@natur.cuni.cz

Reconstructing vegetation directly from paleo-proxy data is not a straightforward task. Recent developments in pollen analysis enable spatially explicit quantifications of land cover, which allow for direct integrations in climate models and comparisons with human settlement density and activities. Similarly, information on past human activity (population densities) has been derived with help of archaeological and historical data, but either concerned too coarse spatial scales or suffered from problematic issues (sampling strategies, period preferences or changes in mobility and subsistence). To derive more exact information on regional human activities in a long-term perspective, a model based on a detailed and complete archaeological survey is essential. In this presentation, we applied the REVEALS and LOVE models in 500-year intervals of the Holocene based on multiple sites in selected regions on an altitudinal gradient in eastern Czech Republic. We estimated the composition of 28 taxa within 100 km radius for each area and compiled the archaeological database of human settlements that we used to estimate a human activity model for the entire area. Finally, we compared the reconstructed land-cover changes to the climate at the study site as simulated by an independent Macrophysical Climate Model. General trends show persistence of open land in the lowlands, which seem to be maintained by local arid climatic conditions during the early Holocene. Neolithic subsistence strategies spread into the lowlands and probably started using existing open habitats. People also affected expansion of tree species, e.g. oak has been found to be related to increases in human occupancy, and thus might be dependent on land-use in historic times. Our results allow for evaluation of today's vegetation naturalness, which has consequences for decision making in future nature conservation.

Acknowledgements: Funding: ERC no. 278065, GAP504/12/0649, VEGA 1/0477/11.

Kuosmanen N.

Oral presentation (young scientist)

Relative importance of climate, human impact and fires on Holocene boreal forest dynamics in Fennoscandia

Special session: Long-term perspectives on vegetation change

Niina Kuosmanen [1,*], Heikki Seppä [1], Miikka Tallavaara [2], Teija Alenius [2], Jennifer L. Clear [3], Richard H.W. Bradshaw [4], Ludmila Filimonova [5], Triin Reitalu [6] & Oleg Kuznetsov [5]

[1]Department of Geosciences and Geography, University of Helsinki, Helsinki, Finland; [2]Department of Philosophy, History, Culture and Art Studies Archaeology, University of Helsinki, Helsinki, Finland; [3]Department of Forest Ecology, Czech University of Life Sciences Prague, Prague, Czech Republic; [4]Department of Geography and Planning, University of Liverpool, Liverpool, United Kingdom; [5]Institute of Biology, Karelian Research Centre of RAS, Petrozavodsk, Russia; [6]Institute of Geology, Tallinn University of Technology, Tallinn, Estonia

* Presenting author: niina.kuosmanen@helsinki.fi

Palaeoecological information can provide means for understanding the processes behind the past changes in the forest composition and provide valuable information regarding the potential effects of future changes in climate on boreal vegetation. To fully understand the processes affecting boreal forest composition both local and regional factors need to be considered. This study is motivated by the results from our study conducted from small forest hollows in NW Russia, where the analysis showed that temperature is the main driver of the long-term changes in the vegetation composition in taiga forests. However, at a shorter temporal scale the role of more local variables, especially forest fires, increased. Still, a high proportion of the variation remained undeterminable by the used environmental variables (temperature, forest fires and local moisture conditions) demonstrating the complex underlying processes behind the boreal vegetation dynamics. In addition, the comparison between lakes and small hollows showed that the role of temperature was more pronounced in the lake records that reflect the regional vegetation. Therefore, in the present study our aim is to investigate more closely the potential drivers of the long-term boreal forest dynamics, in both local and regional scale, in Fennoscandia. To achieve this we employ pollen data from higher number of small forest hollow and lake sites from Russia, Finland and Sweden to reconstruct the vegetation composition. As potential drivers of the Holocene forest dynamics we apply climate data generated from a climate model and sedimentary charcoal records as proxy for past forest fires. To include anthropogenic impact as one potential driver we will use human population data derived from archaeological records. To determine the relative importance of these environmental variables on boreal vegetation dynamics we apply statistical method variation partitioning. The results of these analyses will be given in the presentation.

Kusumoto B.

Poster A-08

Trait assembly patterns of timber species indicate sustainability of wood resources

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Buntarou Kusumoto *, Takayuki Shiono & Yasuhiro Kubota

Faculty of Science, University of the Ryukyus, Nishihara, Okinawa, Japan

* Presenting author: kusumoto.buntarou@gmail.com

Combined use of ethnobotany and functional trait-based ecology plays a key role for translating the value of biodiversity into ecological facet. Functional traits are relevant to species' response to environmental factors and also reflect the variety of human benefits such as ecosystem services. On the other hand, ethnobotanical information that is traditional knowledge of useful plants surrogates ecological niche for humans. In this study, we compiled ethnobotanical records of woody plant species in Japan, together with functional traits data, and identified timber species that have been used for building materials. We examined trait assembly patterns: (1) functional diversity of timber species; (2) potential functional diversity of woody plant community; and (3) functional diversity modified in a managed forest community. To evaluate trait structure of forest community modified by silvicultural activities, we conducted a species-thinning-simulation in which tree species are selectively removed from a community in relation to species successional niches. We finally proposed a framework for testing the value of biodiversity mediated through redundancy and sustainability of ecosystem services in response to logging.

Kuťáková E.

Poster with lightning talk B-13 (young scientist)

Interspecific plant-soil feedback and its relationship to plant traits, species relatedness and co-occurrence in natural communities

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Eliška Kuťáková [1,2]

[1]Department of Botany, Charles University in Prague, Prague, Czech Republic; [2]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic

kutakova.eliska@gmail.com

Plant-soil feedback, the interactions among plants mediated by soil, is considered an important mechanism shaping vegetation processes. Despite a number of studies dealing with such interactions, there is lack of studies focusing on generalities in plant-soil feedback, especially within interspecific plant-soil feedback. In this study, we aimed to investigate general patterns in interspecific plant-soil feedback, using already published experimental data. Specifically, we studied influence of differences in species traits, phylogenetic relatedness and co-occurrence in natural communities on the strength of plant-soil feedback. We found no relationship between plant-soil feedback and differences in plant height and specific leaf area. However, the strength of plant-soil feedback was correlated with the phylogenetic distance and with the frequency of species co-occurrence in natural communities. Though further research is necessary, our results support the idea that plant-soil feedback is an important mechanism influencing species coexistence and community structure. According to the great variability of plant-soil feedback among close relatives, we conclude that this mechanism has an impact also on evolutionary processes and niche partitioning.

Kütt L.

Oral presentation

Diversity, intensity and resilience of flower-based ecosystem services in grassland surrogates

Laura Kütt * & Jaan Liira

Department of Botany and Ecology, University of Tartu, Tartu, Estonia

* Presenting author: laura.kytt@gmail.com

Do field margins and road verges offer ecosystem services with the same quality and resilience as permanent grasslands? To evaluate the aesthetic and pollination service provision in agricultural landscape, we studied flower colour as a functional trait, because it can be attributed to multiple flower-based ecosystem services which in turn also affect the service user groups, e.g. humans and pollinators. We studied three surrogate habitats – two successional age groups of field margins (partly sown grass-strips) and road verges. The three habitats were contrasted to permanent grasslands. Service provision was evaluated by three traits, two qualitative (species richness within colour and colour richness) and one quantitative (conspicuousness as the mean size of a flower unit). We found that all three traits had the highest values in permanent grasslands, indicating higher service diversity and quality compared to alternative habitats. Among surrogate habitats, the first year field margins had greater colour richness, and species richness within flower colour groups, but the smallest average flower unit size compared to road verges. The floral trait values in field margins became more similar to road verges already at the third year of succession. Among service user groups, pollinators perceived higher colour richness, but flower unit size and species richness within colour groups had higher value from human perspective. However, the overall functional trait patterns from pollinator and human perspective were similar, suggesting that service success for both user groups can be monitored using only a single user group. We conclude that young field margins appear to support flower based services more than road verges. However, during few years of succession, field margins change towards the status resembling road verges, probably due to gradual loss of remnant annual weeds in early successional stages. Consequently, none of the surrogate habitats support the stable service delivery as permanent grasslands do. Therefore, we conclude that remnants of permanent grasslands in agricultural landscape cannot be substituted by alternative linear habitats.

Laanisto L.

Oral presentation

Polytolerance to abiotic stresses: how universal is the shade-drought tolerance trade-off in woody species?

Lauri Laanisto * & Ülo Niinemets

Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Tartu, Estonia

* Presenting author: laanisto@ut.ee

According to traditional ecophysiological theories stress tolerance of plants is predominately determined by universal physiochemical constraints. Plant acclimation to environmental stress therefore compromises plant performance under a different stress, hindering successful toleration of several abiotic stress factors simultaneously. Yet, recent studies have shown that these trade-offs are less exclusive than postulated so far, leaving more wiggle room for gaining polytolerance through adaptations. We tested whether the polytolerance to shade and drought depends on cold and waterlogging tolerances – hypothesizing that polytolerance patterns in different species groups (angiosperms vs. gymnosperms; deciduous vs. evergreen; species originating from North America, Europe and East Asia) depend on the length of the vegetation period and species's dormancy through limiting the duration of favourable growing season. Our study analyzed four main abiotic stress factors – shade, drought, cold and waterlogging stress – for 806 Northern hemisphere woody species using cross-calibrated tolerance rankings. The importance of trade-offs among species ecological potentials was evaluated using the species-specific estimates of polytolerance to chosen factors. We found that both cold and waterlogging tolerance are negatively related to species' capabilities of simultaneously tolerating low light and water conditions. While this pattern was different in angiosperms and gymnosperms, species region of origin and leaf type had no effect on this relationship. Our results demonstrate that adaptation to different abiotic stress factors in woody plants is highly complex. Vegetation period length and dormancy are the key factors explaining why woody plants are less capable of tolerating both shade and drought in habitats where vegetation period is relatively short and water table high. While dormancy enables angiosperms to more successfully face additional stress factors besides shade and drought, gymnosperms have lower polytolerance, but are better tolerators of shade and drought when other environmental factors are favorable.

Labadessa R.

Poster B-14 (young scientist)

The influence of edge on grassland plant communities of Alta Murgia (Italy)

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Rocco Labadessa [1,*], Stefania Cassano [2], Luigi Forte [2,3] & Paola Mairota [1]

[1]Department of Agri-Environmental and Territorial Sciences, University of Bari "Aldo Moro", Bari, Italy; [2]Department of Biology, University of Bari "Aldo Moro", Bari, Italy; [3]Botanical Garden and Museum of University of Bari "Aldo Moro", Bari, Italy

* Presenting author: rlab@libero.it

Edges are key features in fragmented landscapes, inducing changes which may have deep consequences on vegetation dynamics. Many studies suggest the importance of edge type in the modulation of edge-related responses, but few of them focused on grassland communities. Our aim was to evaluate the magnitude and distance of edge influence on grassland vegetation patterns of SCI-SPA Murgia Alta (southern Italy) with regard to anthropogenic boundaries. For this purpose we selected 16 grassland sites, each consisting of six linear plots (2.5 × 0.5 m) along a 40 m gradient of distance from edge. The gradients were selected according to a combination of edge attributes, i.e. the adjoining matrix type (road or cereal crop), slope (grassland tilted towards matrix or not) and presence/absence of a stone wall. Plots were laid following a geometric series, at 0 m, 2.5 m, 5 m, 10 m, 20 m and 40 m from the edge. For each plot, cover values of vascular plant species were sampled and used to compute species richness, Shannon's diversity, life form cover, Ellenberg indicator values and grass mean height. For each parameter, mean values among plots surveyed at the same distance have been compared with an interval of critical values representing grassland interior. The interval was defined as a set of means computed for each combination of inner plots. Student's t test was used to evaluate significant differences ($p < 0.05$) among means of plots and interior values. This test was repeated for the datasets related to both cases of each edge attribute (matrix type, slope, wall). As a result, most of the selected parameters showed significant changes within the distance of 2.5 m from the edge. A higher proportion of therophytes, biennials and perennial forbs, as well as an increased soil moisture and grass height and a decreased light value, were associated with edge proximity. These results could be due to the change in water and nutrient intake at the edge, which also tends to favor more generalist species. A number of parameters showed significant changes related to the proximity to crops and in presence of a stone wall or slope. In some cases, the edge influence could be found up to 5 m from the edge. This study provides preliminary information on the influence of human-related boundaries on grassland vegetation, thus underlining the role of edges in the assessment of habitat conservation strategies.

Ladouceur E.

Poster A-09 (young scientist)

Variation in seed traits across European grassland habitats

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Emma Ladouceur [1,*], Borja Jiménez-Alfaro [2] & Costantino Bonomi [1]

[1]Museo delle Scienze, Trento, Italy; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: emmala@gmail.com

Grasslands support high-diversity ecosystems and are of a high conservation concern across Europe. They are also extremely diverse in terms of taxonomic, functional and phylogenetic plant diversity, and current research on these habitats is mainly focused on understanding community variation across environmental gradients. While local-scale studies can be only interpreted in terms of local gradients, biogeographic approaches are mainly focusing on general correlations between climate and community properties, and the integration of both scales is a challenge for biodiversity research. A possible approach for integrating broad and local scales is to analyse the properties of species that consistently show similar ecological niches across different regions. Thus, we may expect habitat-based patterns of functional diversity as a possible explanation of environmental filtering. To test this hypothesis, we analyse habitat-based variation in seed traits, which are of vital importance for the preservation of plant populations and also for the use of target species in restoration programmes. We conducted a bibliographic survey of morphological and germination seed traits of specialist species (i.e. those with a significant presence in a given grassland habitat with respect to any other habitat) of six major grassland types in Europe: acid alpine grasslands (EU code 6150), alpine and subalpine calcareous grasslands (6170), semi-natural dry grasslands (6210), *Nardus*-dominated grasslands (6230), lowland hay meadows (6510) and mountain hay meadows (6520). We show at which extent the selected traits determine the distribution patterns of plant specialists across habitats, and the variation of each trait within habitats.

References

Leyer, I. & Pross, S. 2009. Do seed and germination traits determine plant distribution patterns in riparian landscapes? *Basic and Applied Ecology* 10: 113–121.

Landucci F.

Oral presentation

A consistent formalized classification of European wetland vegetation: results of the WetVegEurope project

Flavia Landucci [1,*], Kateřina Šumberová [2], Lubomír Tichý [1], Milan Chytrý [1] & WetVegEurope partners [3]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [3]Liene Aunina, Claudia Biță-Nicolae, Aleksandr Bobrov, Lyubov Borsukevych, Andraž Čarni, János Csiky, Els De Bie, Dmytro Dubyna, Panayotis Dimopoulos, Tetiana Dziuba, Úna FitzPatrick, Xavier Font, Daniela Gigante, Valentin Golub, Stephan M. Hennekens, Richard Hrivnák, Lorenzo Lastrucci, Svitlana Iemelianova, Ute Jandt, Florian Jansen, Zygmunt Kącki, Konrád Lájer, Dalytė Matulevičiutė, Attila Mesterházy, José Antonio Molina, Jaanus Paal, Eva Papastergiadou, Alessandro Properzi, Vladimir Randelović, Marcela Řezníčková, John S. Rodwell, Joop H.J. Schaminée, Urban Šilc, Zofija Sinkevicienė, Zvjezdana Stančić, Jazep Stepanovich, Boris Teteryuk, Rossen Tzonev, Roberto Venanzoni, Lynda Weekes, Wolfgang Willner, Igor Zelnik

* Presenting author: flavia.landucci@gmail.com

The creation of a standard protocol for vegetation classification at the global or at least at a continental scale and for all kinds of vegetation would be desirable but it is very difficult to achieve. During the last years there is a growing interest in unifying vegetation classification among European countries. The European Vegetation Archive (EVA; *http://euroveg.org/eva-database*) containing vegetation plots from 54 countries has been developed and several large-scale classification projects have been initiated. WetVegEurope is a project started in 2013 with an aim of creating a consistent formalized phytosociological classification of European aquatic (*Lemnetea* and *Potametea* classes) and marsh vegetation (*Phragmito-Magno-Caricetea* class) that could be used as a tool for nature conservation. For this purpose a continental thematic database of vegetation plots was created. Forty-seven data contributors and experts from the whole of Europe were involved in the project and more than 370,000 vegetation plots from 33 European countries were collected. The data management and analysis were performed using the programs TURBOVEG and JUICE. An improved version of the Cocktail method was used which allows to create a consistent vegetation classification, formalize it and make it repeatable through the use of logical formulas combining species abundance values and groups of species that share similar ecology or similar functional traits. Here we present a general synthesis of the results achieved until now with a focus on the *Phragmito-Magno-Caricetea* class and *Magno-Caricetalia* order. We increased the consistency of the classification by reviewing the previous classifications and establishing clear classification criteria and rules for classifying new vegetation plots of similar vegetation types. The same method and similar classification protocols could be used to create formalized classifications of the same or other species-poor vegetation types both in Europe and on other continents.

Le Bagousse-Pinguet Y.

Oral presentation

Climate, topography and soil factors interact to drive community trait distributions in global drylands

Yoann Le Bagousse-Pinguet [1,*], Pierre Liancourt [2], Nicolas Gross [3,4], Francesco de Bello [1,2], Carlos R. Fonseca [5], Jens Kattge [6,7], Enrique Valencia-Gomez [8], Jan Lepš [1,9] & Fernando T. Maestre [8]

[1]Department of Botany, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [2]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [3]INRA, USC1339 Chizé (CEBC), Villiers en Bois, France; [4]Centre d'étude biologique de Chizé, CNRS – Université La Rochelle (UMR 7372), Villiers en Bois, France; [5]Departamento de Ecologia, Universidade Federal do Rio Grande do Norte, Natal, RN, Brazil; [6] Max Planck Institute for Biogeochemistry, Jena, Germany; [7]German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany; [8]Área de Biodiversidad y Conservación, Departamento de Ciencias, Escuela Superior de Ciencias Experimentales y Tecnología, Universidad Rey Juan Carlos, Móstoles, Spain; [9]Institute of Entomology, Biology Centre, The Czech Academy of Sciences, České Budějovice, Czech Republic

* Presenting author: y.b-pinguet@orange.fr

Aim: Quantifying large-scale patterns of community trait distributions (CTDs) is of major importance to further predict the impact of global environmental change on plant communities and associated ecosystem functioning. However, very few studies have documented changes in CTDs at global scales, and none have quantified how climatic and topo-edaphic factors interact to determine CTDs. The present work aims to address this issue by focussing on variations in the first four moments of CTDs (mean, variance, skewness kurtosis).

Location: Global drylands from all continents, except Antarctica.

Methods: 130 dryland communities from arid to dry-subhumid conditions were sampled. Data on two key plant functional traits were collected for perennial species: specific leaf area and maximum plant height. The first four moments of CTDs were computed. Model selection procedures and variance decomposition were used to assess responses of CTDs to mean annual temperature and precipitation, precipitation seasonality, sand content, site slope and their two-way interactions.

Results: Without interactions among predictors, climatic variables explained most of the variations in CTDs. Including interactions strongly increased model predictive power for all moments. Interactions explained up to 21.86% of variations in CTDs, with climate × climate interactions explaining up to 16.08% and climate × topo-edaphic interactions explaining up to 8.57%. The effect of mean annual temperature and precipitation on CTDs was strongly mediated by precipitation seasonality for SLA and soil sand content for maximum plant height.

Main conclusion: Our study highlights the importance to consider interactions among environmental drivers in large-scale quantifications of CTDs. Forgetting that environmental drivers interact to drive composition of vegetation can lead to misleading conclusions, and may dramatically undermine our ability to predict the impact of global environmental change on plant community structure and associated ecosystem functioning.

Lee A.

Poster J-15 (young scientist)

Long-term effects of drainage on the vegetation in Shizukari mire, Japan

Session: Patterns of vegetation change across landscapes

Ahyoung Lee [1,*], Hiroko Fujita [2], Haruki Kobayashi [2] & Toru Suzuki [3]

[1]Graduate School of Agriculture, Hokkaido University, Sapporo, Hokkaido, Japan; [2]Botanic Garden, Field Science Centre for Northern Biosphere, Hokkaido University, Sapporo, Hokkaido, Japan; [3]Food and Environmental Sciences, College of Agriculture, Rakuno Gakuen Universit, Ebetsu, Hokkaido, Japan

* Presenting author: ahyoungping@yahoo.co.jp

Background: Compared with other terrestrial ecosystems, mires have been regarded as stable ecosystems that exhibit slow changes in vegetation over time. However, mire vegetation is sensitive to human-induced disturbance. Shizukari mire in Hokkaido, Japan, had been a stable mire ecosystem for a long time with many ponds and floating islands; however, it has undergone considerable changes since the 1950s due to agricultural development. To identify the changes that have taken place in Shizukari mire, we examined the ponds and drained ponds in the mire, because they are good indicators of environmental change.

Methods: (1) We analyzed the changes in the length of the drainage ditches and open-water areas using multi-temporal aerial photographs from 1947, 1965, 1976 and 2007. We divided the multi-temporal open-water areas into 5 × 5 m grids and categorized them into 4 groups depending on the time period when the open-water grids disappeared. We calculated the distance between the multi-temporal open-water grids and the nearest drainage ditch. (2) We surveyed the vegetation on the ponds and drained ponds. The vegetation was divided into five clusters and analyzed in relationship to the results of multi-temporal aerial photograph analysis and a digital elevation model.

Results and conclusions: The total length of the drainage ditches had increased, whereas the total area of open water had decreased. Open water grids were found to disappear sooner when they were located closer to drainage ditches. Of the five clusters, two that were pond plant communities were farther away from drainage ditches and were located at higher altitudes, whereas the other three clusters associated with drained ponds were closer to drainage ditches and were found at lower altitudes. Our results indicate that until the 1970s, most ponds in Shizukari mire were lost due to direct drainage, and the remaining ponds had shrunk by indirect draining since the 1980s. In addition, drainage has caused subsidence of the mire's surface. Thus, the Shizukari mire ecosystem has been degraded by hydrologic disturbance and continuously drained by the cumulative effect of direct and indirect drainage. If these effects continue, the remaining ponds will disappear and the species compositio n of the mire could become more homogeneous and dominated by fewer species with high cover. In conclusion, hydrologic changes caused by drainage will result in decreased biodiversity of vascular plants in Shizukari mire.

Lee H.

Poster with lightning talk O-09

Influx and historic trajectories of invasive plants in Korea

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Hyohyemi Lee * & Hae-Ryong Song

National Institute of Ecology, Seocheon, Republic of Korea

* Presenting author: hyohyemi@gmail.com

The alien plant species have rapidly increased in the Korean Peninsula by the expansion of international trade. Some of the alien plants established in their new ecosystems and invaded with peculiar characteristics such as their short life cycle, rapid growth, and massive production of seeds. Now, they have been observed in many unstable or disturbed habitats due to their excellent adaptability and high fertility. The invasive plants are classified by the time of introduction in Korean history. The first phase of introduction dates back to 1921 when the ports opened to foreign ships for trade. Cultivated plants native to Asia were mainly introduced through China during the first phase (~1921). After then, at the second phase of introduction between 1922 and 1963, when World War II and Korean War happened, most alien plants were introduced from Japan and the United States. At the third phase of introduction from 1964 up to the present, alien plants were introduced from various locations along with accelerating industrialization. So far, 321 species has been reported as naturalized plants in Korea. If separated by the phase of introduction, 66 species (21%) have been introduced during the 1st phase, 34 species (11%) during the 2nd phase, and 221 species (69%) during the 3rd phase. In particular, over 100 species were introduced into the ecosystem in the last 10 years. The invasive plants in Korea can be classified by their origins. 134 species (42%) originate from Europe, 75 species (23%) from North America, 28 species (9%) from the Europe-Asia and 27 species (27%) from tropical Africa. Classified by life history, annual naturalized plants were the most common with 158 species (49%) of the 321 species, 60 species (19%) are biennials, and 103 species (32%) are perennials. Considering the distribution of invasive plants in Korea, 244 species (76%) were found mainly in the central region with concentration of urban population, and 200 species (62%) were found in Jeju Island located southwest of the Korean Peninsula. Jeju Island is popular vacation spot for Koreans, Japanese and many Chinese. In conclusion, the introduction of alien plant species reflects Korean history of opening of ports, international trade and industrialization. Therefore, the distribution of alien plant species is influenced by the degree of urbanization and global trade.

Lee M.

Oral presentation

VegBank: A permanent, open-access archive for vegetation plot data

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Michael Lee * & Robert K. Peet

Department of Biology, University of North Carolina, Chapel Hill, NC, USA

* Presenting author: michael.lee@unc.edu

VegBank is a public, online, vegetation-plots data archive accessible over the internet at *http://vegbank.org*. The purpose of VegBank is to provide a public repository of vegetation plot data that users may use to freely access, view, search, download, and cite vegetation plots. There are no geographical restrictions for data submission to VegBank, but the initial geographical focus was North America. As of March 2015, VegBank held just over 75,000 plots covering much of North America. As an open database system, there are no rigid restraints on methodology, plant taxonomy, community taxonomy, or intensity of sampling. Users of VegBank data can set filters on searches to match criteria important to their analysis. A key difference between VegBank and many other databases is its support for plant and community concepts, where a plant or community name is paired with a reference in which its meaning and/or delineation is defined. This approach is consistent with the TDWG Taxonomic Concept Transfer Scheme (2008) and is roughly equivalent to Berendsohn's (1995, 1997) "potential taxon". Such an approach is critical, in our view, for the longevity of a system which is tied to an ever-changing understanding of plant (and community) systematics, as the names and meanings of names are always changing. Rare, endangered, or threatened plant species are protected by reducing geo-coordinate precision for plots. Similarly, temporary embargoes can remove plots from public view while the initial analysis of these plots is completed and published. Active development of VegBank took place over a 5 year period in the early 2000's at the National Center for Ecological Analysis and Synthesis (NCEAS) in Santa Barbara, California, USA. Critical support and financing were provided by the Ecological Society of America (ESA), NatureServe, the Federal Geographic Data Committee (FGDC), the US Geological Survey (USGS) Gap Analysis Program, the National Biological Information Infrastructure (NBII), and the National Science Foundation (NSF).

Lee S.

Poster B-15

The relationship between the plant diversity and benthic macro-invertebrate in a pond wetland, Korea

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Siyoung Lee *, Jinkwan Son, Banghun Kang, Minjung Park & Hongki Choi

National Academy of Agricultural Science, Rural Development Administration, Jeonju, Korea

* Presenting author: son007005@korea.kr

Rainfall mainly occurs during the summer months in Korea. Thus, historically, pond wetlands were constructed to retain water for agricultural purposes. However, many of the pond wetlands have been drained recently. These are important ecosystems for the conservation of biological diversity, and they provide a variety of ecosystem services. The habitat function of the benthic macro-invertebrate community is critical to ensure the maintenance of ecosystem biodiversity. Therefore, this study examined the relationship between the dominant plant families and the functional feeding groups (FFGs) and the habitat orientation groups (HOGs) of the benthic macro-invertebrate community. In the vegetation survey of 40 pond wetlands, 457 taxa in 108 families, 309 genera, 392 species, 59 varieties, 5 forms, and 1 subspecies were found. For the benthic macro-invertebrates, 4977 individuals were collected, incorporating 3 phyla, 6 classes, 17 orders, 57 families, 95 genera, and 123 species. The analysis of the HOGs showed sprawlers were the highest for both species construction and number of objects, and the collector-gatherers had the highest species richness. In plants, the *Compositae* were the most diverse with 53 taxa (11.6%) and *Gramineae* with 46 taxa (10.1%), and they were higher than beans, *Rosaceae*, *Cyperaceae*, *Polygonaceae*, *Liliaceae*, *Caryophyllaceae* and *Lamiaceae*. Significant relationships were found between the amount of vegetation and the benthic macro-invertebrates *Malacostraca* (0.467**), *Decapoda* (0.484**), *Coleoptera* (0.429**), *Bithyniidae* (0.391*), *Lymnaeidae* (0.371*), *Palaemonidae* (0.375*), shield mayfly (0.431**), *Belostomatidae* (0.499**) and *Haliplidae* (0.391*). There were also significant relationships between the number of species of benthic macro-invertebrates and naturalized plant species (-0.399*), Hemicryptophytes (0.434**), Nanophanerophytes (0.417**), and *Rosaceae* (0.326*). While the naturalized plants affect the diversity of the benthic macro-invertebrates, a diverse macro-invertebrate community is required for the management of naturalized plants. This study not only contributes to the assessment of the diversity of the benthic macro-invertebrate and plant communities in pond wetlands, but also demonstrates the contribution of these ecosystems to national biodiversity and the importance of pond wetland conservation.

Acknowledgements: This study was carried out with the support of the Project No. PJ009492, National Academy of Agricultural Science, RDA, Republic of Korea.

Lengyel A.

Poster B-16 (young scientist)

Distance decay of functional similarity along a spatial and a productivity gradient

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Attila Lengyel *, Anikó Csecserits, Miklós Kertész, Bence Kovács, Barbara Lhotsky, Gábor Ónodi, Tamás Rédei & Zoltán Botta-Dukát

Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary

* Presenting author: lengyel.attila@okologia.mta.hu

The distance decay of ecological communities denotes the decrease in compositional similarity between pairs of sample sites as the distance between them increases. Besides the geographical space, the decrease of similarity can be examined along any environmental gradient, thus such models are useful for studying beta diversity in the multidimensional ecological space. Until now, mostly species occurrences or abundances were considered for calculating between-site similarities in distance decay models, usually using Jaccard or Sörensen indices. We used a generalization of the Jaccard resemblance measure that weights compositional similarity by relatedness of species, thus it can model decay in functional similarity. We examined the distance decay models calculated with and without weighting by species functional similarities along spatial and environmental distances. 38 vegetation quadrats of 4 m^2 area were sampled in the Kiskunság Sand Ridge region representing several herbaceous plant associations along a productivity gradient ranging from closed dry to wet grasslands. Cover of vascular plant species was recorded on percentage scale. Field measurement of NDVI was used as a background variable correlated with productivity, i.e. the main environmental gradient in the studied vegetation. Leaf size, specific leaf area and generative height of species were gathered from field measurements, databases and identification keys. The pairwise functional and species-level beta diversity was regressed on spatial distances and on distances of NDVI scores. The nugget of the distance decay curves and their relative slope were compared to randomized values. Nuggets and relative slopes differed significantly from the randomized models for unweighted dissimilarities against geographical distances and for trait-weighted dissimilarities against NDVI distance. In both cases the nugget was lower and the relative slope was steeper than the reference. The unweighted dissimilarities against geographical distances and the trait-weighted dissimilarities against geographical distances showed no significant decay. The decay of community similarity in species composition was better explained by spatial processes than by environmental response. In contrast, functional similarity was more significantly related to the main environmental gradient. Modelling the decay of functional similarity between sites can contribute fundamentally to our understanding of patterns in beta diversity.

Lepesi N.

Poster with lightning talk N-03

Binarization options of probabilistic predictions of Predictive Vegetation Models (PVMs) for NAGIS

Session: Vegetation in macroecological modelling

Nikolett Lepesi [1,2,*], Zoltán Botta-Dukát [3] & Imelda Somodi [3]

[1]National Adaptation Centre, Geological and Geophysical Institute of Hungary, Budapest, Hungary; [2]Department of Plant Systematics, Ecology and Theoretical Biology, Eötvös Loránd University, Budapest, Hungary; [3]Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary

* Presenting author: lepesiniki@gmail.com

Predictive Vegetation Models are prominent macroecological models targeted at the vegetation. Their typical output is a probabilistic predicted map of the target vegetation type or types. Although the best option is to use the full information provided by the probability scale, converting the probabilities into presence/absence predictions is often required (e.g. by practitioners or certain pattern analytic tasks). We aim at providing an overview of the currently available possibilities, their redundancies, advantages and limitations. This overview was motivated by the tasks planned in the frame of the National Adaptation Geoinformatic System (NAGIS). This database aims at encompassing data and predictions regarding the effects of climate change on water management, biodiversity and land use. The quantification of the response of vegetation to climate change is a crucial part of this. An inevitable prerequisite of this quantification is the compilation of presence/absence predictions of vegetation distributions in the future given the climate change scenarios. The binarisation of a probability distribution can be translated into the task of choosing the right probability level (termed as threshold or cutoff), above which all probability is classified as predicted presence, while lower probabilities are classified as predicted absence. A natural goal is to find a cutoff that provides good discrimination and a good match if applied to input data set aside for evaluation. To provide an up-to-date basis of the above task we reviewed published binarization options, which clearly appeared to be highly redundant. Firstly, we eliminated this redundancy by collecting synonyms referring to the same formula and by identifying formulas that result in the same decision regarding the cutoff. We tracked back the available indices to three major approaches: Cohen's Kappa, True Skill Statistics, Sensitivity-Specificity equality point. Less widespread approaches enumerated are: Jaccard index, F-score, RE-score. We present a unified notation to these using cells of the standard confusion matrix to provide an overview. Secondly, we provide a library of the typical behaviour of these indices along the cutoffs. Thirdly, we examine if the index is primarily reacting to model discrimination capacity (desired) or if input data characteristics (presence/absence ratio, prevalence) also influence the decision (artefact).

Lepková B.

Poster with lightning talk J-16 (young scientist)

Seed dispersal by free-ranging herbivores and its impact on vegetation

Session: Patterns of vegetation change across landscapes

Barbora Lepková [1,*], Eva Horčičková [1], Jaroslav Vojta [1] & Tomáš Herben [1,2]

[1]Department of Botany, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [2]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic

* Presenting author: barbora.lepkova@natur.cuni.cz

Seed dispersal is a crucial process for the dynamics of plant populations. In the presented project we study plant dispersal by means of biotic vectors – endozoochory. A free-ranging animal can be a very effective dispersal vector because it keeps visiting similar biotopes and therefore the seed has higher chance of being deposited into a favourable environment. Even though large herbivorous mammals occur very often in the European landscape, our knowledge of the dispersal potential of free-ranging animals is highly limited. In the military area Hradiště in the Doupov Mountains (western Bohemia) we are conducting a thorough research on the relationship between free-ranging animals (deer and wild boars) and vegetation. Although we already have a sufficient knowledge of the dispersal potential of deer and wild boars, we still lack any information about how the process works in the field. For this reason we started a so called emergence experiment in which we focus on following questions: (1) What is the seedling emergence from dung pellets in natural localities? (2) How does the deposited dung pellet influence vegetation?

Lepš J.

Oral presentation

Functional traits predict species performance in a long-term experiment in wet meadow

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Jan Lepš [1,2,*], Mária Májeková [1,3], Francesco de Bello [1,4], Jiří Doležal [1,4], Alena Vítová [1] & Terezie Rychtecká [1]

[1]Department of Botany, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; *[2]Institute of Entomology, The Czech Academy of Sciences, České Budějovice, Czech Republic; [3]Department of Soil Science, Comenius University in Bratislava, Bratislava, Slovakia; [4]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic*

* Presenting author: suspa@prf.jcu.cz

Functional traits are expected to capture the most important features of ecological behavior of a species, characterizing both species' role within a community, and also species' chances to gain or lose when the environmental conditions change. We have used a long-term (1994–2014) manipulative experiment in oligotrophic wet meadow, combining mowing, fertilization, and removal of dominant species in a factorial manner to test the predictive role of traits. Mowing is typical example of regular and predictable disturbance, effect of which is however modified by fertility level, and species composition. The inter-annual variability of weather is a highly irregular and unpredictable perturbation, to which species in a meadow respond by changes in their maximum biomass in a season. Detailed recording of vegetation during the whole experimental period included biomass data from mown plots and presence of species in individual cells of permanently marked grid. These data enabled us to test how the community trait composition responded to experimental manipulations and how was the behavior of individual species within community determined by their traits. The species' behavior was characterized by temporal variability of species biomass, temporal correlations of pairs of species, and by species mobility (rate of changing position within a grid over the years). Plant height responded the most to the treatments – its community weighted mean significantly decreased with mowing, and significantly increased with fertilization. Fertilization also increased proportion of grasses. In unmown unfertilized plots, the removed dominant, tussock grass *Molinia caerulea*, was replaced mostly by forbs, i.e. among the most dissimilar species. Traits were able to predict the temporal variability of species biomass (variability decreases with increasing Leaf Dry Matter Content), and species mobility (species with high Specific Leaf Area, and with good lateral spread were more and rosette plants less mobile). On the contrary, the temporal correlation of species biomass was completely independent of the similarity of species traits – but on average, species biomass fluctuation was positively correlated, i.e. variability of individual species was mostly synchronized. The results show the ability of traits to predict not only community response to disturbance or to change in environmental productivity, but also the performance of individual species within communities.

Lewis R.

Oral presentation (young scientist)

Exploring dark diversity: Its value and potential applications in ecology

Special session: The relevance of "dark diversity" for theoretical and applied ecology

Rob Lewis [1,*], Francesco de Bello [2,3,4] & Meelis Pärtel [1]

[1]Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia; [2]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [3]Department of Botany, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [4]Institute of Entomology, Biology Centre of The Czech Academy of Sciences, České Budějovice, Czech Republic

* Presenting author: r.j.lewis@me.com

Absent species fall into two opposing groups: species that have the dispersal ability and ecological affinity to prevailing abiotic conditions to exist at a site, and those that do not. The former are species with a reasonable probability of occurrence and constitute the absent portion of a "habitat-specific" species pool, termed "dark diversity" (Pärtel 2011); this absent portion is gaining attention as an ecologically meaningful and valuable biodiversity metric (Pärtel 2014; Riibak et al. 2014; Ronk et al. 2015). Dark diversity can be used to quantify habitat specific completeness (community completeness), a ratio of observed and absent species (Pärtel et al. 2013). This ratio allows for comparisons of biodiversity across regions and different habitat types. It provides an effective evaluation tool for biodiversity conservation needs across large areas. Measuring dark diversity is also beneficial to restoration ecology. Monitoring the exchange of species in and out of dark and observed diversity can provide useful information to measure restoration success. It too can help to measure better species invasion risk, identifying potential invaders and facilitating pre-planned adaptive management measures (sensu Lindenmayer & Likens 2009).

Lhotsky B.

Poster A-10

Plant trait convergence and divergence in the understory vegetation of a temperate forest: changes along a soil productivity and a light gradient

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Barbara Lhotsky *, János Bölöni, Ferenc Horváth, Bence Kovács & Zoltán Botta-Dukát

Institute of Ecology and Botany, MTA Centre for Ecological Research, Hungarian Academy of Sciences, Vácrátót, Hungary

* Presenting author: lhotsky.barbara@okologia.mta.hu

The assembly of plant communities is thought to be driven mainly by two contrasting processes: (1) “environmental filtering”, which excludes species with traits that are non-adaptive in a given environment, therefore it causes functional trait convergence, and (2) “limiting similarity” according to which co-occurring species with strongly overlapping niche are under strong competition, causing the exclusion of the weaker ones, resulting in trait divergence. The strength of these two assembly-forming processes can change along environmental gradients. We studied the strength of trait convergence and divergence along a soil productivity and a light gradient in the understory vegetation of a temperate, 120–130-year old, Turkey oak and sessile oak dominated forest reserve site. We sampled the herb layer in 340 plots using the protocol of the Forest Reserve Network of Hungary. Plant trait data (height, leaf size, specific leaf area (SLA), leaf dry matter content (LDMC), growth form, shoot growth form, leaf distribution, life span, lateral spread, time of first flowering and seed weight) of the species were collected partly from databases and partly from field measurements. We found evidence for trait convergence in case of LDMC, while there was evidence for divergence in case of height, leaf size, SLA, seed weight, and the combined variable of “life span” and “shoot form”. The strengh of convergence/divergence changed along the studied environmental gradients, but no general trends emerged in the analyses of the individual traits.

Acknowledgements: The research was supported by OTKA K83595.

Li C.F.

Oral presentation

Which number changes along the temperature and moisture gradients: the number of species or the number of individuals?

Ching-Feng Li [1,*], David Zelený [1], Tze-Ying Chen [2] & Chang-Fu Hsieh [3]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Forestry and Nature Resources, National Ilan University, Ilan, Taiwan; [3]Institute of Ecology and Evolutionary Biology, National Taiwan University, Taipei, Taiwan

* Presenting author: woody@sci.muni.cz

Pattern of alpha diversity along environmental gradients is an interesting topic in vegetation science and a number of theories try to explain the observed pattern. However, the observed pattern and all the theories do not receive common acceptance among scientists. Thus, it is desirable to understand the causal mechanism instead of pattern description in studying alpha diversity. One of the causal mechanisms about the number of species in a sampling plot derives from neutral theory, that alpha diversity is a product of the number of individuals in a given sample and the size of species pool of the given habitat. From this point of view, the pattern of alpha diversity is a combined result from both pattern of the number of individuals and pattern of the species pool. In this study, our goal is to understand whether gradients themselves influence the number of species or the number of individuals in one plot. National Vegetation Database of Taiwan (AS-TW-001) contains 3,564 plots which cover an altitudinal range of almost 3,500 m. Sampling size of each plot is 20 × 20 m^2. All the individuals of woody species with diameter at breast height more than 1 cm in the plot were recorded. For each plot, the number of individuals and the number of species were directly counted from the field recorded data. Information of temperature and moisture were derived from GIS layers by the coordinates of plots while species pool of each plot was estimated by the Beals smoothing method. Our results show that environmental factors have small explanatory power for the number of species in one plot, as dependent variable, when the independent variables contain both number of individuals and species pool. Moisture gradient influences the number of individuals of a plot. Humid habitats without obvious seasonal change in humidity support high number of individuals of woody species in Taiwan. Size of the estimated woody species pool in the given plot is mostly influenced by altitudinal gradient, which is a trade-off of limiting factors. Warm habitats with dry winter or heavy rain in summer support high species pool reflecting the evolution history in subtropical eastern Asia.

Li F.Y.

Poster J-17

Grassland production is more stable against but more sensitive to precipitation fluctuation under grazing than mowing in the semi-arid steppe

Session: Patterns of vegetation change across landscapes

Frank Yonghong Li & Taogetao Baoyin

Ecology, College of Life Sciences, Inner Mongolia University, Hohhot, China

* Presenting author: lifyhong@126.com

Background and aims: The variability in vegetation production is composed of an environmental component that varies with environmental changes and a demographic component that is a consequence of species demographic stochasticity and competitive interactions. Precipitation is the most preponderant factor that drives the variation in vegetation production in the semi-arid steppe environment. With the long-term observation on the annual production of steppe communities in Inner Mongolia, here we examined the dynamic patterns of the temporal variability (CV) and the precipitation sensitivity (PS) of grassland production under different human interventions.

Materials and methods: The grassland production was monitored over three decades at three experimental sites in the typical steppe region of Inner Mongolia. These observed time-series data represent the succession of a typical steppe community (dominated by *Leymus chinensis*) (i) under intact natural conditions, (ii) under repeated annual mowing, and (iii) during the restoration of a previously grazing-degraded grassland after the exclusion of animals. We first did a principal component analysis (PCA) of all the data to demonstrate the interrelations among the succession trajectories of these grasslands; then we calculated the CV and PS of plant production at different periods using a moving window of 10-years, where CV = σ/m, with m and σ referring to the mean and standard deviation of annual production respectively; PS was the regression slope of plant production to precipitation.

Main results: The natural community showed no significant change in CV over the three decades. The mowed grassland showed a significant decline in m, but not σ, thus an increase in CV; whereas the restored grassland showed no significant change in CV, as both m and σ increased proportionally during restoration. The PS of plant production declined under long-term mowing and during restoration, but not in natural grassland. This indicates that the variability of grazed grassland contains a greater proportion of “environmental component” driven by precipitation than mowed grassland, and that the grazed grassland is more stable against, and meanwhile more sensitive to precipitation fluctuation than mowed grassland. These results enhances our understanding of the grassland production stability, and have implications for sustainable management of the steppe vegetation.

Acknowledgements: The research was funded by the NSFC and MoST of China.

Li H.

Poster with lightning talk K-03 (young scientist)

Age structure of *Larix sibirica* in ecotone stands between *Larix* forest and forest steppe in the Terelj National Park, Mongolia

Special session: Vegetation patterns, processes and dynamics of timberlines

Hao Li [1,*], Kiyokazu Kawada [1], Haruka Ohashi [2], Takashi Kamijo [1] & Undarmaa Jamsran [3]

[1]Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Ibaraki, Japan; [2]Forestry and Forest Products Research Institute, Tsukuba, Ibaraki, Japan; [3]Mongolian State University of Agriculture, Ulaanbaatar, Mongolia

* Presenting author: leehboy@hotmail.com

Zonal vegetation of northern and central Asia is characterized by a sequence of latitudinal vegetation belts. The present study deals with the southern border of the huge Siberian taiga forests towards the similarly huge Eurasian steppe region. Mongolian larch forest (*Larix sibirica*) is in the southernmost fringe of the Siberian taiga and borders the steppe creating numerous forest-steppe ecotones. In this study, we aimed at clarifying the age structure of *Larix* forest in northern Mongolia and determining how climatic fluctuation potentially influences the annual growth and the stand structure. Field work was carried out in the Terelj National Park, 66 km southwest of the city of Ulaanbaatar in July 2013 and September 2014. Line transects, which were perpendicular to the boundary of forest and steppe, were established in four ecotone sites (No. 1–4). The central point of each line transect was located in the boundary between forest and steppe. At sites No. 1–3, three 20 × 5 m quadrats were established at 5 m, 25 m, 50 m in both forest interior and steppe side equidistantly. Similarly, quadrats at 100 m on both sides were added at site No. 4. All trees in quadrats were measured and a total of 185 wood cores, including *Larix sibirica*, *Pinus sibirica* and *Betula platyphylla*, were sampled by increment borer. The forest area in each of the four ecotone sites was different compared to the other ecotones, and No. 4 was the largest among them. The overall size structure of *Larix sibirica* has unimodal distribution. Moreover, changes in species composition are found along the transect from steppe to forest interior in site No. 4. For example, *Pinus sibirica* trees are found gradually in 50 m and 100 m quadrats. As to age structure of site No. 1–4, unimodal distribution with the age peak of 28–38 years, 38–49 years, 65–80 years and 51–65 years, respectively, is represented. At sites No. 2, 3 and 4, several elderly trees, more than 100 year-old, are found in forest most of which appear deeper in the forest interior. Even-aged uniform *Larix sibirica* forest in the ecotone areas may have developed following a forest fire. Furthermore, the interval period of disturbance changes with the distance from the ecotone, i.e., longer disturbance interval period inside the forest interior. Thus, it is suggested that distance and disturbance regime are closely related and affect the different regeneration pattern, species composition (e.g. more *Pinus sibirica*) inside the forest.

Liancourt P.

Oral presentation

Leaf-trait plasticity and species vulnerability to climate change in a Mongolian steppe

Pierre Liancourt [1,*], Bazartseren Boldgiv [3,4], Daniel S. Song [2], Laura A. Spence [5], Brent R. Helliker [2], Peter S. Petraitis [2] & Brenda B. Casper [2]

[1]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [2]Department of Biology, University of Pennsylvania, Philadelphia, USA; [3]Department of Biology, National University of Mongolia, Ulaanbaatar, Mongolia; [4]Academy of Natural Sciences of Drexel University, Philadelphia, USA; [5]Sterling College, Craftsbury Common, Vermont, USA

* Presenting author: pierre.liancourt@gmail.com

Climate change is expected to modify plant assemblages in ways that will have major consequences for ecosystem functions. How climate change will affect community composition will depend on how individual species respond, which is likely related to interspecific differences in functional traits. The extraordinary plasticity of some plant traits is typically neglected in assessing how climate change will affect different species. In the Mongolian steppe, we examined if leaf functional traits under ambient conditions and if plasticity in these traits under altered climate could explain climate-induced biomass responses in 12 co-occurring plant species. We experimentally created three probable climate change scenarios and used a model selection procedure to determine the set of baseline traits or plasticity values that best explained biomass response. Under all climate change scenarios, plasticity for at least one leaf trait correlated with change in species performance while functional leaf trait values in ambient conditions did not. We demonstrate that trait plasticity could play a critical role in vulnerability of species to a rapidly changing environment. Plasticity should be considered when examining how climate change will affect plant performance, species' niche spaces, and ecological processes that depend on plant community composition.

Liao C.Y.

Poster with lightning talk E-03 (young scientist)

The beta diversity and species turnover affected by climate change in Nanjenshan transect

Special session: Global change and vegetation dynamics: the use of historical data sets

Chieh-Yu Liao [1,*], I-Ling Lai [2], Kuo-Jung Chao [3], Guo-Zhang Michael Song [4] & Wei-Chun Chao [1]

[1]Department of Forestry and Natural Resources, National Chiayi University, Chiayi, Taiwan; [2]Graduate Institute of Bioresources, National Pingtung University of Science and Technology, Pingtung, Taiwan; [3]International Master Program of Agriculture, National Chung Hsing University, Taichung, Taiwan; [4]Department of Soil and Water Conservation, National Chung Hsing University, Taichung, Taiwan

* Presenting author: dovikkiself@gmail.com

Lots of studies suggest that global warming can cause species migration to higher altitudes. Did the distribution of woody plants and seedlings in the Nanjenshan tropical lowland forest, southern Taiwan, also show the same pattern? The length of the transect is 500 m, and the width is 20 to 40 m. Its altitude ranges from 200 to 476 m. It is often visited by typhoon in summer and affected by northeast monsoon wind in winter. We sampled 72 quadrats (10 × 10 m^2) of woody plants and 90 subquadrats (1 × 2 m^2) of woody seedlings. All the woody plants and seedlings have been tagged, identified and measured in 1995 and 2013. The seedlings were monitored every month for 27 times from 1995 to 1997 and once in 2015. According to Liao (1995), the transect can be classified into three vegetation zones along the altitudinal gradient. We analyzed the presence-absence data of woody plant species and seedlings for their distribution, beta diversity and species turnover rate. The results showed that the distribution of woody plants and seedling in the two census periods were almost the same. The beta diversity had no difference in either woody plants or seedlings. At the higher altitude zone, the species turnover rate showed that they gained more species than lost, while at the lower altitude the pattern was opposite. We propose that one of the reasons may be that trees grow slowly under the stress of the northeast monsoon at higher altitude. Another reason may be that environmental heterogeneity made the species grow in different rate.

Lis M.

Poster J-18 (young scientist)

Temporal and spatial variation in the structure of halophilous communities near graduation towers in the town of Ciechocinek

Session: Patterns of vegetation change across landscapes

Marta Lis *, Andrzej Nienartowicz & Agnieszka Piernik

Chair of Geobotany and Landscape Planning, Faculty of Biology and Environment Protection, Nicolaus Copernicus University, Toruń, Poland

* Presenting author: lismartaizabela@gmail.com

The research is aiming at the description of temporal and spatial variation in the structure of halophilous communities based on long-term permanent-plot monitoring near graduation towers in the health resort of Ciechocinek in the Kujawy region, Central Poland. In the analysis phytosociological data from the field work in October 2011 and data obtained from the works of other authors from years 1988, 1990 and 2004 were included. In order to compare changes of halophilous flora the information about six different halophilous species was correlated. The species included *Aster tripolium*, *Atriplex prostrata* subsp. *prostrata* var. *salina*, *Glaux maritima*, *Puccinellia distans*, *Salicornia europaea* and *Spergularia salina*. Agglomerative hierarchical classification with the use of UPGMA algorithm for constructing dendrogram was performed by MVSP programme to distinguish groups similar in species composition. Moreover, divisive TWINSPAN classification was carried out. Furthermore ordination techniques were applied for spatial and temporal generalization of species variation with the use of the CANOCO 5.0 package. The obtained results demonstrate that the flora of each graduation tower is different, what is connected with different salinity level of brine on each tower related to the technology of salt production. The species composition is also affected by expansion of herbaceous species coming from the surrounding area. It is also linked to various management types of lawns. The analysis of temporal variation in four analysed stages demonstrates that the same plots differ in number and composition of halophytic plant species in time. The comparison of the results of the research conducted so far and the analysis of spatial variation of existing structure of vegetation communities prove that the long-term presence of halophilous flora is determined by continuous soil supplying by chlorides and by high soil moisture, which depends on regular functioning of graduation towers. In that way old technological process supports existence of inland halophytic vegetation that is protected in Poland.

Lisner A.

Poster with lightning talk C-08

Relationship between productivity and diversity in meadow communities changes with spatial scale

Session: Patterns and drivers of alpha and beta diversity in plant communities

Aleš Lisner [1,*] & Jan Lepš [1,2]

[1]Department of Botany, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [2]Institute of Entomology, The Czech Academy of Sciences, České Budějovice, Czech Republic

* Presenting author: aleslisner@seznam.cz

The relationship between productivity and diversity in plant communities has been a long studied problem. Unimodal humped-shaped pattern is widely documented for temperate grasslands. Decreasing part of this relationship for medium to high productivity range is typical for the Central European mown meadows. There are various explanations for this decrease. An individual density decrease hypothesis assumes that the size of individuals increases with increasing productivity, which leads to their decreasing density simply because there is not enough space for them. As the increase in number of species with number of individuals is a concave function, the same proportional decrease in number of individuals will cause the greatest proportional decrease in species at smaller spatial scales. It leads to faster random species exclusion from the plant community at small spatial scales. In contrast, our suggested homogeneity hypothesis implies that the rate of species loss will be smaller at small spatial scales. The species loss is caused by increased plant competition asymmetry with increased competition for light in more productive conditions. There is a potential set of species which could be excluded. We are able to find low and random number of species from potential exclusion set at small scales and whole set at large scales so more species disappear from large plot. On the contrary, the competitively strong species will be probably the same over the whole plot. This will lead to spatial homogenization and consequent decrease in the *z* parameter in the species area relationship (as described by Species = c.Area^z). Thirty moderately to high productive meadows (productive range from 150 g/m^2 to 550 g/m^2) were sampled in the vicinity of České Budějovice, South Bohemia, Czech Republic. Aboveground biomass was used as a surrogate for productivity level and number of species was determined at three spatial scales (0.04 m^2, 1 m^2, 25 m^2) at the peak of vegetation season. The competition for light was estimated by measuring maximum percentage amount of light (photosynthetic active radiation) passing through the plant cover to the ground. Results show slower proportional species number decrease at small spatial scales and faster at larger spatial scales, and also decrease of the *z* parameter with increasing productivity. These results support our proposed homogeneity hypothesis, and contradict the individual density decrease hypothesis.

Liu X.

Poster K-04 (young scientist)

Determinants of maximum woody cover in the temperate forest-steppe ecotone

Special session: Vegetation patterns, processes and dynamics of timberlines

Hongyan Liu & Xu Liu *

MOE Laboratory for Earth Surface Processes, College of Urban and Environmental Sciences, Peking University, Beijing, China

* Presenting author: liuxu_ch@pku.edu.cn

It is commonly regarded that mean annual precipitation (MAP) determined the maximum woody cover in tropical savannas. We hypothesized that the temperate forest-steppe ecotone might follow the same rule. With a case study in the Inner Mongolian forest-steppe ecotone in China, we intended to test the above hypothesis. We visually interpreted percentage woody cover with high-resolution images in Google Earth for 203 effective sampling sites designed by spatial sampling rules with each sample area of 4 × 4 km. Climate data for each site was extracted from gridded climatic data. According to the above data, we found that the maximum woody cover received a constraint from mean annual precipitation (MAP), but with an obvious transition at MAP of 383 ± 25 mm. Below the MAP of 383 ± 25 mm, the maximum realizable woody cover increased gradually and linearly with increasing MAP, although soil properties and micro-topography modified the actual woody cover. With MAP exceeding 383 ± 25 mm, the slope of woody cover increasing with MAP became significantly greater than the lower MAP regime. The transition of MAP-control limit could be accounted for by the mountains with elevational distribution of forests. Our results suggested that woody cover in the temperate forest-steppe ecotone might also determined by MAP, as observed in the tropical savanna. Nevertheless, prediction of forest-steppe ecotone dynamics should take into consideration the role of mountains in vegetation pattern.

Löfgren O.

Poster M-03

Predicting fine-scale Ellenberg indicator values and vascular plant species richness in dry grazed grassland with the help of the NDVI and historical land-use data

Special session: Remote sensing for vegetation science

Oskar Löfgren [1,2,*], Thomas Möckel [1], Honor C. Prentice [2] & Karin Hall [1]

[1]Department of Physical Geography and Ecosystem Science, Lund University, Sweden; [2]Biodiversity Unit, Department of Biology, Lund University, Sweden

* Presenting author: oskar.lofgren@nateko.lu.se

Ellenberg indicator values represent the ecological tolerances of individual species, and community mean Ellenberg values can be used, as a proxy, to characterize variation in environmental conditions. Remote sensing data have the potential to provide information on vegetation properties, and the normalized difference vegetation index (NDVI) is frequently used to measure above-ground live biomass. The present study focuses on dry, grazed grasslands within an agricultural landscape in S Sweden.We used generalized linear models to examine whether the NDVI, alone or in combination with historical land-use data, can be used to predict fine-scale (i) mean Ellenberg indicator values for moisture (M) and nutrient (N) availability, and (ii) vascular plant species richness (SR) in grasslands with different continuities of grazing management. The floristic composition of 98 (4 × 4 m) plots was recorded in the field during the summer of 2011. Worldview-2 satellite data (acquired on 22 May 2011), airborne hyperspectral data (acquired on 9 July 2011 and used to simulate Worldview-2 data), and historical land-use data from the 19th century were used as explanatory variables: (i) NDVIMay, (ii) NDVIJuly, and (iii) G1800 (a factor indicating whether the plot was grazed or ungrazed during the 19th century). The 98 plots were randomly divided into a model-training dataset and a validation dataset, and the models were evaluated by comparing Pearson correlations (r) between predicted and observed values in the validation dataset. A model based on a combination of NDVIMay and NDVIJuly was most successful in the prediction of Ellenberg M (r = 0.69), suggesting that multi-temporal NDVI is valuable for detecting between-plot differences in soil moisture. The best predictions of N (r = 0.69) were given by a model based on a combination of NDVIMay and G1800, indicating that part of the variation in N, particularly for low values of N, is related to the history of grassland management rather than to the present-day grassland productivity. The significance of predictions in the models for SR was lower than that for the models for M and N, and the observed SR showed stronger relationships with predicted Ellenberg values than with predicted SR. We conclude that satellite data in combination with historical land-use data can provide valuable information on grassland environments that has the potential to contribute to both ecological research and environmental monitoring.

Loidi J.

Oral presentation

Can parenchyma ray be used as a proxy for climate?

Alberto Arzac [1], José Miguel Olano [2], Georg von Arx [3], Ana García-Cervigón [2], Patrick Fonti [3], Vicente Rozas [4] & Javier Loidi [1,*]

[1]Department of Plant Biology and Ecology, University of Basque Country (UPV/EHU), Bilbao, Spain; [2]Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland; [3]Departamento de Ciencias Agroforestales, EU de Ingenierías Agrarias, Universidad de Valladolid, Soria, Spain; [4]Laboratorio de Dendrocronología, Facultad de Ciencias Forestales, Universidad Austral de Chile, Valdivia, Chile

* Presenting author: javier.loidi@ehu.es

It is well known that tree-ring anatomy reflects changes in the environmental conditions, but ray parenchyma characteristics and their relationship with environmental variations have been poorly explored. To assess the potential of ray parenchyma, we focused the work in defining the best way to quantify ray parenchyma and determine which climate factors affect ray parenchyma abundance. First, we evaluated several approaches to quantify ray parenchyma in *Pinus sylvestris* L. employing different planes of cutting (cross-sectional, tangential and radial); finding that the transversal and tangential sections are the best planes for ray parenchyma abundance estimations. The following step was to explore the potential of the annual patterns of xylem ray parenchyma as a climate proxy in *Juniperus thurifera* L. We constructed ring-width and ray parenchyma chronologies for a period of 40 years and their correlation with climate records obtained from a nearby meteorological station. We found that parenchyma-based chronologies can be used as a complement of ring-width chronologies in climate reconstructions, because ray parenchyma responds to climate conditions at critical stages during xylogenesis. Based on our results, we can say that the analysis of the ray parenchyma characteristics has great potential as a complementary tool in dendrochronology in the study and reconstruction of past environmental conditions.

Lososová Z.

Oral presentation

Is phylogenetic diversity a good proxy for functional diversity of plant communities?

Special session: Urban vegetation

Zdeňka Lososová [1,*], Natálie Čeplová [1,2], Milan Chytrý [1], Lubomír Tichý [1], Jiří Danihelka [1,3], Karel Fajmon [1], Deana Láníková [1,3], Zdenka Preislerová [1] & Vladimír Řehořek [1]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Biology, Masaryk University, Brno, Czech Republic; [3]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic

* Presenting author: lososova@sci.muni.cz

It is often assumed but poorly tested that the patterns of functional diversity reflect phylogenetic diversity in plant communities. Here we test whether phylogeny can be used as proxy for function in general and specifically for diversity in plant niche preferences, their dispersal strategy and competitiveness. We used a large species composition dataset from seven urban habitats sampled in 32 European cities and added information about phylogeny and functional trait spectra, the latter being divided into categories representing niche preferences, dispersal strategies and competitiveness. We found significant positive but very weak relationship of phylogenetic diversity to functional diversity in general, and to diversity in niche preferences and dispersal strategy. This relationship was non-significant for diversity in competitiveness-related traits. We suggest that combination of phylogenetically conserved and convergent traits weakens the phylogeny-function relationship. We conclude that phylogenetic diversity is a weak proxy for functional diversity of plant communities.

Ma W.

Poster J-19

Temporal plant diversity-productivity relationship in temperate grasslands along broad environmental gradients

Session: Patterns of vegetation change across landscapes

Wenhong Ma *, Xiaxia Niu, Liqing Zhao, Cunzhun Liang & Yonghong Li

School of Life Science, Inner Mongolia University, Hohhot, China

* Presenting author: whmapku@126.com

Plant diversity-productivity relationships are generally reported to be linear or hump-shaped across spatial scales, but few of them have been tested through time. Using 4-yr data from 24 different community types in temperate grasslands in Inner Mongolia, we test the temporal relationship between aboveground net primary productivity (ANPP) and species diversity (species richness, Shannon-Wiener and evenness). We found that species diversity was less variable among years than productivity. High biodiversity causes lower temporal variability in community productivity, and supports the hypothesis that the community with high diversity will be more stable. Our analysis also indicates that positive diversity-productivity relationship across the broad environmental gradients shows slight variability over time. The similar responses of plant diversity and productivity to climate variability may contribute stable shapes between them. However, the positive pattern of diversity and productivity based on relative short-term data may not be extended to predict the long-term relationship in one location, because community may change through time.

Macek M.

Oral presentation (young scientist)

Modelled niche parameters along soil reaction gradient outperform Ellenberg indicator values

Special session: Species and plant community responses along soil gradients

Martin Macek [1,2,*], Martin Kopecký [1,2] & Radim Hédl [1,3]

[1]Institute of Botany, The Czech Academy of Sciences, Průhonice and Brno, Czech Republic; [2]Department of Botany, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [3]Department of Botany, Faculty of Science, Palacký University Olomouc, Olomouc, Czech Republic

* Presenting author: martin.macek@ibot.cas.cz

Is the time to substitute Ellenberg indicator values by modelled parameters of niche space? Here we present a new set of data-driven models of species responses along soil acidity gradient for Central European forest plant species. Comparison of the mean Ellenberg indicator values for soil reaction and newly calculated values (species optima and ranges for soil pH) showed that use of newly calculated values can significantly improve correlation with measured soil pH. We collected large dataset of ~ 6000 forest vegetation plots accompanied with laboratory measured soil pH in water solution, covering the whole range (pH 3 to 8) observed within the Central European forests. We used GAM models to quantify species responses along the soil acidity gradient and Huisman-Olff-Fresco models to classify the shapes of species responses. We were able to quantify the shape of soil acidity responses for more than 500 forest species. Most species displayed a unimodal response to soil pH gradient with clearly defined optima. However, part of the species have a response curve with plateau above and strict limitation under certain pH value, usually around 4.5 pH units, reflecting their sensitivity to free Al^{+} ions in the soil. Interestingly, calculated species optima often markedly differ from their optima suggested by Ellenberg values for soil reaction. Moreover, we also showed that the estimation of soil acidity with newly calculated species optima is substantially better than classical approach based on averaging Ellenberg indicator values. Therefore, we recommend to use newly calculated niche parameters for soil acidity instead of classical Ellenberg R values both as an information about individual species requirements as well as for estimation of soil pH from vegetation composition.

Machado R.E.

Poster A-11

Can taxonomic and functional diversity predict ecosystem function during succession in the Atlantic rainforest?

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Rafael Engelman Machado *, Mark Douglas Leithead, Luciana Regina Podgaiski,
Kátia Janaína Zanini, Sandra Cristina Müller & Valério D. Pillar

Department of Ecology, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil

* Presenting author: machado.rem@gmail.com

The number of studies investigating how biodiversity influences ecosystem functioning (BEF) has increased greatly in the past decades in the face of rapid global species loss. A great part of the BEF knowledge has come from studies in grasslands and streams, and few studies have been performed to clarify these questions in tropical forests. Current knowledge of BEF is not consensual and differing results have highlighted that linking the role of species to processes is very complex to predict. As such, observational studies may fill some gaps in the BEF knowledge. We studied a 6–45 years chronosequence plus reference sites of Atlantic rainforest, Southern Brazil, describing the tree component by several dimensions of diversity (species richness, species diversity, species composition, functional diversity and community weighted mean traits) and the vegetation structure. In each stand, we evaluated litter production, decomposition, soil fauna feeding activity and litter and soil nutrients, and analyzed patterns of plant community changes during succession and the possible influence of plant diversity on the processes and soil surface properties by partial least squares path model. Community leaf traits changed substantially during succession towards a more conservative strategy of resources (lower leaf N, P and SLA and higher LDMC). Productivity and decomposition were influenced by the dominance of some species and traits, and soil nutrients accumulate during succession with no direct correlation to litter quality. Functional diversity tended to decrease in time. The integration of several ecological variables and the use of taxonomic and functional diversity together improved the prediction of ecosystem processes. We demonstrate that BEF are strongly regulated by two important drivers, one related to temporal changes that influence the species and functional composition of communities, and the other related to patterns of diversity, with important implications for both production and decomposition. Although, the changes in soil nutrients probably depend on other factors related to time do not contemplated in this study. The effects of diversity on ecosystem processes are dynamic, driven through a temporal scale of long-term changes in vegetation structure (including the influence of both species and trait composition) and shall be explored considering longer time periods and different components of biodiversity.

Magnes M.

Poster with lightning talk D-19

Evaluation of compensation areas for nature protected dry grassland vegetation on serpentine rocks in Styria (Austria)

Session: Vegetation science serving nature conservation

Martin Magnes * & Philipp Sengl

Institute of Plant Sciences, University of Graz, Graz, Austria

martin.magnes@uni-graz.at

The area around the village Kraubath (Styria, Austria, 14°56’2.82’’E, 47°18’23.49’’N) is an extension of an inner-alpine dry valley containing the largest outcrop of serpentine rocks in Central Europe. The site is populated by the palaeoendemic plant species *Sempervivum pittonii* and immensely valuable serpentine steppes. It is the only primary steppe in that region of Austria, due to an interaction of special soil conditions, steep (> 30°) southern faced slopes and regionally low precipitation (730 mm per year). The central part of the steppe in particular, the well investigated “Gulsen”, has been under nature protection, and was 2006 also designated as a Nature 2000 area (according to the habitats directive). Part of the area is still endangered by a stone-quarry. As a consequence of a former deficient depletion measure, an area of about 5000 m^2 must be removed because of mining law rules or it will glide off within the next years. It has therefore been necessary to search for prospective compensation areas in the vicinity. We were able to find two locations with an area of approximately 0.2 km^2 within a 3 km perimeter of the “Gulsen” with similar geological and geomorphological conditions. Interestingly, we were able to verify most of the rare plant species of the serpentine forest steppe and serpentine crevices in these areas, however a detailed study of vegetation revealed that the association of serpentine dry grassland (*Armerio-Potentillietum arenariae*, *Avenulo adsurgentis-Festucion pallentis*) is lacking – even in unforested areas. This is obviously due to a variety of small scaled climatic factors, such as greater wind velocity, slightly higher medium annual temperatures, higher maximum temperatures in July and lower precipitation levels (especially in winter) in the river valley. The study revealed the importance of detailed vegetation analysis in the assessment of nature conservation values, especially in areas with high geomorphological differences on small scales.

Májeková M.

Oral presentation (young scientist)

Evaluating functional diversity: missing trait data and the importance of species abundance structure and data transformation

Mária Májeková [1,2,*], Taavi Paal [3], Nichola S. Plowman [4,5], Michala Bryndová [6,7], Liis Kasari [3], Anna Norberg [8], Matthias Weiss [4], Tom R. Bishop [9,10], Sarah H. Luke [11,12], Katerina Sam [4,5], Yoann Le Bagousse-Pinguet [1], Jan Lepš [1,4], Lars Götzenberger [13] & Francesco de Bello [1,13]

[1]Department of Botany, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [2]Department of Soil Science, Faculty of Natural Sciences, Comenius University in Bratislava, Bratislava, Slovakia; [3]Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia; [4]Institute of Entomology, Biology Centre, The Czech Academy of Sciences, České Budějovice, Czech Republic; [5]Department of Zoology, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [6]Institute of Soil Biology, Biology Centre, The Czech Academy of Sciences, České Budějovice, Czech Republic; [7]Department of Ecosystem Biology, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [8]Department of Biosciences, University of Helsinki, Helsinki, Finland; [9]Department of Earth, Ocean and Ecological Sciences, University of Liverpool, Liverpool, United Kingdom; [10]Centre for Invasion Biology, Department of Zoology and Entomology, University of Pretoria, Pretoria, South Africa; [11]School of Biological Sciences, University of East Anglia, Norwich, United Kingdom; [12]Department of Zoology, University of Cambridge, Cambridge, United Kingdom; [13]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic

* Presenting author: maria.majekova@gmail.com

Functional diversity (FD) is an important component of biodiversity which is increasingly used to understand community assembly and ecosystem functioning. However, practical constraints often make it difficult to collect complete data on functional traits. Since FD indices are sensitive to missing trait data, the biological conclusions drawn from them can be affected by data gaps. The structure of both species abundance and trait data, and the effect of data transformation, are often neglected when computing FD indices and can potentially alter the effect of missing trait data. We therefore investigated how different sampling scenarios, data structure (abundance and trait), and transformation influence the robustness of FD indices to missing trait data. To simulate the effect of missing trait data we used three real datasets from plant, ant, and bird communities and sequentially removed the least abundant species from each. We assessed the robustness of FD indices to missing trait data by comparing the ranking of FD values across plots in original and reduced datasets. Finally, we used linear mixed effect models to test the extent to which robustness of FD indices is affected by different sampling scenarios and transformation of species abundance and trait data. Our results demonstrate that data structure and its transformation are as important as the amount of available trait data. The more the trait data transformation improves data normality, the more it improves the robustness of the FD indices to missing trait information. We also show that the decision of setting trait data sampling thresholds on the whole pool of species or in each plot separately depends upon the particular study system, FD index, and research question. Data structure and data transformation should be given careful consideration during the analysis and interpretation of FD, especially where trait data are missing. A proper usage of both abundance and trait data can, to a certain degree, even compensate for missing trait data. These effects should also be taken into account when planning the experimental design and sampling. We provide recommendations and the R package "traitor" to assist these decisions.

Manthey M.

Oral presentation

EcolClass – An automated protocol to define site factor classes and ecological species groups for bioindication

Special session: Species and plant community responses along soil gradients

Michael Manthey [1,*] & Florian Jansen [1,2]

[1]Institute of Botany and Landscape Ecology, University of Greifswald, Greifswald, Germany; [2]Botanic Garden and Botanical Museum Berlin-Dahlem, Freie Universitaet Berlin, Berlin, Germany

* Presenting author: manthey@uni-greifswald.de

In applied vegetation science we have a long tradition to use plant communities as integrative indicators of environmental conditions. Particularly edaphic characteristics like soil moisture, soil reaction and nutrient supply are commonly estimated by means of expert systems like Ellenberg Indicator Values (EIV) or by the combination of ecological species groups. While the calculation of mean EIV is mathematically questionable, requires full species lists and can thus hardly be achieved directly in the field, ecological species groups allow a more rapid on-site mapping of site factor classes like nutrient or water levels. So far, ecological species groups and site factor classes have been derived from manual table work with large representative vegetation datasets and complementary site measurements. We developed an automated protocol to define site factor classes and ecological species groups for a given environmental gradient. The procedure requires a sufficient dataset of vegetation plots including measurements of the site factor of interest and is based on a simple sorting of the plots along the rank-ordered factor measurements. Every possible split of the gradient into factor classes is evaluated by means of a multiple group indicator species analysis, modified from De Cáceres et al. (2010) and those splits are saved that reveal the highest sum of significant indicator values, i.e. the best floristic separation of factor classes. The optimal number of splits is evaluated by a post-hoc process that takes into account the floristic distinctiveness of the factor classes, i.e. the chance to separate adjacent factor classes by means of the presence or absence of ecological species groups.

References

De Cáceres, M., Legendre, P. & Moretti, M. 2010. Improving indicator species analysis by combining groups of sites. *Oikos* 119: 1674–1684.

Marozas V.

Poster L-02

Neophyte communities of *Robinia pseudoacacia* L. and *Acer negundo* L. in two cities of the eastern part of the Baltic Sea Region

Special session: Urban vegetation

Vitas Marozas [1,2,*], Gunta Cekstere [1], Maris Laivins [1] & Lina Straigyte [1,2]

[1]Institute of Biology, University of Latvia, Salaspils, Latvia; [2]Faculty of Forestry and Ecology, Aleksandras Stulginskis University, Kaunas, Lithuania

* Presenting author: vitas.marozas@asu.lt

In this study we examine the species composition of neophyte communities of *Robinia pseudoacacia* and *Acer negundo* and compare site conditions in the urban environment of two cities – Riga and Kaunas of eastern Baltic Sea region. Altogether, 85 plots of *A. negundo* and *R. pseudoacacia* communities were selected. Within each plot, all vascular plant species were recorded and abundance was estimated in June-August 2014. In each sample plot, composite soil samples of the 0–10 cm mineral topsoil for the estimation of soil chemical properties were collected at nine systematically distributed points. For the vegetation data analyses canonical correspondence analysis was used. An indicator species analysis was carried out in order to determine indicator species for the groups. The relationship between the soil chemical parameters was assessed by principal component analysis. The results showed that the number of species in *A. negundo* communities did not differ significantly in Riga and Kaunas cities; but the number of species in *R. pseudoacacia* communities was lower in Kaunas city. Percentage of alien species both in *A. negundo* and *R. pseudoacacia* communities was higher in Riga city. The shrub layer was more developed in Riga city both in *R. pseudoacacia* and *A. negundo* communities. The herb layer was more developed in *R. pseudoacacia* communities both in Riga and Kaunas cities. The soil in neophyte communities in Riga city had more carbon and was richer in nutrients than in Kaunas city. *R. pseudoacacia* grew in more fertile soils than *A. negundo* communities both in Riga and Kaunas cities. Soil acidity was higher in *R. pseudoacacia* than in *A. negundo* communities in Kaunas city, while there was no difference between neophyte's communities in Riga city.

Martynova-Van Kley A.

Poster B-17

Relationships between arbuscular mycorrhizal fungi, hosts, plant communities and season, in Eastern Texas, USA forests

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Alexandra Martynova-Van Kley *, James E. Van Kley & Armen Nalian

Department of Biology, Stephen F. Austin State University, Nacogdoches, TX, USA

* Presenting author: avankley@sfasu.edu

Arbuscular mycorrhizal fungi (AMF, Phylum *Glomeromycota*), form symbioses with the roots of most plant species and are likely critical drivers of plant diversity and community composition. We report relationships between AMF, host plant, plant community and season for humid-subtropical mixed pine-broad leaf deciduous forests in eastern Texas, USA. AMF were sampled from roots of three widely-occurring native hosts: *Callicarpa americana*, *Chasmanthium sessiliflorum*, and *Toxicodendron radicans* taken from sites representing a range of local forest communities. We used denaturing gradient gel electrophoresis (DGGE) to separate AMF PCR products of 18S rDNA amplified from root samples using the AM1 primer in combination with forward primer NS3. Each band on DGGE gels was interpreted as potentially representing a taxon. The resulting samples-by-bands data were subject to non-metric multidimensional scaling and canonical correspondence analysis. PCR products from a limited pool of samples were also subject to 454 pyrosequencing. We identified all AMF sequences, where possible, to species using the GenBank sequence database and BLAST. These samples-by-taxa data were also subject to ordination. External factors included soil parameters, topographic position, host plant, habitat type, sampling month, and vascular plant community ordination scores. AMF communities differed across the three hosts and samples from them occupied largely different regions in ordination space. For example *Glomus mosseae* and *Scutlospora castanea* were mostly found with *T. radicans* while *Glomus proliferum* appeared to associate with both *T. radicans* and *C. americana*. Variation in AMF communities also corresponded to differences in soil texture, nutrients, topographic position, and the vascular plant community. The smaller pyrosequenced dataset corroborated these patterns while providing the additional benefit of identification of AMF taxa. For example, *Glomus hoi*, *G. proliferum*, and *Gigaspora decipiens* tended to associate with upland communities while *Glomus intraradices* and *G. mosseae* favored mesic forests and floodplains. In an upland site sampled monthly, AMF changed over a 1-year period with chief differences occurring being between wet and dry months. Our results are largely consistent with other studies which also report variation in AMF related to host, habitat, and seasonality. Future research aims to further investigate relationships between AMF, soils, and plant communities.

Mayer R.

Poster with lightning talk J-20

Expected and unexpected changes in high altitude plant communities

Session: Patterns of vegetation change across landscapes

Roland Mayer *, Martin Mallaun, Peter Unterluggauer & Brigitta Erschbamer

Institute of Botany, University of Innsbruck, Innsbruck, Austria

* Presenting author: Roland.Mayer@uibk.ac.at

High altitude plant communities are considered to be particularly sensitive to climate change and major impacts were suggested due to migrating species from lower altitudes. Long-term monitoring programs are essential to verify the hypotheses regarding range expansions of lowland species and decreasing/vanishing alpine and nival species. In the Central Alps long-term data are available from the GLORIA project at the Nature Park Texelgruppe (South Tyrol, N-Italy) and the LTER site Obergurgl (Tyrol, Austria). In both projects, permanent plots of 1 m^2 were installed along altitudinal gradients from the subalpine to the nival zone and frequency analyses were carried out. In addition, at the LTER site Obergurgl, grazed and ungrazed plots were compared. Variations in species richness and species turnover were calculated per year and community development was analyzed. Species frequencies increased in all plots with exception of the grazed exclusions. Species numbers decreased in ungrazed plots and increased in all other plots (exception: plots of the nival summit). Species turnover was highest at the recently deglaciated sites and lowest at the lichen heath. A correlation of winners and losers with mean annual temperatures of the sites showed a higher increase of warm-adapted species in contrast to cold-adapted ones.

Michaelis J.

Oral presentation (young scientist)

Soil pH limits determine range size and threat level of forest vascular plants

Special session: Species and plant community responses along soil gradients

Jana Michaelis *, Angela Pannek & Martin Diekmann

Institute of Ecology, University of Bremen, Bremen, Germany

* Presenting author: jana.michaelis@uni-bremen.de

Even though edaphic factors are known to play a major role in explaining plant distributions, knowledge about the responses of species to soil variables is scarce. In the framework of species distribution modelling and plant conservation, these responses are usually expressed as optima or indirectly assessed by indicator values. However, habitat loss and soil degradation may force species to live in ecologically marginal environments, i.e. close to their physiological or ecological limits. We used Huisman-Olff-Fresco models to examine the species responses of forest vascular plants along a soil pH gradient with a particular focus on rare species. Optima and limits were calculated and related to regional range size, change in range size over the past decades and threat level. Soil pH affected range size, as species being intolerant of acid soils were less widespread than less sensitive taxa. Species lower pH limits were more closely related to range size and rarity than optima and species with relatively high lower pH limits had also decreased more over time and were more threatened than species able to grow on very acid soils. We argue that these lower limits in most cases represent the physiological thresholds of species instead of being determined primarily by competition. The results reinforce the importance of soil variables for the occurrence of plant species and suggest that limits may be better predictors of current and future species distributions than optima. There is an urgent need for collecting and analysing more soil data, because the inclusion of detailed knowledge of edaphic conditions for the survival of plants is crucial for the conservation of species.

Michalcová D.

Poster C-09 (young scientist)

Is there any ecotone effect on species number in fragmented agricultural landscapes?

Session: Patterns and drivers of alpha and beta diversity in plant communities

Dana Michalcová *, Milan Chytrý & Jiří Danihelka

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: danmich@sci.muni.cz

Fragmentation of agricultural landscapes can cause biodiversity decline, but it also generates ecotones, which could theoretically compensate for the negative effect of fragmentation, because ecotones are believed to be zones with increased diversity. However, the notion of increased diversity in the ecotones is controversial. We asked whether ecotones in an agricultural landscape are richer in vascular plant species or their subgroups (archaeophytes, neophytes or red-listed species) than patches of homogeneous habitats. We also tested whether the more structurally diverse ecotones are more species-rich than the less structurally diverse ecotones. In the agricultural landscape of southern Moravia, Czech Republic, vegetation plots were sampled in all ecotones and habitat patches encountered along five 1-km transects. Total species numbers in the ecotones were similar to those in the neighbouring open-land habitat patches. Species numbers within species groups were not significantly different between ecotones and any adjacent habitat. Species numbers in forest/scrub-open land ecotones did not differ from species numbers in ecotones between two open-land patches, indicating that even increased structural heterogeneity did not increase species numbers in ecotones. Based on our own results and various published case studies, we suggest that contrary to the widespread belief repeated in ecological textbooks, higher species number is not a general feature of ecotones, at least not in the central European agricultural landscape. Ecotones therefore cannot counteract the negative effects of habitat fragmentation. They probably do not serve as refugia of red-listed species, but at the same time they do not host increased number of neophytes.

Mičová P.

Poster J-21

Changes in floristic composition of permanent grassland in relation to different cutting regimes

Session: Patterns of vegetation change across landscapes

Marie Štýbnarová [1], Pavlína Mičová [1,*] & Josef Hakl [2]

[1]Agrovýzkum Rapotín Ltd., Rapotín, Czech Republic; [2]Czech University of Life Sciences Prague, Prague, Czech Republic

* Presenting author: pavlina.micova@vuchs.cz

The effects of cutting regime with absence of fertilization on the floristic composition and species richness were investigated during 2005–2011 on permanent grassland in the locality of Rapotín (50°00′32″N and 17°00′83″E). The experimental site is situated in the Czech Republic at 390 m a.s.l. on an east-facing slope (with 5.1–6.2° inclination) in a moderately warm region without temperature extremes. Grassland was intensively grazed without fertilization for more than 30 years before the experimental set up. The small-plot trial (one plot size: 30 m^2) in completely randomized blocks with four replicates consisted of treatments: 4C (four cuts; 1st cut on 15 May), 3C (three cuts; 1st cut on 31 May), 2C (two cuts; 1st cut on 15 June), 1C (one cut on 30 June) and 0C (unmanaged grassland). Maximum number of vascular species was found in grassland with three cuts per year (24 species; mean of years). Species richness significantly decreased in treatments 1C and 0C. All species were classified into mixed C-S-R strategy types. We detected an increasing proportion of competitors with decreasing intensity of utilization, also in the treatment 0C. In contrast, plants with combined CSR strategy (CSR) dominated in grasslands with the intensive disturbance (four cuts per year). According to RDA anlyses, both management and years significantly influenced botanical composition and explained 23% of its variability whereas interaction among them explained 43%. On the basis of our results we can conclude that in cases of grazing management cessation (e.g. caused by low livestock number) there is a suitable compromise which can guarantee the maintenance of species richness by cutting the sward with three cuts per year.

Acknowledgement: This work was supported by the Ministry of Agriculture under institutional support Decision No. RO1215 from 26 February 2015 for the long-term conceptual development of the research organisation.

Miglécz T.

Poster with lightning talk D-20

Sowing species-rich cover crop seed mixtures at two wine regions of Hungary

Session: Vegetation science serving nature conservation

Tamás Miglécz [1,*], Ádám Donkó [2], Orsolya Valkó [1], Balázs Deák [3], András Kelemen [3], Péter Török [1], Dóra Drexler [2] & Béla Tóthmérész [1,3]

[1]University of Debrecen, Department of Ecology, Debrecen, Hungary; [2] Hungarian Research Institution of Organic Agriculture, Budapest, Hungary; [3] MTA-DE Biodiversity and Ecosystem Services Research Group, Debrecen, Hungary

* Presenting author: tamas.miglecz@gmail.com

In organic viticulture the development of new methods to save soil fertility, enhance soil microbial activity, control erosion and deflation and to suppress weeds are high-priority issues. Sowing high-diversity cover crop seed mixtures in vineyard inter-rows offers a great opportunity to fulfil these tasks. Furthermore, we can also improve the biodiversity and ecosystem services of vineyards. Generally non-native or low-diversity seed mixtures are used for cover cropping, containing some grass, grain or *Fabaceae* species. We studied vegetation development after sowing native high-diversity seed mixtures in vineyards of Tokaj and Szekszárd wine regions in Hungary. In March 2012 three seed mixtures were sown: Biocont-Ecowin (12 species), Legume (9 species) and Grass-medical forb (16 species) seed mixtures. The percentage cover of sown and unsown (weed) species was recorded in 2012, 2013 and 2014. In the first year the Biocont-Ecowin and Legume seed mixtures were best established in both wine regions, therefore the weed control capability was also the best in inter-rows sown with these seed mixtures. For the second and third year in inter-rows sown with the Grass-medical herb and Legume seed mixtures, lower weed cover was detected, while in inter-rows sown with Biocont-Ecowin seed mixture and in control inter-rows higher weed cover was detected. All sown species were detected in our plots during the time of the study, however some species were present only with low cover scores or only in a few plots. Out of the sown species *Lotus corniculatus*, *Medicago lupulina*, *Plantago lanceolata*, *Trifolium repens*, *T. pratense* and *Coronilla varia* established the most successfully, and had high cover scores on most sites even in the second and third year. Our results show that sowing high-diversity cover crop seed mixtures in vineyard inter-rows offers a great opportunity to control weeds regardless of wine regions.

Minchin P.

Oral presentation

Defining restoration targets at a regional scale: Initial analyses of the Illinois Natural Areas Inventory Database

Peter Minchin * & Melisa Hillman

Southern Illinois University Edwardsville, Edwardsville, IL, USA

* Presenting author: pminchi@siue.edu

The evaluation of community restoration success requires explicit objectives and criteria that assess progress towards those objectives. In North America, where major changes in vegetation have occurred since European settlement, a commonly stated objective is to restore pre-settlement communities but a lack of data on the species composition of such communities can be a major impediment to defining clear restoration targets. This is especially the case in regions where very little of the original vegetation is left. In Illinois, only 0.01% of the prairie remains and forest covers 37% of its original extent. Beginning in 1976, the Illinois Department of Natural Resources (IDNR) performed the Illinois Natural Areas Inventory (INAI), an extensive search for the best remnants of the pre-settlement vegetation, and vegetation data were collected from 367 sites. An additional 111 sites were added in 2008–2012. Sites were rated for conservation value using criteria that assess the degree of anthropogenic disturbance and community integrity and assigned to vegetation types defined by structure and topography. This study reports initial analyses of the INAI upland forest data. Our objectives were to characterize the range of upland forest variation in Illinois, assess the degree to which IDNR's forest classification and conservation value classes are supported by the data, and demonstrate the use of the database to define restoration targets. A matrix of 109 sites by 71 tree species was utilized, with dominance measured for each species using trees with a DBH of at least 10 cm and an area of 0.5 ha sampled at each site. Ordination by non-metric multidimensional scaling required three dimensions (stress = 0.167), which were correlated with topographic moisture class, mean annual temperature, and soil type. Analysis of Similarities found that IDNR forest types differ in species composition but conservation value classes cannot be distinguished. Restoration targets for regrowth forest sites in Madison County were identified as sites in the INAI database with similar topographic position, mean annual temperature, and soil type and progress towards targets was assessed using Trajectory Analysis. Future research will extend the approach to include prairie, bottomland forest, and wetland sites from the INAI database, and develop a system to determine the best pre-settlement targets for restorations in Illinois and provide quantitative assessments of restoration success.

Minden V.

Poster with lightning talk O-10

A comparison of native and non-native *Impatiens* species across experimental light and nutrient gradients

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Vanessa Minden * & Jelena Gorschlüter

Landscape Ecology Group, Institute of Biology and Environmental Sciences, University of Oldenburg, Oldenburg, Germany

* Presenting author: vanessa.minden@uni-oldenburg.de

The success of invasive species over resident species is often assigned to their trait attributes and their ability to show plastic responses towards fluctuating environmental conditions. To shed light on the role of differentiated trait responses towards environmental conditions promoting invasion success, we conducted a congeneric study with three *Impatiens* species, one of which is native to Central Europe (*I. noli-tangere*), while the other two are introduced and considered invasive (*I. parviflora* and *I. glandulifera*). Monocultures of the species were grown in pots at nine combinations of light and nutrient availabilities (ambient, medium and high light, and N-limited, balanced and P-limited) and their responses in terms of biomass allocation traits, growth rates and reproduction were measured. We conducted multivariate analysis of trait responses and trait-trait interactions via path analysis and structural equation modelling. Performance of invasive *Impatiens* species is more prone to unfavourable nutrient conditions than light conditions. Trait responses to the environment of *I. noli-tangere* and *I. parviflora* showed similar patterns, whereas those of *I. glandulifera* differed from the latter two. Across species, most trait-trait relationships were only significant for one of the three species. We conclude that although closely related, the species differed in their allocation patterns to biomass, growth and/or reproduction, which might contribute to their success or failure at a specific site, respectively. Based on our findings, we expect *I. glandulifera* to occupy different microsites than the other species. Regarding *I. noli-tangere* and *I. parviflora*, we do expect habitat overlap due to similar responses to the environment.

Mitsuda Y.

Poster C-10

Evaluating diversity of landscape structure as a basis for understanding landscape scale biodiversity in the Aya Biosphere Reserve, Japan

Session: Patterns and drivers of alpha and beta diversity in plant communities

Yasushi Mitsuda *, Haruka Nagatomo & Satoshi Ito

Faculty of Agriculture, University of Miyazaki, Miyazaki, Japan

* Presenting author: mitsuda@cc.miyazaki-u.ac.jp

Evaluating diversity of landscape structure is a basis for understanding landscape scale biodiversity and diversity in plant communities. Our study area is Aya Town located in the south-western part of Japan and designated as a biosphere reserve in 2012 for large natural reserve area of lucidophyllous forests. We developed a land cover distribution map by interrupting an ortho-photograph taken in 2013. Proportion of area of agricultural land use (paddy field, crop field) was higher in the eastern part of the study area and dominant land cover was shifting to planted and natural forest with moving to the west part. We calculated the Shannon diversity index within 1000 × 1000 m moving window placed on the land-use map. The spatial distribution map of the Shannon diversity index derived from the land cover map showed that the highest point in diversity of landscape structure (hotspot) was located in the middle between agricultural area and forest area. Because of the complexity of land use, the hotspot of land cover diversity can be regarded as SATOYAMA where human related land use and natural vegetation were located sympatrically and vegetation diversity was high. We also investigate relationships between land cover type and topography. Topographic analysis revealed that agricultural land use was located on gentle slope and in low elevation area and forest was located on steep slope and in high elevation area. Topography of the hotspot was the middle slope and middle elevation, and various land-cover types were located in the hotspot because of this topographic feature. Our analyses will help understanding the beta and gamma diversity in plant communities of the Aya Biosphere Reserve. Furthermore this study will provide useful information for a future land use plan of Aya Town to promote better management of the Aya Biosphere Reserve.

Mony C.

Oral presentation

Understanding clonal plant interactions over time along the exploration-exploitation gradient: a fine-scale approach based on experimental communities

Hugo Saiz Bustamante [1], Anne-Kristel Bittebiere [2], Marie-Lise Benot [3], Vincent Jung [1] & Cendrine Mony [1,*]

[1]UMR 6553 Ecobio, CNRS – Université de Rennes 1, Rennes, France; [2]UMR 5023 LEHNA, CNRS – Université de Lyon 1, Villeurbanne, France; [3]UMR 1202 BIOGECO, INRA – Université de Bordeaux, Bordeaux, France

* Presenting author: cendrine.mony@univ-rennes1.fr

Competitive interactions are a determinant driver of plant community structure in temperate grasslands. In such dense and mono-stratified vegetation cover, competition may arise mostly for free-space, conditioning niche availability. Clonal growth determines the way a plant can exploit horizontal space: either to resist to competitors through space consolidation (phalanx form) or to explore and colonize free spaces (guerilla form), with possible intermediate strategies. Few works have explored the dynamics of coexisting plants belonging to different clonal strategies. Models predict that guerrilla forms may be advantageous at the early stages of succession, while phalanx ones are expected to be better competitors over time, due to their higher consolidative spatial pattern. We aimed at testing these predictions in experimental situations and explore possible mechanisms promoting clonal plant coexistence. We analyzed therefore spatio-temporal dynamics of experimental plant communities over five years (2009–2014), through a large-scale mesocosm design manipulating the mixtures of clonal forms. We demonstrated that guerilla forms dominated the early community but their dominance decreased at later stages at the benefit of intermediate forms. As expected, guerilla forms were more prone to competitor invasion than phalanx ones but their segregation in space increases with time. Segregation in phalanx forms was more pronounced when growing respectively with intermediate forms or with other phalanx species in the early stage but only with the latter in 2014. Phalanx forms had a stronger degree of local co-occurrence with guerilla forms than with intermediate ones in 2010 whereas there was no more differences between neighbor types in 2014. Guerilla forms however co-occur more with intermediate forms than with phalanx ones whatever the date considered. Intermediate-growth forms between extreme phalanx and extreme guerillas displayed hence either consolidative or explorative patterns depending on the clonal forms of the other competitors, suggesting plastic variations of their traits. This study validates our expectations and highlights the key role of clonal forms in driving competitive interactions and hence determining the spatio-temporal dynamics of grassland communities.

Moreno J.

Poster with lightning talk G-08 (young scientist)

A model of soil-plant relationships in Spanish National Park "Tablas de Daimiel"

Special session: Species and plant community responses along soil gradients

Joaquín Moreno *, María Ángeles Alonso, Alejandro Terrones & Ana Juan

Department of Environmental Sciences & Natural Resources, University of Alicante, San Vicente del Raspeig, Alicante, Spain

* Presenting author: joaquin.moreno@ua.es

The aim of this study is to establish vegetation patterns related with environmental gradients within the Spanish National Park "Tablas de Daimiel". This protected landscape is a unique wetland in Europe and the last example of the river ecosystem called "tablas", once characteristic of the central plain of the Iberian Peninsula. This complex ecosystem is caused by the overflowing in the confluence of two rivers: Guadiana River, which transports freshwater during all the year, and Cigüela River, which is a seasonal river with brackish water. The special characteristics of this landscape make it extremely interesting to study the soil-vegetation relationships. The water salinity changes markedly in different seasons, creating ecological soil gradients along the landscape. Six sampling stations were chosen within the National Park and the incoming and outcoming rivers. In each area, three plots were selected. In each plot, a soil sample was collected at five different depths and a vegetation relevé was taken. This fieldwork was repeated every three months during a year for covering the complete seasonal variation. The edaphic variables measured were moisture, electrical conductivity, pH, texture and field capacity. In addition, samples of water were collected in each different plot. A total of 18 plots were sampled each season. This methodology was repeated each three months during a year to observe seasonal changes in ecological patterns. Our data were analyzed using multivariate analysis. Plant distribution responds to changes in the soil-water conditions. We trust that our research will allow obtaining soil-plant relationships models to improve the environmental management in wetlands and the conservation of this landscape.

Moretti M.

Oral presentation

Contrasting trait assembly patterns in plant communities emerge along urbanization gradients

Special session: Urban vegetation

Marco Moretti [1,*], Elena Conception [1], Martin K. Obrist [1], Lars Götzenberger [2], Francesco de Bello [2] & Michael P. Nobis [1]

[1]Swiss Federal Institute for Forest WSL, Birmensdorf, Switzerland; [2]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic

* Presenting author: marco.moretti@wsl.ch

While urbanized areas steadily expand worldwide, there is great concern about the consequences on biodiversity changes in species assemblages, and shifts in the functional structure of biological communities with possible effects on ecosystem processes and underlying services. We investigate species richness and community functional structure of plant species assemblages along urbanization gradients at the landscape scale (1 km^2) and compared with patterns of a contrasting model taxa, i.e., birds (consumers and mobile organisms) along the same urbanization gradients but also along other land-uses (i.e., agricultural area) and environmental gradients (i.e., climate, topography, and landscape heterogeneity). The study was carried out in the Swiss Plateau, a densely populated region that has undergone substantial urban sprawling in recent decades, similarly to many other large areas all over Europe. Our study revealed that while topography, climate and landscape heterogeneity only caused minor changes in community functional structure, agricultural land-use and particularly urban area drove contrasting assembly patterns in plant trait composition, with convergence prevailing for vegetative traits (i.e., plant height and leaf dry matter content), and divergence for reproductive traits (i.e., Raunkier's growth forms). In contrast to plants (producers and sessile organisms), for birds both agricultural and urban land-uses enhanced consistent divergence in traits related to resource use (diet and nesting sites). These findings indicates that contrasting assembly patterns may arise within and across taxonomic groups along the same environmental gradients as result of distinct underlying processes, i.e., increased environmental heterogeneity and environmental filtering. Our study further indicates low functional diversity and redundancy of species assemblages in the entire Swiss Plateau, suggesting possible consequences for key ecological processes under the impact of future global stressors.

Mori H.

Poster A-12 (young scientist)

Effects of host tree traits and ground conditions on liana distribution in a cool temperate forest

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Hideki Mori [1,*], Takashi Kamijo [1] & Takashi Masaki [2]

[1]Faculty of Life and Environmental Sciences, University of Tsukuba, Ibaraki, Japan; [2]Forestry and Forest Products Research Institute, Ibaraki, Japan

* Presenting author: s1010750@gmail.com

Recent studies have shown that lianas (woody vines) have important ecological functions (e.g. forest community dynamics). Host tree traits and ground conditions are known as important factors which influence liana distribution. However, most of current knowledge come from tropical and subtropical forests, whereas lianas that thrive in temperate forests remain poorly understood. The aim of this study is to clarify the relationship between liana distribution and habitat preference in a cool temperate forest. The study was conducted in Ogawa Forest Reserve (OFR, 6 ha) located in the north of Ibaraki prefecture, Japan. DBH, species name and location were recorded for all liana stems that were higher than 1.3 m above the ground. We dichotomised them into "young" and "adult" stages based on the position of liana in the host tree (canopy or not) and size of the host tree (DBH ≥ 25 cm or not). For each of the stages, liana presence probability on non-liana trees was analyzed with a generalized additive model (GAM) to evaluate the effect of host tree traits (size, shade tolerance (tolerant or intolerant), lifeform (canopy or understory)) and ground conditions (slope inclination, soil water content, micro-scale landforms (crest slope, head hollow, upper side slope, lower side slope, flood terrace, river bed)). Model selection was performed according to Akaike information criterion (AIC). Results of the analysis show that host tree size had a significant positive effect on adults of *Wisteria floribunda*, *Euonymus fortunei*, *Schizophragma hydrangeoides*, *Rhus ambigua*, *Vitis coignetiae* and young of *E. fortunei*, *S. hydrangeoides*, *R. ambigua*, *Hydrangea petiolaria*. This is because larger trees often have larger surface area and longer time to be infested by liana. However, the observed effect on young trees of *W. floribunda* was the opposite (negative effect), since stem twiners can easily climb up smaller diameter supports. Life form of host trees was not selected significantly either for young or adult, whereas effects of shade tolerance of host trees varied between species. Microscale landform did not have significant effect on any species. Soil moisture and slope angle had significant negative effect on young *W. floribunda* and *S. hydrangeoides*, respectively. These results show that host tree traits, such as size, have more impact or significant effect on liana distribution than ground condition in a cool temperate forest.

Mudrák O.

Oral presentation

Functional trait composition and diversity in disturbed habitats – comparison across successional series

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Ondřej Mudrák [1,*], Klára Řehounková [2], Kamila Lencová [2], Jiří Doležal [1,2], Francesco de Bello [1,2] & Karel Prach [1,2]

[1]Department of Functional Ecology, Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [2]Department of Botany, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic

* Presenting author: ondrej.mudrak@centrum.cz

Understanding the mechanisms of succession by which plants assemble into communities after disturbance is a challenging topic for both theoretical and applied science. Many studies have been conducted over last century that brought deep basic knowledge about successional processes. However, these studies focused mainly on the local scale and taxonomic changes, while comparisons of succession across broad scales and from functional point of views are largely missing. It is therefore unclear to which extent the same processes are shared across different habitats. We analyzed the dataset comprising over 2800 relevés sampled in 19 various types of disturbed habitats (sand pits, post-mining heaps, quarries, etc.; successional series here after) in the Czech Republic in differently aged seral stages (1–160 years). Vegetation developed spontaneously in these habitats without direct human impact. To explore a functional pattern of succession we analyzed trait composition (expressed as the community weighted mean) and functional diversity (expressed as the Rao's quadratic entropy). Our results show that competitive species (often tall plants with high capacity for clonal growth, high leaf dry matter content and with large seeds) became more abundant with increasing time since disturbance. The functional diversity of seed size increased with time from the disturbance, while the functional diversity in capacity for clonal growth decreased overtime. This main pattern was, however, not consistent over all individual successional series. We discuss the differences in trait composition in individual series and their implications for using traits as predictors in other regions having different pool of species and environmental conditions.

Müller S.C.

Oral presentation

Responses of tree species and leaf traits of subtropical rainforest communities to an altitudinal gradient

Sandra Cristina Müller [1,2,*], Rodrigo S. Bergamin [2], Kátia Janaína Zanini [2], Mariana Gliesch-Silva [2], Marcelo A. Frangipani [2] & Martin Molz [3]

[1]Department of Ecology, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil; [2]Graduate Program of Ecology, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil; [3]Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil

* Presenting author: sandra.muller@ufrgs.br

Tropical rain forests of the Brazilian coast achieve their southern limit already under subtropical climate where many species find their distribution limits. Assemblies of rainforest trees in subtropical regions are under stronger environmental constrains, mainly due to decreasing solar radiation and temperature. Such conditions can easily become harsher towards elevational gradients in this region. We studied communities of trees based on species and functional traits along an altitudinal gradient in subtropical rainforests to understand assembly and diversity patterns in the face of climate change. Since several assemblies show unimodal diversity patterns along altitudinal gradients, we predicted highest species diversity at the midpoint of the domain and, consequently, highest functional diversity in terms of leaf traits. Further, because of harsher environmental conditions in highlands, we also expected convergent patterns of some leaf traits (e.g. lower leaf area and higher leaf dry matter content – LDMC) for communities at higher altitudes. We gathered data of tree species density for 26 rainforest plots along a gradient from 43 to 1095 m of altitude. Forests in the region are characterized by a mix of broadleaf evergreen rainforest and evergreen mixed rainforest (*Araucaria* forest). Our compilation resulted in 323 species and we locally measured leaf traits for 294 species (99.16% of total individuals). Leaf traits considered were: leaf area, specific leaf area (SLA), LDMC, leaf thickness, nitrogen and phosphorus content, and maximum height. The results indicated a clear pattern of species turnover throughout the elevational gradient and the species diversity was higher at the midpoint of the domain showing a humped-shape curve. Functional diversity of all traits together had a similar pattern in relation to altitude, but species richness also explained the variation. Accounting for that influence, we still obtained a significant response to the gradient. The diversity of individual traits led to different relationships: while diversity estimated based on LDMC and phosphorus produced a humped-shape curve, leaf area, SLA, and nitrogen linearly decreased with altitude. Community-weighted mean of traits also supported convergent patterns, especially for leaf area, SLA, and LDMC. Our study provides evidence of strong responses of tree species and functional leaf traits to changes in climate caused by altitudinal gradients in subtropical rain forests.

Müllerová J.

Oral presentation

Remote sensing in invasive ecology? Detection, monitoring and control of alien plant species

Special session: Remote sensing for vegetation science

Jana Müllerová [1,*], Josef Brůna [1,2], Petr Dvořák [3] & Petr Pyšek [1,2]

[1]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [2]Faculty of Science, Charles University in Prague, Prague, Czech Republic; [3]Institute for Aerospace Engineering, Brno University of Technology, Brno, Czech Republic

* Presenting author: jana.mullerova@ibot.cas.cz

Plant invasions represent a serious threat to changing landscapes. Once fully established, the invaders spread rapidly, outcompete native species and their removal and elimination is difficult. Early detection enabled by the means of remote sensing (RS) could make the management more efficient and less expensive. In an ongoing project, we aim at developing innovative methods of mapping invasive plant species (semi-automatic detection algorithms) by using purposely designed unmanned aircraft (UAV) and combination of aerial and satellite optical RS data. We examine the possibilities for detection of several invasive herbs, such as *Heracleum mantegazzianum*, *Robinia pseudoacacia*, *Ailanthus altissima*, and *Fallopia* s. l. (*F. japonica*, *F. sachalinensis* and *F.* × *bohemica*). Our aim is to establish fast, repeatable and efficient computer-assisted method of timely monitoring of invasions applicable over large areas, reducing costs of extensive field campaigns. We evaluate the imagery of different origin (satellite, aerial and UAV), spectral (panchromatic, multispectral and color), spatial (very high to medium) and temporal resolution, and various technical approaches (object-based – OBIA, pixel-based and hybrid approaches). The rule-based OBIA hierarchical classification was successfully applied for detection of *H. mantegazzianum* even on low spectral resolution historical panchromatic aerial photographs and the results let us to study the process and progressing of invasion in detail. Thanks to its flexibility and low cost, UAV enables to assess the effect of phenological stage and spatial resolution on the recognition of the species, and is most suitable for monitoring the efficiency of eradication efforts. However, several challenges exist in UAV application, such as geometrical distortions, radiometric differences during the flight, high amount of data to be processed and legal constrains for the UAV flight missions over urban areas (often highly invaded). In our study, we address trade-offs between spectral, spatial and temporal resolutions required for balance between the precision of detection and economic feasibility. The resulting data enable assessment of the invasibility of different types of habitat, modelling the potential species distribution and identifying the drivers of spread; the derived knowledge can serve as a valuable input for prediction, monitoring and prioritization purposes in other areas.

Muslimovic S.

Poster P-24 (young scientist)

Patterns of vegetation diversity of mesic and wet grasslands of *Molinio-Arrhenatheretea* class in the central part of Bosnia and Herzegovina

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Senida Muslimovic [1,*] & Samir Dug [2]

[1]Division of Conservation Biology, Landscape Ecology and Vegetation Ecology, University of Vienna, Vienna, Austria; [2]Faculty of Science, University of Sarajevo, Sarajevo, Bosnia and Herzegovina

* Presenting author: senida.muslimovic@yahoo.com

Mesic and wet grassland vegetation is, along with forest vegetation, one of the most widespread vegetation types in the central part of Bosnia and Herzegovina. In this study, 164 relevés of the *Molinio-Arrhenatheretea* class have been analyzed. Grasslands and mesic pastures of the *Molinio-Arrhenatheretea* class in the study area are differentiated into five alliances and three orders. Differentiation is influenced mainly by moisture, followed by temperature, light and soil reaction. The most antropogenically influenced grasslands in the study area are represented by the community *Arrhenatheretum elatioris*. From the viewpoint of nature conservation, plant communities from *Pancicion* alliance are most valuable, because of the notable diversity of species and communities, as well as a considerable number of threatened plant species.

Naaf T.

Oral presentation

Acido- and neutrophilic temperate forest plants display distinct ecological niche shifts across north-western Europe

Special session: Species and plant community responses along soil gradients

Tobias Naaf [1,*], Jennifer Reinecke [2], Monika Wulf [1], Lander Baeten [3], Jörg Brunet [4], Guillaume Decocq [5], Pieter De Frenne [3], Martin Diekmann [6], Bente J. Graae [7], Thilo Heinken [8], Martin Hermy [9], Aurélien Jamoneau [5], Jonathan Lenoir [5], Jan Plue [10], Anna Orczewska [11], Hans Van Calster [12] & Kris Verheyen [3]

[1]Institute of Land Use Systems, Leibniz-Centre for Agricultural Landscape Research (ZALF) Müncheberg, Germany; [2]Department of Botany, Section Phanerogams I, Senckenberg Natural History Museum Görlitz, Görlitz, Germany; [3]Forest & Nature Lab, Ghent University, Gontrode-Melle, Belgium; [4]Southern Swedish Forest Research Centre, Swedish University of Agricultural Sciences, Alnarp, Sweden; [5]UR "Ecologie et Dynamique des Systèmes Anthropisés" (EDYSAN, FRE 3498 CNRS-UPJV), Amiens, France; [6]Vegetation Ecology and Conservation Biology, Institute of Ecology, FB2, University of Bremen, Bremen, Germany; [7]Department of Biology, Norwegian University of Science and Technology, Trondheim, Norway; [8]Biodiversity and Systematic Botany, Institute of Biochemistry and Biology, University of Potsdam, Potsdam, Germany; [9]Division Forest, Nature and Landscape, University of Leuven, Leuven, Belgium; [10]Department of Physical Geography and Quaternary Geology, Stockholm University, Stockholm, Sweden; [11]Department of Ecology, University of Silesia, Katowice, Poland; [12]Research Institute for Nature and Forest (INBO), Brussels, Belgium

* Presenting author: naaf@zalf.de

It is known that the ecological niche of organisms varies across geographical space. However, both the patterns in niche shifts between regions and the underlying mechanisms remain largely unexplored. Understanding these patterns and mechanisms is a prerequisite to make reliable predictions of species' responses to global change drivers. Here, we studied shifts in the pH niche of 42 temperate forest plant species across a latitudinal gradient from northern France to boreo-nemoral Sweden. Specifically, we asked (i) whether species restrict their niche with increasing latitude as they reach their northern range margin (range-margin hypothesis); (ii) whether species expand their niche with increasing latitude as regional plant species richness decreases (competitive-release hypothesis); and (iii) whether species shift their niche position towards more acidic sites with increasing latitude as the relative proportion of acidic soils increases (local-adaptation hypothesis). Based on 1458 vegetation plots and corresponding soil pH values, we modelled species response curves separately for four regions using Huisman-Olff-Fresco models. Four niche measures (width, position, left and right border) were compared among regions by randomization tests. Niche contractions (33%) and expansions (29%) with increasing latitude occurred similarly often. With increasing latitude, neutrophilic species tended to retreat from acidic sites, indicating that these species contract their niche to the most favourable sites when approaching their range margin. Alternatively, these species might benefit from enhanced nitrogen deposition in southern regions, or lack behind in recolonizing their potential habitats in northern regions after the last glaciation. Most acidophilic species extended their niche towards more base-riche sites with increasing latitude, indicating that these species are released from competition through neutrophilic species. Alternatively, some acidophilic species might benefit from optimal climatic conditions in the North where they have their core distribution area. Shifts in the niche position towards more acidic sites (29%) were no more common than shifts towards more base-rich sites (19%), suggesting that local adaptation is of minor importance. Our study demonstrates that differentiating between acidophilic and neutrophilic species is a crucial step forward in the identification of general patterns and mechanisms in shifts of plant species' pH niche.

Nagel T.A.

Oral presentation

Three decades of tree mortality and recruitment across old-growth forests of Slovenia

Special session: Global change and vegetation dynamics: the use of historical data sets

Tom A. Nagel * & Dejan Firm

Department of Forestry, University of Ljubljana, Ljubljana, Slovenia

* Presenting author: tom.nagel@bf.uni-lj.si

In the temperate region of Europe, much of our understanding of late-successional (old-growth) forest dynamics is based on inferences from stand structure or historical reconstructions from dendroecological data. Very few studies have made direct long-term observations of demographic processes, yet such information is critical for understanding stand dynamics. We used data from a three-decade study of permanent plots located in ten old-growth forest reserves distributed throughout Slovenia to examine long-term rates of mortality and recruitment. The forest reserves are dominated by *Fagus sylvatica* or mixtures of *F. sylvatica* and *Abies alba*. The study includes 19 plots ranging from 0.4–2 ha in size and more than 5000 tagged trees > 5 cm diameter at breast height (dbh). Following their establishment around 1980, some plots were re-censused in the 1990s, and all plots were censused between 2010 and 2013; measurements include dbh, mortality, and type of mortality. Preliminary results indicate that mortality and recruitment rates varied between species, among forest reserves, and over time. Among the forest reserves included in the preliminary analysis that were not damaged by windthrow, the overall annual mortality rate ranged from 0.7–1.4% for *F. sylvatica* and 0.5–1.9 for *A. alba*. In general, mortality rates were highest for the smallest (5–20 cm dbh) and largest (> 70 cm dbh) diameter classes, reaching up to 2.5%/year for both species, although size-specific mortality rates varied widely among plots, reserves, and census periods. For reserves that had a second remeasurment in the 1990s, the annual mortality rate increased by more than 1% in the recent census period for large canopy trees. Two of the reserves were damaged by windstorms, with individual events killing about 20% of the trees. In all of the mixed stands, recruitment into the smallest diameter class was low for *F. sylvatica* (0–3.8%/year), and completely lacking for *A. alba*. These results provide some of the first long-term estimates of demographic rates in temperate old-growth forests of Europe and will provide an important baseline to assess future rates of mortality due to global change.

Nakano Y.

Poster A-13 (young scientist)

Plasticity of life history strategy of *Pterocarya rhoifolia* under different snowfall conditions

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Yosuke Nakano [1,2,*] & Hitoshi Sakio [3]

[1]Graduate School of Science and Technology, Niigata University, Niigata, Japan; [2]Tadami Beech Center, Fukushima, Japan; [3]Field Center for Sustainable Agriculture and Forestry, Faculty of Agriculture, Niigata University, Niigata, Japan

* Presenting author: nkn.yhsk@gmail.com

Background and aims: Japanese wingnut (*Pterocarya rhoifolia* Sieb. et Zucc.) is a dominant tree species in riparian forests in the cool temperate zone of Japan. This species grows in areas that receive light snowfall as well as areas that receive very heavy snowfall. Heavy snow levels can kill individuals of some tree species by uprooting the trees or breaking trunks. In this study we investigated how heavy snow affects the life history of *P. rhoifolia* by measuring tree size, growth form, number of sprouts, and seed production along a snowfall gradient.

Study sites and methods: We established four study sites in riparian forests along small streams in central Japan: Ooyamazawa (Chichibu Mountains), Ookouchizawa (Sado Island), and Tadamisawa and Akakurasawa (Tadami region). The forest age and maximum snow depth were 120 years and 30 cm at Ooyamazawa, 70 years and 140 cm at Ookouchizawa, 50 years and 200 cm at Tadamisawa, and 50 years and 480 cm at Akakurasawa. We measured diameter at breast height (DBH), tree height, stem length, number of sprouts, and seed production of *P. rhoifolia* at each site.

Results: The growth form of trees at Akakurasawa was noticeably different than at the other sites. At Akakurasawa, *P. rhoifolia* trees grew along the ground surface in a dwarf form. In contrast, trees at the other sites grew straight and upright. Mean tree height was significantly less at Akakurasawa (4.3 m) than at the other sites (25–35 m), and the mean ratio of tree height to stem length also differed significantly between Akakurasawa (36%) and the other study sites (95–100%). The mean number of sprouts in a stool was much greater at Akakurasawa (40) than at the other sites (3–5). The distribution of DBH sizes varied among the sites: Tadamisawa had a continuous L-shaped distribution, Ooyamazawa and Ookouchizawa had less continuous L-shaped distributions, and Akakutasawa had a continuous inverse J-shaped distribution. Seed production at Akakurasawa was also much less than at the other sites.

Conclusions: These results suggest that *P. rhoifolia* grows in a dwarf shrub form under heavy snow conditions, with many sprouting stems that maintain the population but less seed production. This represents a trade-off between vegetative reproduction (sprouting) and sexual reproduction (seed production) in response to snowfall levels.

Nettan S.

Oral presentation (young scientist)

The role of co-evolution between competitors on community structuring in calcareous grasslands

Special session: Integration of evolutionary processes into invasion studies

Siim Nettan *, Anette Sepp, Maria Abakumova, Rein Kalamees, Anu Lepik, Kersti Püssa, Sirgi Saar, Merilin Saarma, Marge Thetloff, Qiaoying Zhang, Kristjan Zobel & Marina Semchenko

Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: siimnettan@gmail.com

Studies on invasive plant species show that invader often have severe negative effect on root systems of local species. The mechanism of this can be either direct inhibition by root exudates or indirect by changing microbial community in the soil in an invaded range. By contrast, the invader does not have similar effects to neighbour plants in their native range. The absence of negative effect in the natural communities suggests that naturally co-occurring plant species may have evolved resistance to exudates of their neighbours and do not affect microbial communities. To understand the role of non-toxic exudates in a plant community we designed an experiment to compare co-evolved plant communities. We used eight common plant species from three calcareous grasslands in Estonia (distance between sites is more than 40 km). We planted artificial communities of 16 plant individuals, with always two from every species. Those communities consisted of genotypes originating from one location (natural community) or of genotypes originating from two locations (novel community). Community origin was in factorial design with activated carbon and soil sterilisation treatment, to see the role of root exudates or soil microbes, respectively. All combinations resulted in 244 pots. The experiment lasted for three years and each year we measured parameters separately. We found that the root exudates supported higher species richness in the natural community in 2012 ($P = 0.045$) and one species more in 2013 ($P = 0.035$). Root exudates also promoted overall productivity ($P = 0.005$) and especially aboveground productivity of graminoids ($P = 0.010$) in the natural community. In the absence of soil microbes, the aboveground biomass of graminoids was one gram heavier ($P = 0.045$) at first year and year later the aboveground biomass was more than 1.5 grams heavier ($P = 0.020$) in the natural community.

Neuenkamp L.

Oral presentation (young scientist)

Arbuscular mycorrhizal fungi and ecosystem restoration: A local and global perspective

Lena Neuenkamp [1,*], Rachel Standish [2], Suzanne Prober [3] & Martin Zobel [1]

[1]Department of Botany, University of Tartu, Tartu, Estonia; [2]School of Veterinary and Life Sciences, Murdoch University, Perth, WA, Australia; [3]CSIRO, Land and Water Flagship Australia, Perth, WA, Australia

* Presenting author: lena@ut.ee

During recent decades ecological restoration has become increasingly important for mitigation of ecosystem degradation and global change, for biodiversity conservation and maintenance of ecosystem services. Understanding complex ecological processes, such as those governing ecosystem structure and function, is essential for successful ecological restoration. The need for improved monitoring and evaluation of restoration output calls for improved methods and indicators of success. Soil mycorrhizas are a poorly understood but potentially highly important component of ecological recovery, and considering them in the practice and evaluation of restoration could be an important step forward to improve the ecological quality of restoration interventions. There is a growing body of research demonstrating that mycorrhizal fungi can affect growth of individual plants and, at the community level, may affect community assembly. With regard to communities of herbaceous plants the role of arbuscular mycorrhizal fungi (AMF) is potentially of great importance because many herbaceous species form associations with AMF. While several studies have investigated the impact of AMF on plant community composition and plant performance, studies exploring the role of AMF in restoration projects are less common but increasing. We present evidence for the importance of AMF in restoration at two scales. First, we describe a literature review summarizing the effect of AMF on the outcomes of ecosystem restoration, focusing on dispersal limitation of AMF, success and need for inoculation techniques and usefulness of AMF as a restoration tool depending on the restoration target. Second, to illustrate the conclusions from the literature survey, we describe the results of a field study investigating covariation of plant and AMF communities during secondary succession of semi-natural grasslands. Findings from co-variation analysis imply that plant and AMF communities are clearly correlated in grasslands but diversity as well as correlation of plant and AMF communities decline with shrub and tree encroachment. This further indicates that AMF might be an important factor in structuring grassland plant communities with AMF diversity promoting plant diversity. Thus restoration of grassland plant communities might be retarded by a lack of proper symbiotic AMF, either due to a lack of local fungal propagules, or due to the presence of profoundly altered local AMF communities.

Ni J.

Poster A-14

Vegetation in karst terrain of southwestern China allocates more biomass to roots

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Jian Ni [1,2,*], Libin Liu [1,2] & Yangyang Wu [1,2]

[1]State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang, China; [2]Puding Karst Ecosystem Observation and Research Station, Chinese Academy of Sciences, Puding, China

* Presenting author: nijian@vip.skleg.cn

In mountainous areas of southwestern China, especially in Guizhou Province, continuous, broadly distributed karst landscapes with harsh and fragile habitats often lead to land degradation. Research indicates that vegetation located in karst terrains has low aboveground biomass, and land degradation reduces vegetation biomass, but belowground biomass measurements are rarely reported. Using the soil pit method, we investigated the root biomass of karst vegetation in five degraded (successional) stages: grassland, grass-scrub tussock, thorn-scrub shrubland, scrub-tree forest, and mixed evergreen and deciduous forest in two sites of central and southern Guizhou Province, respectively. The results show that roots in karst vegetation, especially the coarse roots, and roots in rocky habitats, are mostly distributed in the topsoil layers (89% on the surface up to 20 cm depth). The total root biomass in all habitats of all vegetation degradation periods is 18.77 Mg ha^{-1}, in which roots in rocky habitat have higher biomass than in earthy habitat, and coarse root biomass is larger than medium and fine root biomass. The root biomass of mixed evergreen and deciduous forest in karst habitat (35.83 Mg ha^{-1}) is not greater than that of most typical, non-karst evergreen broad-leaved forests in subtropical regions of China, but the ratio of root to aboveground biomass in karst forest (0.37) is significantly greater than the mean ratio (0.26 ± 0.07) of subtropical evergreen forests. Vegetation restoration in degraded karst terrain will significantly increase the belowground carbon stock, forming a potential regional carbon sink.

Nijs I.

Oral presentation

A novel self-organization mechanism in deserts with phytogenic mounds

Ivan Nijs [1,*], Jan Quets [1], Stijn Temmerman [2], Magdy I. El-Bana [3], Saud L. Al-Rowaily [4] & Abdulaziz M. Assaeed [4]

[1]Department of Biology, Centre of Excellence PLECO (Plant and Vegetation Ecology), University of Antwerp, Wilrijk, Belgium; [2]Department of Biology, Ecosystem Management, University of Antwerp, Wilrijk, Belgium; [3]Department of Botany, Faculty of Science, Port Said University, Port Said, Egypt; [4]Department of Plant Production, College of Agriculture, King Saud University, Riyadh, Saudi Arabia

* Presenting author: ivan.nijs@uantwerpen.be

Phytogenic mounds, also called nebkhas, are burial-tolerant plants which have been trapping wind-borne sediment within their canopies. They are widespread in drylands where they often are buffers against the damaging effects of land degradation and desertification. The dynamics of nebkha landscapes are however understudied, while desertification is globally intensifying. Here we suggest that the formation of mounds by nebkha-forming plants generates a feedback cycle of events that leads to biogeomorphological self-organization in deserts. The cycle starts with the reduction of wind speed in areas with high nebkha densities, owing to the greater surface roughness compared to more barren areas. The resulting sedimentation (deposition of particles, also between the nebkhas) elevates these landscape parts where nebkhas are abundant, concentrating the runoff water during rainfall events in the topographic depressions with less frequent nebkhas. The soil moisture in areas with few nebkhas therefore progressively improves over time while it deteriorates in nebkha-dense areas, respectively promoting and suppressing the growth of existing nebkhas as well as the emergence of new seedlings. Topographic lows thus eventually become denser in nebkhas, which subsequently elevates these areas. The nebkhas on topographic highs, on the other hand, decline, which brings erosion and eventually topographic depression. Here the cycle recommences. We demonstrate these mechanisms for a study site in central Saudi Arabia where nebkha presence and size were monitored over a three-year period with remote sensing, together with the collection of elevation data. Nebkha growth was positive in depressions (interpreted as the result of better soil moisture conditions) and negative, mostly even leading to strong size shrinkage, on topographic highs (understood as the outcome of low available soil moisture). Seedling emergence exhibited the same spatial pattern. These findings imply that the vegetation cover in landscapes with phytogenic mounds is spatially rearranged over time, according to a dynamic equilibrium where nebkha density and size locally oscillate. Man-made planting of nebkha cuttings in wet years, as a potential mitigation measure against desertification, may benefit from this knowledge by concentrating the cuttings in landscape parts where chances of successful establishment are greatest.

Nobis M.

Poster P-25

Diversity and distribution of rock vegetation in the Pamir Alai Mts (Middle Asia: Tajikistan)

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Marcin Nobis [1,*], Arkadiusz Nowak [2], Agnieszka Nobis [1] & Sylwia Nowak [2]

[1]Department of Plant Taxonomy, Phytogeography and Herbarium, Institute of Botany, Jagiellonian University, Kraków, Poland; [2]Department of Biosystematics, Laboratory of Geobotany and Plant Conservation, Opole University, Opole, Poland

* Presenting author: m.nobis@uj.edu.pl

Tajikistan is a country of rocks. Almost a half of the country area is a bare, rocky land dominated by rupicolous plant communities. Although not rich in species, the rock vegetation is unique and very interesting. This is because harsh and extreme chasmophytic habitats can serve as suitable biotopes for many endemic and specialized plant species. Approximately 30% of vascular plant species known from Tajikistan are generally accepted endemics. During our phytosociological research in the Pamir Alai Mountains carried out in 2007–2013, ca. 600 phytosociological relevés were sampled using the Braun-Blanquet method. In our studies we focus on phytocoenoses dominated by plants able to colonize rock clefts, ledges, cracks and fissures of rock faces, stone walls, and bare solid rocky substrates. This group of species is termed chasmophytes, petrophytes or rupicolus plants. As a result of field research and numerical analyses, 35 associations representing two classes *Asplenietea trichomanis* and *Adiantetea capili-veneris* were distinguished. The most associations belong to the former class, of which 29 represent phytocoenoses of vascular plants and four of pteridophytes. Based on differences in species composition, determined mainly by climatic conditions and altitudinal range of particular plant species, the two main alliances can be distinguished there, *Caricion koshewnikowii* distributed in montane and colline zones, and *Asperulo albiflorae-Poion relaxae* distributed mainly in alpine and subalpine zones. Patches of *Caricion koshewnikowii* are distributed between (780–) 980 and 1950 (–2250) m a.s.l., whereas those from the second alliance are found between (1400–) 1800 and 3200 (3700) m a.s.l. The alliances differ also with respect to the rock substrate. On acidic rocks, such as granite, schist, conglomerate or gneiss most of the associations from *Caricion koshewnikowii* alliance (e.g., *Scutellarietum schugnanicae*, *Dionysietum involucratae*, *Tylospermetum lignosae*) were recorded, whereas associations from *Asperulo albiflorae-Poion relaxae* were found on alkaline substrates (e.g., *Asperulo-Stipetum zeravshanicae*, *Inuletum glauce*, *Sergietum regelii*, *Asperuletum fedtschenkoi*). Other significant features affecting the diversity of vegetation are insolation and inclination of the rock faces, e.g. *Dionysietum involucratae* often occurs on overhanging walls on southern and south-western slopes, whereas *Tylospermetum lignosae* prefers northern, shaded sides.

Noedoost F.

Oral presentation (young scientist)

Comparing plant functional types in an old-field and a natural rangeland vegetation

Fariba Noedoost [1,*], Mohammad Jankju [2] & Maryam Nikan [3]

[1]Department of Biology, Faculty of Science, Khatam Alanbia University of Technology, Behbahan, Iran; [2]Department of Range and Watershed Management, Ferdowsi University of Mashhad, Mashhad, Iran; [3]MSc Graduated, Department of Biology, Ferdowsi University of Mashhad, Mashhad, Iran

* Presenting author: fariba.noedoost@gmail.com

This research was conducted to compare plant functional types (PFT) and traits in an old-field (abandoned for 28 years) and a control site, in the Baharkish rangelands, Quchan, Iran. At both sites, 40 randomized quadrats were established. Floristic list, frequency, canopy cover and 20 vegetative, phenological and morphological plant traits were measured for all plant species, within each quadrat. According to the Pearson correlation analysis, and by using R software, nine plant traits including life form, plant canopy, reproduction mode, reserve organ, root type, leaf phenology, growth form, life cycle, and regeneration mode, were known as the major plant functional traits. Data classification and ordination were applied on a matrix of 9 traits × 112 species, by using CANOCO and TWINSPAN software. It led to identification of five plant functional types. Total canopy cover of two PFT was significantly (70%) reduced and that of three PFT's was increased by 10–20% in the abandoned field. In conclusions, plants being annual, therophytes, geophytes, and rhizomatus are tolerant, whereas those being perennial (phanerophytes, chamaephytes and hemicryptophytes), having tap root system, and wide canopy cover are sensitive to ploughing disturbance.

Noroozi J.

Oral presentation (young scientist)

A survey of the alpine vegetation of the Iranian mountain ranges

Jalil Noroozi [1,*] & Wolfgang Willner [2]

[1]Department of Conservation Biology, Vegetation and Landscape Ecology, University of Vienna, Vienna, Austria; [2]Vienna Institute for Nature Conservation & Analyses, Vienna, Austria

* Presenting author: noroozi.jalil@gmail.com

Our study focuses on the vegetation types of the alpine region of Iranian mountains. In this study we wanted to know which plant communities occupy these ecosystems and what is their syntaxonomic position? Which environmental factors determine the species composition of these habitats? Almost 700 phytosociological relevés were collected in altitudes between 3000 and 4800 m a.s.l. from Alborz and Azerbaijan mountains in N and NW Iran. This data set was classified using TWINSPAN, and the numerical classification was translated into a syntaxonomic system. Floristic differences between vegetation types were evaluated using detrended correspondence analysis (DCA). A total of 319 vascular plant species were recorded and four major vegetation types were recognized in this study: (1) Tall herbs and umbelliferous vegetation, which is mainly dominated by species belonging to the *Apiaceae*, occupy the subalpine zone. (2) Alpine snow-bed vegetation with one alliance and three associations. (3) Thorn-cushion grasslands, which usually cover the alpine xerophyte habitats, with three alliances and 10 associations. (4) High-alpine and subnival scree communities were arranged in two orders, three alliances and ten associations. The assignment of these orders to phytosociological classes is still provisional except for the scree communities for which a new class, *Didymophyso aucheri-Dracocephaletea aucheri* was described. The study introduces a syntaxonomic classification of alpine vegetation types in Iranian mountains, thus providing a scheme for ongoing ecological surveys and monitoring programmes to assess the impacts of climate warming and human land use on these unique ecosystems.

Novák P.

Poster P-27 (young scientist)

Vegetation of European oak-hornbeam forests – an introduction to the project

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Pavel Novák & project partners

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

pavenow@seznam.cz

Oak-hornbeam forests are mesophilous deciduous forests dominated by oaks and mesophilous tree species. Mesophilous forest herbs prevail in their field layer and their floristic composition is influenced by both environmental and historical factors. They are distributed at lower altitudes of Europe, mainly in the subcontinental climatic regions of the temperate zone. In Central and Western Europe oak-hornbeam forests are predominantly classified within the alliance *Carpinion betuli*. Nevertheless their association-level syntaxonomy on the supranational scale is still unresolved and syntaxonomical systems used in different countries are rather inconsistent. Across the whole of Europe the situation is even less clear. About fifteen alliances of oak-hornbeam forests are currently recognized in Europe, but syntaxonomical revision based on numerical analysis of international data sets still missing. The first aim of this starting project is to prepare a dataset of phytosociological relevés of oak-hornbeam forests from the whole continent. Relevés were obtained mainly from the European Vegetation Archive (EVA) using a two-step selection procedure. In the first step relevés classified by their authors to the alliances of oak-hornbeam forests were selected. In the second step other relevés were chosen that contained at least one of the tree species characteristic of oak-hornbeam forests with a cover higher than 5%. Applying this approach a primary dataset was obtained. This dataset contains ca. 84,000 relevés, of which ca. 19,000 were classified by their authors to the alliances of oak-hornbeam forests, ca. 43,000 were classified to other alliances and the rest of them remains unclassified on the alliance level. In the next step relevés of the primary dataset are subject to stratified resampling using various approaches. Subsequently relevés containing the target vegetation will be classified and a revised syntaxonomical system (on the association level for Central and Western Europe, on the alliance level for the whole Europe) based on the results of numerical analysis will be proposed.

Nowak A.

Poster P-28

Crop type and altitude are the main drivers of species composition of arable weed vegetation in Tajikistan (Middle Asia)

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Arkadiusz Nowak [1,*], Sylwia Nowak [1], Marcin Nobis [2] & Agnieszka Nobis [2]

[1]Department of Biosystematics, Laboratory of Geobotany & Plant Conservation, Opole University, Opole, Poland; [2]Department of Plant Taxonomy, Phytogeography and Herbarium, Institute of Botany, Jagiellonian University, Kraków, Poland

* Presenting author: anowak@uni.opole.pl

The influence of broad-scale environmental factors on the species composition of segetal weed communities in Tajikistan was investigated. The research was conducted throughout the country, analysing plots of root crops as well as cereals from all phytogeographical regions of Tajikistan with the exception of the eastern Pamir. The study was based on 440 phytosociological relevés sampled between 2009–2013 and analysed using direct and indirect ordinations. A set of environmental variables was obtained for each plot: altitude, mean annual precipitation, mean annual temperature, pH, crop type, longitude, latitude and date of sampling (seasonality). Crop type was the major factor determining species composition, which was related to the different farming practices in root crops and cereals. Major changes in weed species composition were also driven by altitude and correlated temperature. The seasonality of weed communities also had a considerable effect on weed community structure. Samples from spring differed significantly from samples from summer and late summer. Only longitude and soil pH were found to be insignificant. The complete set of environmental variables used in a canonical correspondence analysis explained 8.32% of the species variation in sampled plots. The study showed that despite the very diverse climatic conditions and low intensity of agriculture in Tajikistan, agrocoenoses respond mainly to the type of cultivation practised in arable lands.

Okitsu S.

Poster I-07

Distribution of two temperate conifers, *Picea alqoquiana* and *Pinus koraiensis*, in the Last Glacial in central Japan: a key to reconstruct developmental processes of present humid forest vegetation of Japan

Special session: Long-term perspectives on vegetation change

Susumu Okitsu

Faculty of Horticulture, Chiba University, Matsudo city, Japan

okitsu@faculty.chiba-u.jp

Two temperate conifers, *Picea alqoquiana* and *Pinus koraiensis*, are rare at present in Japan. Previous palaeobotanical studies reported on macrofossil data for the two conifers obtained throughout Japan at the Last Glacial; they occurred much more abundantly than at present. The generally accepted view is that they consisted of continental type of coniferous forests under cold-dry continental climate in the Last Glacial in central Japan. These overviews suggest that the two conifers have experienced unique distribution history since the Last Glacial. We surveyed the distribution of the two conifers along a soil moisture gradient in the upper stream of the river Ussuri in the Russian Far East to reconstruct a reliable distribution history of the two conifers. Along the river Ussuri, the two conifers are principally distributed on mesic and moist sites with mesic types of deciduous broad-leaved trees such as *Populus maximowiczii*, *Chosenia arbutifolia*, *Fraxinus mandshurica* and *Ulmus japonica*. They are completely missing in the dry sites in contrast to the generally accepted view, where xeric/dry species such as *Quercus mongolica*, *Betula davurica* prevail. The survey results show that (1) actually no continental type of coniferous forests consisting of the two species in the Russian Far East as well as in central Japan occurs at present, and (2) the two conifers are ecologically temperate mesic type in nature. The abundant outcrops of macrofossils of the two conifers in the Last Glacial throughout Japan indicate that in the Last Glacial the two conifers prevailed on the mesic and moist sites which preserved macrofossils well. The most prominent feature of the tree distribution in the Last Glacial in central Japan was that the two conifers made the mixed forest with deciduous broad-leaved trees on the lowland mesic and moist sites. *P. koraiensis* played an important ecological role in the establishment of the mixed coniferous and deciduous broad-leaved forest. Vegetation of Japanese mountains has been developed under humid-per humid climate of northern Pacific since the Last Glacial. This overview is in contrast with generally accepted view that in the Last Glacial, Japanese mountains experienced cold-dry continental climate.

Osyczka P.

Poster G-09

How do substrate factors determine cryptogamic vegetation structure and species richness in various contaminated habitats? A comparative study of psammophilous grasslands, wastelands and slag dumps

Special session: Species and plant community responses along soil gradients

Piotr Osyczka [1,*] & Kaja Rola [2]

[1]Department of Polar Research and Documentation, Institute of Botany, Jagiellonian University, Kraków, Poland; [2]Department of Plant Taxonomy, Phytogeography and Herbarium, Institute of Botany, Jagiellonian University, Kraków, Poland

* Presenting author: piotr.osyczka@uj.edu.pl

Cryptogams, mainly lichens and bryophytes, frequently constitute a main part of biomass in initial terrestrial-ecosystems development. They are known as effective and rapid colonisers of bare ground and play a fundamental role in spontaneous succession of both natural and anthropogenic habitats. Heavy metal contamination generally leads to a decrease in biodiversity and impoverishment of lichen and bryophyte communities. On the other hand, cryptogams are often regarded as stress tolerators, and some of them are strongly linked to metal-rich substrates. Moreover, their occurrence at polluted sites is frequently favored by low competition from vascular plants. This comparative study concerns cryptogamic communities occurring in various strongly disturbed and contaminated habitats located in the industrial region of southern Poland. Lichens and bryophytes were examined in 45 study plots: 14 related to poor grasslands, 13 to wastelands, 12 to post-smelting slag dumps heavily contaminated by Cd, and the last 6 to slag dumps heavily contaminated by Zn, Pb, As. The chemical properties (As, Cd, Pb, Zn, C org., N tot. and pH) of corresponding substrate samples were analyzed. This allowed us to assess which edaphic parameters most affect the structure and species richness of cryptogamic communities within various anthropogenic and contaminated habitats. Altogether, 32 cryptogamic species, including 7 bryophytes and 25 lichens (mainly *Cladonia* spp.), were recorded in the plots. Generally, three different responses of cryptogams to metal contamination were recognized, i.e. tolerant, sensitive, and indifferent species. Cryptogamic community structure corresponds to the type and degree of soil contamination and this fact indicates that the occurrence of some specific assemblages of cryptogams is not accidental. The results showed that cadmium contamination of the substrate has the greatest negative impact on the species richness among all considered heavy-metals. In contrast, very low soil fertility does not adversely affect species diversity. Due to their pioneer nature cryptogams undoubtedly constitute an important element in the natural regeneration of disturbed habitats.

Acknowledgements: The project was financially supported by the National Science Centre (Decision No. DEC-2012/05/N/NZ8/00842).

Paal T.

Oral presentation (young scientist)

Functional trait-based ecology explains the limited use of corridors by forest-dwelling plants

Taavi Paal * & Jaan Liira

Department of Botany, University of Tartu, Tartu, Estonia

* Presenting author: taavi.paal@ut.ee

Woody corridors in fragmented landscapes have been proposed as dispersal enhancing landscape elements or surrogate habitats for forest plants. We studied the dispersal of common forest-dwelling plants from forest interiors to and along woody corridors located in open agricultural landscape. We used statistical models to explain what limits the success of forest plant dispersal via species' traits and corridor properties. We sampled 50 forest–corridor transects in the agricultural landscapes of south-eastern Estonia. The selected forests are dominated by deciduous trees and both forest and corridor are located on analogous soils to maximise the similarity of habitat conditions between them and to enhance species dispersal. This allowed us to concentrate on the detection of corridor specific effects. Our target group of interest was regionally common forest-dwelling species, having establishment difficulties outside of forest, labelled as forest-restricted species (F species). They were observed in at least 10% of dispersal source forests. We searched for trait convergence with two groups of reference species. First group, a more analogous type to F species – forest dwelling generalists (G species), are also forest dwellers, but successful in utilising corridors. The second group consisted of common corridor-dwelling species, which are common in corridors, but rare in forests. We found that species richness and the proportion of F species decreased sharply from the seed-source forest interior to forest edge and to the first 10–15 m of the corridor, while the species richness of G species remained constant throughout the transect. Light conditions were important for the presence of both F and G species in corridors, while corridor age and width had an opposite effect for these two groups, as F species had a positive correlation and G species a negative correlation with time and width. Trait convergence between forest-restricted and generalist or corridor-dwelling species was observed mainly in traits which are related to establishment and environmental tolerance. The results indicate that dispersal-related traits had mostly a diverging pattern along the transect, which indicated their low functional role in dispersal into corridors. We conclude that most woody corridors are only dispersal stepping-stone habitats for habitat generalist species, and not for specialists.

Pakeman R.J.

Oral presentation

Long-term changes in Scottish coastal vegetation

Robin J. Pakeman

The James Hutton Institute, Aberdeen, United Kingdom

robin.pakeman@hutton.ac.uk

Comparing surveys carried out centred on 1976 and 2010 allowed us to look at long-term changes in Scottish dune and Machair vegetation. Using attribute and indicator values, little change could be ascribed to climate change but significant change due to nitrogen enrichment. The impact of these drivers varied between habitats and between regions.

Palmer M.W.

Oral presentation

Tallgrass prairie plants ride a multidimensional carousel

Michael W. Palmer

Department of Botany, Oklahoma State University, Stillwater, OK, USA
mike.palmer@okstate.edu

The carousel model of van der Maarel and Sykes, which stresses the high temporal turnover ("mobility") of plants in species-rich grasslands, is now 22 years old. Nonetheless, the phenomenology of mobility has remained imperfectly explored, despite the availability of long-term data sets. In this study, I take advantage of a publicly-available data set featuring 12 years of annual data from a tallgrass prairie in Oklahoma, from permanent quadrats of four grain sizes: 0.01, 0.1, 1.0, and 10.0 m^2. For the 104 most frequent vascular plant species, I analyze previously developed indices of mobility (extinction, immigration, residence time, relative residence time, persistence, carousel time, and relative cumulative frequency) and two new ones (simultaneity and philopatry) at the four grains. Carousel times range from 16 years to 4000 years at the finest scale, and from 1 to 250 years at the broadest scale. While most indices behave predictably as a function of scale (e.g. residence times increase with grain), different life history strategies scale in different ways. For example, rhizomatous forbs tend to have high fine-scale mobility and low broad-scale mobility, whereas annual plants tend to have high mobility at all grains. Philopatry (the tendency stay and/or return to previously occupied locations) is negatively correlated with simultaneity (the tendency to appear or disappear in the same years across sites) at all grains, yet a number of species behave counter to this relationship (for example, the annual grass *Bromus arvensis* exhibits both simultaneous and philopatric behavior). While some generalizations can be made about life histories, species do not form neat groups with well-defined mobility strategies.

Palpurina S.

Poster with lightning talk C-11 (young scientist)

Fine-scale species richness in Eurasian dry grasslands: does nutrient limitation matter?

Session: Patterns and drivers of alpha and beta diversity in plant communities

Salza Palpurina [1,*], Milan Chytrý [1], Viktoria Wagner [1], Annika Brinkert [2], Jiří Danihelka [1,3], Norbert Hölzel [2], Johannes Kamp [2], Pavel Lustyk [1], Kristina Merunková [1], Zdenka Preislerová [1], Michal Hájek [1], Petra Hájková [1,3], Michal Horsák [1], Martin Kočí [1], Svatava Kubešová [1,4], Mikhail Cherosov [5], Nikolai Ermakov [6], Dmitry German [7,18], Paraskovia Gogoleva [9], Nikolai Lashchinsky [6] & Vassiliy Martynenko [10]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Institute of Landscape Ecology, University of Münster, Münster, Germany; [3]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [4]Department of Botany, Moravian Museum, Brno, Czech Republic; [5]Institute for Biological Problems of Cryolithozone, Siberian Branch of the Russian Academy of Sciences, Yakutsk, Russia; [6]Central Siberian Botanical Garden, Russian Academy of Sciences, Novosibirsk, Russia; [7]Department of Biodiversity and Plant Systematics, Centre for Organismal Studies (COS) Heidelberg, Heidelberg University, Heidelberg, Germany; [8]South-Siberian Botanical Garden, Altai State University, Barnaul, Russia; [9]Institute of Natural Sciences, North-Eastern Federal University Named After M.K. Ammosov, Yakutsk, Russia; [10]Institute of Biology, Ufa Scientific Center, Russian Academy of Sciences, Ufa, Bashkortostan, Russia

* Presenting author: salza.palpurina@gmail.com

If a limiting nutrient is added, ecosystems will usually respond with an increase in their productivity, changes in species composition, and occasionally with a decline in species richness. The final outcome, however, depends on the nature of the nutrient limitation (N vs. P). Thus, under the anthropogenically increased input of N and P in terrestrial ecosystems, knowing whether dry grasslands are N- or P-limited enables better planning for their protection or restoration. Previous observational studies focused mainly on wet grasslands but little is known about what type of nutrient limitation prevails in temperate Eurasian dry grasslands, and whether their species richness depends on the nature of nutrient limitation (N vs. P). One the one hand, aridity and high soil pH should limit plant-available P because P is bound in an insoluble form under these conditions. On the other hand, adaptation to arid substrates could have compensated for P-limitation. No study has tested whether species richness in these vegetation types peaks in N-limited, P-limited, or in N&P co-limited communities, as reported for wet and moist grasslands. To explore species richness patterns in relation to different types of nutrient limitation in Eurasian temperate grasslands, we related fine-scale species richness (number of all vascular plant species in a 100 m^2 plot) to the N:P ratio (an indirect measure of the nature of nutrient limitation at the community level), using a sample of temperate grasslands from seven biogeographical regions spanning over a 6400 km gradient from the Czech Republic to eastern Siberia. We asked: (1) Is there a geographical pattern in the nature of nutrient limitation in dry grasslands across Eurasia? (2) Is there a peak in species richness at intermediate N:P values as suggested by previous studies?

Paluots T.

Poster D-21 (young scientist)

Vegetation assessment and habitat quality of Natura 2000 forest habitats in Estonia

Session: Vegetation science serving nature conservation

Teele Paluots *, Henn Korjus & Diana Laarmann

Institute of Forestry and Rural Engineering, Estonian University of Life Sciences, Tartu, Estonia

* Presenting author: teele.paluots@emu.ee

Protected forest areas contain many different habitats in Estonia, including old-growth remnant structures and various features originating from semi-natural woodlands (e.g. former pastures). Dynamics of habitats changes with the change of management regime of these ecosystems. EU Natura 2000 network of protected sites was formed in Estonia in 2004 resulting in drastic change of the management of selected new protected areas. After ten years, there are changes in habitat types and habitat quality in the Natura 2000 network. Unmanaged areas develop differently from previously assumed trajectories and habitat management and restoration treatments should be applied to meet conservation objectives. Vegetation composition and structural and functional qualities of two forest habitat types – Fennoscandian herb-rich forests with *Picea abies* and Western taiga (Habitats Directive habitat types 9050 and 9010 respectively) – are analyzed in this study. The study is based on sample plots from the Estonian Network of Forest Research Plots measured in 2013–2014 and located in protected and non-protected areas. *Aegopodium*, *Filipendula* and *Oxalis* forest site types are included for assessment of vegetation, tree structure and dead wood composition. Forest ecosystem composition and dynamics is compared on managed and unmanaged sites and possible ecosystem restoration measures are discussed in the study.

Pannek A.

Poster Q-01 (young scientist)

IAVS Young Scientists

Session: IAVS Reports

Angela Pannek [1,*], Kyle Palmquist [2], Alessandra Fidelis [3] & Michael Lee [4]

[1]Vegetation Ecology and Conservation Biology, Institute of Ecology, University of Bremen, Bremen, Germany; [2]Department of Botany, University of Wyoming, Laramie, WY, USA; [3]Departamento de Botânica, UNESP/Rio Claro, Bela Vista, Rio Claro, SP, Brazil; [4]Department of Biology, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

* Presenting author: APannek@uni-bremen.de

The Young Scientists (YS) are a section of the IAVS, founded in 2014, with the main goal of promoting the connectivity between young scientists in vegetation science and providing a more formal way for young scientists to communicate their needs to the Society. With the creation of this network, we aim at improving personal and scientific communication between young scientists and for them to gain more experience in the current issues of ecology around the world. Another key goal of this section is to encourage young researchers to present their own data, exchange experiences and initiatives, but especially to facilitate international research collaborations. Therefore, the main aim of this poster is twofold. For one, we would like to increase the awareness of our group, and second, we aim at initializing research cooperation between young researchers across the globe. If you are a Young Scientist yourself, we would like to encourage you to join our group, either by writing an e-mail to Angela or subscribing to our listserv at (*http://lists.unc.edu/read/all_forums/subscribe?name=iavs-ys*). You can also check out our Facebook site or webpage (*https://iavsyoungscientists.wordpress.com/*). You do not need to be a member of the IAVS to join in. At the moment, the YS consist of about 40 members from a variety of countries, with hopefully increasing numbers!

Parfenova E.

Poster J-22

The major forest-forming conifer tree species distribution across Siberia under climate change

Session: Patterns of vegetation change across landscapes

Elena Parfenova * & Nadezhda Tchebakova

Forest Institute of Siberian Branch of the Russian Academy of Sciences, Krasnoyarsk, Russia

* Presenting author: lena02611@rambler.ru

Our goal is to evaluate consequences of climate warming for forests and forest-forming tree species in Siberia. Our bioclimatic models of the Siberian forests and major tree conifer species were developed to predict their potential distribution in a changing climate by 2080 from GCM-predicted data. Each forest type and conifer distribution was mapped by coupling our bioclimatic model with bioclimatic indices and the permafrost distribution for the basic period and 2080. Climatic departures for the future climate were derived from two climate change scenarios the HadCM3 A2 and B1 reflecting the largest temperature increase and the smallest temperature increase correspondingly. The ecological ranges of forest-forming tree species are valuable for prediction of their distribution in a changing climate of the current century. The model input parameters are climatic indexes: growing degree days above 5 °C (GDD5), growing degree days below 0 °C (DD0), annual moisture index (AMI), equal GDD5/RMM, where RMM is annual precipitation. Potential habitats for *Pinus sylvestris*, *P. sibirica*, *Abies sibirica*, and *Larix sibirica* were classified in three-dimensional climatic space based on these indexes. Our modeled map of tree species distribution showed a fair match with the observed map. Based on a database compiled from forest inventory data of across Central Siberia, a relationship between mean stand heights of the first storey and climatic conditions of a habitat was found. Stand heights were mapped for Central Siberia using this relationship. The relationship was used to predict stand heights under climate change in 2080. Siberian forests were predicted to decrease and shift northwards and forest-steppe and steppe ecosystems were predicted to dominate 50% of central Siberia due to the 2080 drier climate. The forest zones could shift northwards as far as 600–1000 km by substitution or complete replacement of northern ecosystems. Light conifers (*Larix* spp. and *Pinus sylvestris*) may get an advantage before dark conifers in a predicted dry climate and may cover a larger area in the near future due to their stronger resistance to water stress and wildfire. The model also predicts new habitats suited to temperate broadleaf forests, non-existing presently, by 2080. In a changing climate, the stand height increase is predicted in southern and lowland montane dark taiga. The climatic range of the high site quality class (> 30 m) would extend and shift 500 km northwards.

Pätsch R.

Poster D-22 (young scientist)

Salt grasslands along the German and Polish Baltic Sea coast and the influence of wild grazing animals

Session: Vegetation science serving nature conservation

Ricarda Pätsch [1,*], Agnieszka Piernik [2] & Jasmin Mantilla-Contreras [1]

[1]RG Ecology and Environmental Education, Insitute of Biology and Chemistry, Hildesheim University, Hildesheim, Germany; [2]Department of Geobotany and Landscape Planning, Faculty of Biology and Environment Protection, Nicolaus Copernicus University of Toruń, Toruń, Poland

* Presenting author: paetschr@uni-hildesheim.de

Salt grasslands are semi-natural habitats along the Baltic Sea coast which replace the natural common reed stands of low-lying areas. They have developed through extensive anthropo-zoogenic management since the 13th century. Today, they are characteristic landscape elements of the Baltic Sea coast and provide a habitat for a very specialized flora and fauna. Salt grasslands have a great importance for coastal protection as they function as a natural sea defence. Due to embankment of large areas and abandonment of the traditional management, salt grasslands have dramatically declined and the remaining fragments are endangered. While the impact of anthropogenic managed grazing is well studied, there are only a few studies about the influence of so called “natural grazing”. This is especially of interest because in Poland, areas with salt grassland exist which never have been grazed by cattle and might have developed only because of natural grazing. An overview of different areas will be given, considering varying management and the different vegetation types found on salt grasslands along the German and Polish Baltic Sea coast. The occurring wild animals and their influence on salt grasslands and specific plant species will be presented. In conclusion, future prospects will be given.

Pavlů V.

Poster J-23

Long-term grazing management and its effects on *Agrostis capillaris* dominated grassland

Session: Patterns of vegetation change across landscapes

Vilém Pavlů [1,2,*], Lenka Pavlů [2], Vendula Ludvíková [2], Jan Gaisler [1] & Michal Hejcman [1,2]

[1]Weeds and Vegetation of Agroecosystems, Grassland Research Station Liberec, Crop Research Institute, Liberec, Czech Republic; [2]Department of Ecology, Faculty of Environmental Sciences, Czech University of Life Sciences Prague, Prague, Czech Republic

* Presenting author: grass@volny.cz

In contrast to cutting, grazed grasslands are influenced by other factors, including: trampling; in situ nutrient addition by urine and faeces; seed dispersal; and selective defoliation by animals. Grazing management therefore usually leads to enhanced structural heterogeneity of the sward canopy. To study the effect of long-term different grazing intensity on vegetation on previously abandoned semi-natural grassland we established a randomized block experiment in 1998 with the following treatments: unmanaged control (U), intensive (IG) and extensive (EG) continuous grazing, first cut followed by intensive (ICG) and first cut followed by extensive (ECG) continuous grazing for the rest of the growing season. There were measured following sward characteristics: (i) Density of all vascular plant species was visually estimated in 100 cm^2 circles; (ii) Percentage cover of all vascular plant species was recorded in permanent 1 × 1 m plots; (iii) The percentage cover of all vascular species was recorded along the line transect in 707 cm^2 circles. Almost immediate increase in densities of all sward components, especially grass tillers, in comparison with the unmanaged control was a characteristic change after introduction of grazing on the previously abandoned grassland. It is evident that increases in plant density as a function of intensive defoliation are not restricted to the frequently documented effect on grass tillers but also can occur in many legume and forb species. The diversification in plant species composition created by different defoliation occurred in the fourth year of the study. Abundance of tall grasses and tall forbs reflected the intensity of management in the order U > EG, ECG > IG, ICG. Prostrate forbs, on the other hand, increased their cover with increasing intensity: ICG > IG > ECG > EG. Floristic composition of patches within the same sward height depended upon stocking density. Moderate and tall patches under a given stocking density had similar botanical composition. Vegetation within short patches differed considerably from that of other patches under extensive grazing, whereas under intensive grazing the differences between short, moderate and tall sward-height patches were small. The findings show grazing intensity is a key driver of the sward density, sward floristic composition as well as the floristic composition of sward-height patches in *Agrostis capillaris* dominated grassland.

Pedrotti F.

Poster P-29

Multi-level integrated mapping for the Val di Sole (Trentino, Central Alps) on a scale of 1:15,000

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Franco Pedrotti

University of Camerino, Camerino, Italy

franco.pedrotti@unicam.it

This work presents a multi-level integrated map on a scale of 1:15,000 for the Val di Sole, Trentino (central Alps), a valley that runs latitudinally between 700 and 2572 m of elevation, one slope of which has northern and the other southern exposure, and thus presenting strong ecological dissymmetry. The lithology is formed of limestones, granites, gneisses and alluvial deposits. Six geobotanical maps and one environmental map were elaborated. The geobotanical maps refer to the following levels of integration: (1) a phytosociological map (actual natural vegetation), with 38 associations belonging to 12 vegetation classes: *Caricetea curvulae*, *Elyno-Seslerietea*, *Salicetea herbaceae*, *Scheuchzerio-Caricetea fuscae*, *Festuco-Brometea*, *Molinio-Arrhenatheretea*, *Querco-Fagetea*, *Rhamno-Prunetea*, *Vaccinio-Piceetea*, *Betulo-Adenostyletea*, *Chenopodietea*, *Plantaginetea*; (2) a map of the dynamic tendencies of the vegetation; (3) a map of 31 vegetation series (sigmeta), mapped analytically, with all the component stages; (4) a more concise (synthetic) map of the vegetation series (sigmeta), with only the climax associations (map of the potential vegetation); (5) a map of the 4 vegetation geoseries (or geosigmeta), corresponding to the 4 lithological types listed above; and (6) a map of the vegetation belts (lower and upper hilly, lower and upper montane, subalpine and alpine). The map of systems and subsystems of the landscape comprises the following systems: those of carbonatic substrata, of siliceous substrata, of alluvial and fluvio-glacial deposits, and of anthropic environments. From the methodological point of view, it must be observed that the boundaries of classic phytosociological maps (map no. 1) have been included in the other maps as well, so as to facilitate their use. In some cases these boundaries were adapted according to the vegetation series. The map with the greatest amount of information is the phytosociological map integrated in analytical form (map no. 3), because it combines the map of current vegetation (associations), the dynamic relationships among the associations of the same series and the potential vegetation (climax associations), the vegetation belts, and the geoseries. For this reason, the integrated phytosociological map (analytical form) proves to be more meaningful than the classical phytosociological map.

Acknowledgement: The technical preparation of the maps in the laboratory was done by E. Murrja (Camerino).

Peppler-Lisbach C.

Oral presentation

Patterns of species richness and turnover along the pH gradient – comparing forest and grassland communities

Special session: Species and plant community responses along soil gradients

Cord Peppler-Lisbach

Landscape Ecology Group, Institute of Biology and Environmental Sciences, University of Oldenburg, Oldenburg, Germanny

cord.peppler.lisbach@uni-oldenburg.de

Species richness patterns along ecological gradients result from niche overlap or niche segregation of individual species from a respective species pool. In this study, realized niches of forest and grassland species with respect to pH were quantified employing Huisman-Olff-Fresco (HOF) models. The response curves were used to calculate turnover rates at any position along the gradient. Apart from total turnover rates, turnover rates of increasing and decreasing species were separated. Looking at the balance of turnover resulting from increasing and decreasing species allows for closer insights in the shift of species composition and richness along the gradient. Confounding effects of other ecological factors were assessed by analyzing turnover rates of different ecological species groups according to their indicator values, e.g. for soil moisture or nitrogen content. A major discontinuity in grassland species composition between pH (H_2O) 4.5 and 5 corresponded to a similar pattern in forests of the same region.

Peterka T.

Poster P-30 (young scientist)

Towards consistent classification of European fens

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Tomáš Peterka * & Michal Hájek

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: peterkatomasek@seznam.cz

Fens (i.e. minerotrophic mires of the *Scheuchzerio palustris-Caricetea nigrae* class) are remarkable habitats with a unique and specific species composition. Although their vegetation has been studied for almost 100 years, consistent vegetation system of European fens has not been established. The main reasons are incompatibility of national classification systems which are based on different concepts and bad accessibility of primary data (phytosociological relevés) from several regions. In 2013, Mire Ecology working group (Department of Botany and Zoology, Masaryk University, Brno, Czech Republic) started to carry out the project of large-scale synthesis and syntaxonomical analysis of European fens. The relevés were obtained from national/regional vegetation databases, private databases of mire ecologists and the research of the members of the working group. Moreover, relevés published in papers and monographs were computerized. The latter activity has resulted in the new vegetation database containing more than 10,000 plots of mire vegetation including those parts of Europe without any national/regional database (mostly Fennoscandia and the Balkan region). Our next aims are (1) to create the classification of European fens using semi-supervised methods and (2) to test the floristic differentiation of particular alliances. This “general” classification will be compared with the results of unsupervised classification (the ISOPAM method) performed on several local data subsets of a medium-size.

Piernik A.

Oral presentation

Species-environment relations in inland saline areas in Central Europe

Special session: Species and plant community responses along soil gradients

Agnieszka Piernik

Chair of Geobotany and Landscape Planning, Faculty of Biology and Environment Protection, Nicolaus Copernicus University, Toruń, Poland

piernik@umk.pl

In the humid climate of Central Europe natural sites of inland halophilous vegetation are connected with fossil salt deposits uplifted to the surface. The research covers most of the existing sites of inland saline areas in Poland and the most typical places in Germany. In total 285 plots were included. Plant species were recorded by Braun-Blanquet method. In each plot soil sample from the root zone was taken. In soil samples chemical properties were determined. As far as possible each plot were classified within categories of management type. Factors determining the pattern of species distribution were identified based on CCA analysis and variation partitioning procedure. Species were grouped based on their frequency within the studied patches. Ecological response of species from the most frequent groups were analysed in detail. The minimum and maximum salinity (ECe) values were quoted at which they were present. Ecological optima of occurrence were calculated in relation to salinity and ionic composition in the soil as weighted average values at which species was found. Moreover species response curves along the ECe gradient were estimated. The GLM technique was applied. Analyses resulted in four types of species responses. Type I represents a decreasing response to increasing salinity characteristic of species that start their ranges on non-saline soils but end on saline ones. Type II represents unimodal response curves, only partially realised on saline soils, with the optimum in the initial part of the analysed gradient. Type III represents unimodal response curves realised entirely on saline soils, Type IV with two occurrence optima: one on non-saline soils and the other one on saline soils. The results for all species groups were discussed with existing halophyte data bases and salinity indicator values by Ellenberg and Zarzycki.

Pillar V.D.

Oral presentation

Searching for traits that predict community composition

Valério D. Pillar [1,*] & Sergio Camiz [2]

[1]Department of Ecology, Federal University of Rio Grande do Sul, Porto Alegre, Brazil; [2]Department of Mathematics, Sapienza University of Rome, Roma, Italy

* Presenting author: vpillar@ufrgs.br

Predicting species composition in communities is challenging, for species coexistence is not only determined by shared ecological niches but also by more complicated assembly processes. Here we model potential community composition by trait-based fuzzy-weighting and compare it to well-known Beals smoothing. We use as input composition matrix **W** of species proportions in communities, and matrix **B** of species described by traits. Beals smoothing is applied to **W** without including the abundance of the target species for the estimation of their own probability of occurrence in a community, resulting in matrix **Z** of species by communities. For the fuzzy-weighting of community composition in **W**, the species probability of occurrence in a community is estimated based on the species trait similarities with other species observed in the same community. Thus, we use species traits to build a potential community composition matrix. For this, with the traits in **B**, a species by species similarity matrix **S** is computed. Since the traits may be of mixed type, we use the Gower similarity index. Normalizing the columns of **S** to their respective total, we obtain a matrix **U** whose columns define a similarity profile of each species with all others. We interpret its values as probabilities that species *j* be represented by another one, according to their similarity, under the assumption that the higher the trait similarity among species, the higher the chance to find another species in the place of the found one. We take each row *i* of **U** as a fuzzy set defined by species *i*, which is the neighbourhood of species *i* in the traits space. The more likely a species may be represented by species *i*, the larger is its degree of belonging to neighbourhood *i*. Fuzzy-weighted community composition is computed by right multiplying **U** by **W**, resulting in a species by communities matrix **X**, where each element in row *i*, column *k* is an estimation of the probability of occurrence of species similar to species *i* in community *k*. Then, a correlation *r*(**XZ**) between **X** and **Z** is measured, through Procrustes, RV and/or other methods, and its significance is tested by permutation of the rows of **B**, keeping **W** and **Z** constant. Examples with simulated and real community data indicate promising results. This approach allows analytically searching for traits that explain ecological structure and species coexistence in communities.

Pinto P.

Poster with lightning talk G-10

Optimizing floristic survey for plant bio-indication of forest soil characteristics

Special session: Species and plant community responses along soil gradients

Paulina E. Pinto [1,2,*], Jean-Luc Dupouey [2], Jean-Claude Gégout [1], Jean-Christophe Hervé [3] & Myriam Legay [4]

[1]LERFOB, Laboratoire de Recherche Forêt Bois, AgroParisTech, Nancy, France; [2]EEF INRA-Lorraine University, Forest Ecology and Ecophysiology Unit, Champenoux, France; [3]Laboratory of Forest Inventory, IGN Institut National de l'information Géographique et Forestière, Nancy, France; [4]ONF R&D Office National des Forêts, Research and Developpement, Nancy, France

* Presenting author: paulina.pinto.pro@gmail.com

Questions: Is it possible to reduce the time spent in the field to carry out a floristic inventory when the goal is to estimate soil resources by bio-indication?

Location: Temperate French forests.

Methods: We worked both at a national and a local level to encompass the large variability of French forest ecosystems, and to ensure the applicability of results to various stand types and management practices. At the large scale, 329 plots were distributed over the entire French territory by a selection of National Forest Inventory plots. At the local scale, 166 plots were installed across three forests in northeastern France using a systematic sampling design. In each plot a timed floristic inventory was fulfilled and the pH (H_2O), C:N ratio and base saturation (BS) were measured in the laboratory from a sample of the A-soil layer. The same three soil parameters were predicted at the plot level from vegetation inventories using the pH, C:N ratio and BS species indicator values (IV) of the EcoPlant database. Using a resampling procedure, the plot bio-indicated values were computed for an increasing number or proportion of species, and an increasing time effort. Predicted values were compared with measured values and the performance of predictions was evaluated by: (i) the square of the linear correlation coefficient between measured and predicted values (R^2), and (ii) the root mean square error (RMSE) of predictions.

Results: The number rather than the proportion of species included in estimations was determinant for pH (H_2O) predictions' quality. Bio-indication of pH (H_2O) and BS was optimal using the first 20–25 species recorded per plot, corresponding to a 15–25 minutes long inventory. The C:N ratio showed a lower bio-indication performance with a greater number/time necessary to reach maximum goodness of prediction (25 species, 25–35', respectively). We evidenced that the order of species have a significant effect in the performance of the prediction, the first species being more informative than those recorded at the end of the plot inventory. Results were similar at the national and local levels.

Conclusions: When the objective is to estimate soil nutritional resources by plant bio-indication, it is feasible to significantly reduce the time spent on floristic inventory, and thus their cost. This is especially true when the goal is mapping of soil characteristics. Our results could help decision making in forest management, at both large and local levels, and national scale monitoring of soil changes.

Pipenbaher N.

Poster A-16

Influence of cutting on species and functional composition of mesotrophic lowland hay meadows

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Sonja Škornik [1], Nataša Pipenbaher [1,*], Sandra Kneževič [3], Branko Kramberger [2] & Mitja Kaligarič [1,2]

[1]Biology Department, Faculty of Natural Sciences and Mathematics, University of Maribor, Maribor, Slovenia; [2]Faculty of Agriculture and Life Sciences, University of Maribor, Hoče, Slovenia; [3]Izseljenska 8, Slovenska Bistrica, Slovenia

* Presenting author: natasa.pipenbaher@um.si

European semi-natural grasslands are relicts of European traditional agricultural landscape and became threatened due to changes in the land use (intensification and/or abandonment). It is essential to provide the best management regime to ensure the conservation of these grasslands in the future. In this study we used results from long-term agricultural field experiment, which was established in 1995 at a semi-natural extensively used mesotrophic lowland hay grassland site (NE Slovenia). The experiment was started to study the effects of different cutting regimes on species and plant functional trait (FT) composition of a lowland hay meadow. The cutting frequencies were: 14–16 cuts per year, 7–8 cuts per year, 5 cuts per year, 4 cuts per year, 3 cuts per year and 2 cuts per year. Multivariate analysis revealed differences in floristic composition during the observed period. The surprising fact was that plots with the highest cutting frequency had the highest number of species, species evenness and Shannon diversity index, compared to the plots with the low cutting frequency. These observations can be explained as the result of favorable growth conditions (soil depth, adequate nutrient and water availability, optimal soil pH etc.) in studied plots that favor growing and expansion of ruderals. This result is also confirmed with the FT composition. The highest cutting regime decreased community weighted trait means (CWM) for plant height, SLA, LDMC and seed mass; increased the proportion of annuals and species with persistent green leaves. Rosette and semirosette plants had advantages for growth in high frequency cutting regime. The tallest vegetation, higher proportion of grasses, plants with scleromorphic leaves and consequently high LDMC values were recorded on the plots with low cutting regime. The CSR classification showed presence of larger numbers of species with ruderal strategy on the plots with higher disturbance regime. On the plots with lower disturbance regime the component C was more strongly expressed. We can conclude that if the abiotic soil conditions remain more or less unchanged (mesotrophic), there are small differences in species richness between different cutting regimes but cutting regime significantly affects floristic and functional composition of mesotrophic lowland hay meadows.

Pivello V.

Poster with lightning talk F-02

Can frequent fires affect the genetic diversity and population structure of a fire-prone plant species in the Brazilian savanna (Cerrado)?

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Vânia Pivello [1,*], Marcia Duarte-Barbosa [1], Miklos Bajay [2] & Maria Zucchi [3]

[1]Department of Ecology, University of São Paulo, São Paulo, SP, Brazil; [2]Department of Genetics, University of São Paulo, Piracicaba, SP, Brazil; [3]Agência Paulista de Tecnologia dos Agronegócios, Piracicaba, SP, Brazil

* Presenting author: vrpivel@usp.br

The Brazilian Cerrado is the world's most diverse savanna, where fire has been a selective agent with great influence on its ecological and evolutionary dynamics. Several endemic species show adaptations to fire, which may occur under different regimes (frequency, intensity, season, type). Genetic studies related to fire are recent and have not yet been reported to Cerrado. Therefore, we chose the fire-adapted species *Vellozia squamata* to investigate whether there was variation in the genetic diversity and population structure due to different fire regimes (frequency and season). The study was developed in the IBGE Ecological Reserve, Brasília, Brazil, where a long-term ecological fire project was installed. Experimental fires of different frequencies and seasons were applied from 1991 to 2011 in five 4 ha permanent plots. We developed 47 microsatellite markers (SSR) for the species, of which 10 were selected (polymorphic, on linkage equilibrium) and used for genotyping the sample population, represented by individuals of the five fire treatments. The results showed a genetic variability of He9 and HO proved to be restricted, indicating gene flow up to 174 m, and this estimate confirms the intermediate value of FST.

Png G.K.

Poster G-11 (young scientist)

Nitrogen fixation does not increase the phosphorus demand of native nitrogen-fixing plants adapted to contrasting soil phosphorus availabilities

Special session: Species and plant community responses along soil gradients

Guochen Kenny Png [1,*], Hans Lambers [1], Felipe E. Albornoz [1] & Etienne Laliberté [1,2]

[1]School of Plant Biology, The University of Western Australia, Crawley, Perth, Australia; [2]Institut de Recherche en Biologie Végétale, Département de Sciences Biologiques, Université de Montréal, Montréal, Canada

* Presenting author: kenny.png@research.uwa.edu.au

Atmospheric nitrogen (N) fixation in native N-fixing plants is thought to be constrained by low phosphorus (P)-availability because of the high P-cost of N fixation that is essential to sustain their "N-rich lifestyles". However, it remains unclear whether a higher P demand in native N-fixing species is due to the N fixation process or is needed to sustain plant growth. Indeed, it has been suggested that native N-fixing plants adapted to low soil P-availability do not have high P requirements for N fixation. Here, we grew four native south-western Australian N-fixing legume (*Acacia truncata*, *A. rostellifera*, *A. pulchella* and *Jackonia floribunda*) and one non-legume (*Allocasuarina lehmanniana*) species with contrasting soil P requirements in a glasshouse at three levels of phosphorus (0.1, 5 or 50 µg total $P.g^{-1}$ sand) crossed with two levels of nitrogen (25 or 650 µg total $N.g^{-1}$ sand). Plant growth, biomass of symbiotic N-fixing structures, and ectomycorrhizal (ECM) colonisation were measured. At 0.1 µg $P.g^{-1}$ sand, growth of all species was limited and symbiotic N-fixing structures were absent. *Acacia truncata* (restricted to young, N-poor but P-rich soils) and *A. rostellifera* (more abundant on younger N-poor and P-rich soils, but also occurring on older P-poor soils) produced root nodules at 5 and 50 µg $P.g^{-1}$ sand with 25 µg $N.g^{-1}$ sand, but not at 650 µg $N.g^{-1}$ sand. At 5 µg $P.g^{-1}$ sand, *A. truncata* had higher ECM colonisation than *A. rostellifera*; however, ECM colonisation of *A. truncata* decreased at 50 µg $P.g^{-1}$ sand, and became similar to all other legumes grown at 5 and 50 µg $P.g^{-1}$, suggesting that ECM colonisation declines when P-availability increases. Similar rates of ECM colonisation between nodulated and non-nodulated *A. truncata* at 5 µg $P.g^{-1}$ sand suggests that N fixation did not increase P demand. Finally, consistently low arbuscular and ECM colonisation in *A. pulchella* and *J. floribunda* across all treatments suggest that these species, which are most abundant in older, P-impoverished soils, may not rely strongly on mycorrhizas for P-acquisition. We conclude that N fixation does not increase P demand in native N-fixing plants and species occurring on extremely P-poor soils do not necessarily rely on mycorrhizal symbioses for P-acquisition.

Potůčková A.

Poster I-08

The Early Holocene persistence of thermophilous Pannonian woodlands in the Danubian Lowland

Special session: Long-term perspectives on vegetation change

Anna Potůčková [1,2,*], Petra Hájková [2,3], Libor Petr [2] & Michal Horsák [2]

[1]Department of Botany, Charles University in Prague, Prague, Czech Republic; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic

* Presenting author: annapotuckova6@gmail.com

The Danubian lowland in the northern part of the Pannonian Basin played a major role in the spreading of thermophilous biota northwards after the Last Glacial Maximum. Indirect evidence suggests the persistence of mesophilous forest species in a northern cryptic refugium on the border of the Western Carpathians and the Pannonian Basin during the Last Glacial. Despite the importance of this area for European florogenesis, only a few palaeobotanical investigations have been made here. In this poster we present a new multi-proxy investigation based on macrofossils, pollen and snails extracted from travertine deposits near the village Santovka (southern Slovakia). The obtained palaeorecord covers the entire Early Holocene period (11,700–8200 BP). An oak-dominated forest with Pannonian understorey shrubs (*Staphylea pinnata*, *Cotinus coggygria*) was present at that time around a shallow pool with macrophytes (*Ceratophyllum submersum*, *Potamogeton pusillus*, *Myriophyllum verticillatum*) and many aquatic snails (e.g. *Bathyomphalus contortus*, *Valvata cristata*, *Anisus vortex*). The occurrence of *Chondrula tridens* and *Granaria frumentum* (steppe species) and *Sphyradium doliolum* and *Fruticicola fruticum* (forest and shrub species) indicate an open park-like character of the landscape with patches of woodlands and steppe grasslands. The study provides evidence that oak (*Quercus* sp.) occurred at the site since the beginning of the Holocene and other broad-leaved trees *Tilia cordata*, *Corylus avellana* and *Ulmus* sp. expanded at the site a thousand years later.

Prach J.

Poster I-09

The Czech “Lake Country” – Třeboňsko as an archive of the Late Glacial and the Holocene vegetation development

Special session: Long-term perspectives on vegetation change

Jindřich Prach [1,2,*], Jan Hošek [3,4], Petr Šída [5,6], Pavla Žáčková [1,2], Petra Houfková [5] & Petr Pokorný [1]

[1]Center for Theoretical Study, Charles University in Prague, Prague, Czech Republic; [2]Department of Botany, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [3]Institute of Geology and Paleontology, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [4]Czech Geological Survey, Prague, Czech Republic; [5]Laboratory of Archaeobotany and Palaeoecology Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [6]Department of Archaeology, University of Western Bohemia, Plzeň, Czech Republic

* Presenting author: jindraprach@gmail.com

The Třeboňsko Region (Biosphere Reserve and Ramsar Site) in the southern part of the Czech Republic is known for its sophisticated fishpond system, built mostly during the 16th century, and associated diverse wetlands. We suggest that the fishponds followed previous natural lakes and thus represent continuation of the natural development over the past ~14,000 years. Nowadays, natural lowland lakes are a rare phenomenon in central Europe, in contrast to Northern Europe (glaciated in the Last Glacial period) or the Alps. Recently, an interdisciplinary research including contribution of botanists, geologists, archaeologists etc., has revealed until now 10 former lakes (their thick sediments being preserved mainly under the water of the present artificial fishponds) in the territory of about 20 × 5 km. For the study of the long-term vegetation succession and the possible water ecosystem continuity, we selected a former lake “Velký Tisý”, the largest in the region (approximately 0.3 × 1 km in size). Nine meters long core of the lake sediments provides an excellent palaeoenvironmental archive. Geochemical record reflects large-scale climatic oscillations. High-resolution pollen record is currently under investigation. This new locality provides a longer and more detailed palaeoenvironmental stratigraphy than earlier investigated Lake Švarcenberk, which has terrestrialized and changed to a peat bog ca 5500 years BP. Still many questions remain to be solved: What was the influence of hunter-gatherer communities (indicated by the archaeological evidence from the lake banks) on the surrounding vegetation and the whole lake ecosystem? How did the ecosystem respond to rapid climate changes in the Pleistocene/Holocene transition? Was there a continuity of open water ecosystem during the entire Holocene, i.e. between the Late Glacial Lake and the present fishpond?

Price J.N.

Oral presentation

Species-rich temperate grasslands on five continents are characterised by small-scale functional trait similarity

Jodi N. Price [1,*], Riin Tamme [2], Antonio Gazol [3], John W. Morgan [4], Steve Leonard [4], Claire Wainwright [5], Gisela C. Stotz [6], James F. Cahill [6], Juan José Cantero [7], César Núñez [7], Ricardo Ibáñez [8], Inga Hiiesalu [9], Ülle Reier [10] & Meelis Pärtel [10]

[1]School of Plant Biology, University of Western Australia, Crawley, Perth, WA, Australia; [2]Evolution & Ecology Research Centre, School of Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, NSW, Australia; [3]Instituto Pirenaico de Ecología (CSIC), Zaragoza, Spain; [4]Department of Ecology, Environment and Evolution, La Trobe University, Bundoora, VIC, Australia; [5]The Ecology Centre, School of Biological Sciences, The University of Queensland, St Lucia QLD, Australia; [6]Department of Biological Sciences, University of Alberta, Edmonton, AB, Canada; [7]Universidad Nacional de Río Cuarto, Río Cuarto, Córdoba, Argentina; [8]University of Navarra, Department of Environmental Biology, Pamplona, Spain; [9]Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [10]Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: jodi.price@uwa.edu.au

Temperate grasslands are diverse communities at small scales where plant species interact, generating questions about how species coexist when they require the same limiting resources. Coexistence may be promoted by functional differences among species reducing competition, if so we expect both species richness and functional diversity to be positively related to environmental heterogeneity, as heterogeneity provides opportunities for different species to coexist (niche partitioning). Alternatively, similarity may facilitate coexistence due to competitive equivalence among co-occurring species. We studied 48 temperate grassland sites in 6 countries (Canada, Estonia, Spain, Mongolia, Australia, and Argentina). There is large variability in species richness within and among the study sites, and we ask if there are general patterns in the relationship between functional similarity, species richness and environmental variability. In each site, we established a transect (10 × 0.1 m) consisting of 100 quadrats (10 × 10 cm). In each quadrat, we recorded species composition, and measured soil moisture, and light availability. We measured plant traits (height, leaf area, and specific leaf area) for most of the species occurring in each transect. We calculated functional diversity (FD) for all traits at the quadrat scale, and compared the observed FD to that expected at random using null models generated from species that occurred in the transect. Quadrat mean trait values and FD were then related to small-scale mean environmental conditions and heterogeneity respectively. We found co-occurring species were more functionally similar than expected for most traits. Functional similarity was partly related to small-scale environmental conditions; species were taller and had larger leaves with increased soil moisture, and increased size-related traits reduced light availability. Environmental heterogeneity was positively associated with FD for all of the measured traits, but was negatively related to species richness. Environmental heterogeneity promoted functional differences among species, which likely enabled the establishment of competitive hierarchies leading to species loss. The studied grasslands were characterised by small-scale functional similarity, suggesting coexistence may be maintained by competitive equivalence rather than functional differences.

Procházková J.

Poster D-23 (young scientist)

How does air pollution affect communities of epiphytic bryophytes on oaks?

Session: Vegetation science serving nature conservation

Jana Procházková * & Eva Mikulášková

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: jana.prochazkova@mail.muni.cz

This study is focused on the relationship between air pollution and species composition of epiphytic communities of bryophytes. Epiphytic bryophytes are good bioindicators, but bioindication ability of their communities has not been sufficiently explored. The main aim of the study was to find out whether (and how) the structure of epiphytic communities on oaks (*Quercus* spp.) in the Czech Republic is affected by the air pollution. Additional aims are to clarify whether the concentration of nitrogen in the moss thallus and the bark pH correspond with the level of air pollution, and whether the bark pH affects species composition of epiphytic bryophyte communities. Bryophytes were studied on oaks across climatically similar but differently polluted areas in the Czech Republic. The data gained during the field research were completed with data from maps and values of concentration of nitrogen in thalli of *Hypnum cupressiforme* Hedw. Structure of epiphytic bryophyte communities was significantly affected by the emission load. Clearly defined communities (belonging to the order *Orthotrichetalia* Hadač in Klika et Hadač 1944) were recorded on the study sites with low levels of air pollution. Communities from the areas with higher levels of air pollution lacked any diagnostic species. Sensitive species of bryophytes, e.g. mosses from the *Orthotrichaceae* family and the liverwort *Radula complanata* (L.) Dumort., were more frequently recorded on less polluted study sites. The amount of nitrogen in thalli of *Hypnum cupressiforme* corresponded with the level of NO_2 pollution on particular study sites. Phorophyte bark pH was not directly affected by the concentration of tracked pollutants in the air, but it strongly influenced epiphytic communities. Sensitive species of bryophytes preferred phorophytes with higher bark pH. According to results of this study communities of epiphytic bryophytes on oaks are significantly affected by air pollution. Only communities from areas with low level of air pollution are clearly defined and contain sensitive species.

Prokhorov V.

Poster with lightning talk N-04

Biodiversity data restoring with Beals smoothing method

Session: Vegetation in macroecological modelling

Vadim Prokhorov * & Tatiana Rogova

General Ecology Department, Institute of Ecology and Environmental Management, Kazan Federal University, Kazan, Russia

* Presenting author: vadim.prokhorov@gmail.com

Spatial distribution of species diversity is one of the key themes of modern ecology, with both theoretical and practical importance. It is important to detect diversity hotspots for the conservation. In species diversity mapping the main problem is the limited data availability caused by uneven spatial and temporal field studies. This problem is typical even for the areas with a long history of research. Moreover, the flora is a dynamic phenomenon constantly changing due to human activities and climate fluctuations. In this context it is necessary to count "unrecorded" and dormant species and to create probabilistic models of the species composition of different areas. For this models species pool concept can be used. We have attempted to estimate the spatial distribution of vascular plant species diversity on the Middle Volga landscapes (Tatarstan Republic, Russia) using one of the methods of data smoothing (Beals smoothing), in which species co-occurrence was used as predictors (Beals 1984). We have used data from 2006 georeferenced relevés stored in a regional vegetation database (GIVD ID EU-RU-011). The study area was divided into a grid of 10 × 10 km (100 km^2) and species list was compiled for each cell. Probability values of each species presence for 250 cells were calculated using Beals smoothing in the Vegan package of R software. Model calibration and determination of the probability threshold at which the species can be included in the list of species pool were performed by analysis of the original data. It was found that the probability threshold is 5% quantile of probability values sample of actually present species ($q_{0.05}$ = 0.1172775). Probabilistic lists of species were created and the number of species was calculated for each grid cell. Modeled values of species richness per 100 km^2 are in the range of 316 to 550 species, 409.5 on average. The model was visualized with Surfer 8.0 software and continuous isoline map of spatial distribution of species richness was created. This study demonstrated the possibility of using the method for creating spatial probabilistic models of biochorological diversity at different scales. It is planned to improve the model algorithm, as well as to use not only regular grid but also other spatial units such as landscapes or river basins.

Qiu S.

Poster A-17 (young scientist)

C4 plants explain slower decline in species richness than biomass along a drought gradient in northern China

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Hongyan Liu & Shuang Qiu *

Department of Ecology, College of Urban and Environmental Sciences, Peking University, Beijing, China

* Presenting author: 1401214697@pku.edu.cn

The response of grassland biomass and species richness to drought is an important issue under the current rapid warming and drying in the semi-arid region. Biomass and diversity are two significant indicators of ecosystem stability and the relationship between them has been a hot topic of plant community ecology for decades. We investigated the species traits and aboveground biomass of grassland communities in the central Inner Mongolian steppe of China, and measured $\delta^{13}C$ isotope of selected species according to plant functional groups to represent their water use efficiency. Regression analysis and Redundancy Analysis (RDA) were used to illustrate the variances of biomass and species richness, and the distribution of C3 and C4 plants. Results revealed that in response to elevated drought regime, species richness showed an invisible decrease, whereas much sharper drop was detected in biomass relative to species richness. At the plant functional groups level, numbers of C4 plants, which have obviously higher water use efficiency than C3 plants, exhibited a significant negative relationship with precipitation, suggesting more C4 plants under drier climate. Moreover, plant communities with high species richness, instead of those with high biomass, were more likely to own high water use efficiency. The above results implied that C4 plants may prevent the fierce decline of species richness at severe arid condition by rising community water use efficiency, so that plant communities under water deficiency could also maintain stability with the occurrence of C4 plants. Our work detected and illustrated the difference between decreasing trends of biomass and species richness along a drought gradient, which will contribute to climate change adaptation as well as grassland restoration in this region.

Raman M.

Poster with lightning talk D-24

Vegetation science underpinning the implementation of the European Habitats Directive

Session: Vegetation science serving nature conservation

Maud Raman *, Els De Bie, Jan Wouters & Gerald Louette

Research Institute for Nature and Forest, Brussels, Belgium

* Presenting author: maud.raman@inbo.be

The Habitats Directive 92/43/EEC wants to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. It establishes the EU wide Natura 2000 ecological network of protected areas to assure the long-term survival of Europe's most valuable and threatened species and habitats. The network incorporates Special Areas of Conservation designated by Member States under the Habitats Directive and Special Protection Areas designated under the 1979 Birds Directive. A full implementation of the Habitats Directive implies that all enlisted habitats and species attain a favourable conservation status all over the European territory. The term favourable conservation status refers to the optimal and long-term ecological functioning and conservation of habitats and species. Each member state has to make its own interpretation, which is expected to be based on scientific insights. Most Habitat Directive areas encounter severe environmental bottlenecks. Desiccation, acidification and eutrophication occur very often. To reach a suitable conservation status of habitats a huge effort is needed in environmental restoration combined with ecological restoration techniques. Furthermore damaging activities that could significantly disturb these species or deteriorate the habitats of the protected species or habitat types should be avoided. Therefore an appropriate assessment required under Article 6 of the Habitats Directive can be made. In this poster we want to give attention to the contribution of scientific research in the assessment of the impact of a project or plan, either alone or in combination with other projects or plans, on the integrity of the Natura 2000 site, with respect to the site's structure and function and its conservation objectives. The Flemish government (Northern Belgium) is now giving priority to vegetation science underpinning each stage in the step-wise approach of the assessment. This should result in more detailed habitat maps, clear habitat definitions, a clear concept of the favourable conservation status, a better documentation of biotic and environmental characteristics of each habitat type and improved evaluating methods.

Ranta P.

Oral presentation

Is high biodiversity a problem for urban governance?

Special session: Urban vegetation

Ari Jokinen, Pertti Ranta *, Ville Viljanen & Eveliina Asikainen

Department of Environmental Science, University of Helsinki, Helsinki, Finland

* Presenting author: pertti.ranta@saunalahti.fi

Despite its advance, conservation of urban biodiversity has limitations in catching the urban dynamics. In this paper we locate the problem in the imbalance between biodiversity potential of urban matrix and the policy focusing on green areas. The latter is powerful enough to keep the matrix biodiversity in limbo, which is a result from co-production between science, conservation practice and urban planning. Using recent literature and employing hotspot analysis as an experimental case study, we show that the originality of urban matrix is the key to biodiversity governance which is capable of making use of urbanization. Originality means emergent properties and unexpected novelties, and these features of the matrix are in productive tension with contextual determinacy. From this viewpoint, we develop grounds for a matrix-based approach to proactive biodiversity policy, using ambiguity as an asset. For exploring biodiversity potential of urban landscape from the viewpoint of originality, we outline a test bed which takes artifacts, modes of urban life, and urbanization as starting points.

Rapson G.

Oral presentation

Are New Zealand urban floras really different?

Special session: Urban vegetation

Gillian Rapson [1,*], Carlo Ricotta [2], Ullrich Asmus [3], Frank La Sorte [4], Ingolf Kühn [5], Petr Pyšek [6] & Ken Thompson [7]

[1]Ecology Group, Institute of Agriculture and Environment, Massey University, Palmerston North, New Zealand; [2]Department of Environmental Biology, Sapienza University of Rome, Roma, Italy; [3]Department of Environmental Engineering, University of Applied Science Weihenstephan-Triesdorf, Weidenbach,Germany; [4]Division of Biological Sciences, University of California, San Diego, USA; [5]Department Community Ecology, Helmholtz Centre for Environmental Research, Halle, Germany; [6]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [7]Department of Plant Science, University of Sheffield, Sheffield, United Kingdom

* Presenting author: G.Rapson@massey.ac.nz

New Zealand (NZ) has a very recent history of settlement, with urban areas only developing over the last 150 years, and most exotic species present only arriving within the last 180 years, and those from a very limited source pool, largely western European. Thus the country provides a useful test situation for the development of urban floras internationally. Initial survey work suggests that the urban floras of New Zealand appear basically homogeneous, with only minor differences between them, affected by distances from the coast, temperature regime, and level of infrastructural development. This is apparently due to their relatively recent and similar histories of colonisation. Of particular interest is the low abundance of native species persisting within developed environments. To see how the residence times of species differ in their place of origin and in NZ influenced the pairwise dissimilarity values among the various urban floras, we examined native European species and early introductions, known as archaeophytes. We compared species of European origin in 10 urban areas in New Zealand with the same species in 10 urban areas from each of Central European and United Kingdom (UK) urban databases. We calculated three pairwise dissimilarity values (Jaccard, species´ turnover and species´ richness difference) for four different combinations of urban floras, comparing the same species in NZ cities with: native species in the Central European cities; natives and archaeophytes in the Central European cities; native species in the UK cities; natives and archaeophytes in the UK cities. The pairwise Jaccard dissimilarity among urban floras was on average much higher in the NZ floras than in the Central European or UK floras. This difference was mainly due to the turnover component, which was significantly different between the NZ floras and the Central European and UK floras, whereas the richness difference component was not significantly different between NZ and Central Europe (or UK). This shows the influence of the residence times of the alien species on their homogenization effect in urban floras, with NZ urban floras less homogeneous than considered, and instead featuring high turnover rates between urban areas, while long residence times of species in urban areas of the northern hemisphere increase homogeneity.

Rašomavičius V.

Poster O-11

Changes of plant communities in areas invaded by *Heracleum sosnowskyi*

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Zigmantas Gudžinskas, Valerijus Rašomavičius * & Domas Uogintas

Nature Research Centre, Institute of Botany, Vilnius, Lithuania

* Presenting author: valerijus.rasomavicius@botanika.lt

Invasive plant species have considerable potential for changing community structure and ecosystem function of invaded areas. *Heracleum sosnowskyi* Manden. (*Apiaceae*) is one of the most invasive plant species in Lithuania as well as in a major part of East Europe. This study is based on analysis of two data sets. The first data set includes 48 relevés of plant communities with *H. sosnowskyi* stored in the Lithuanian Vegetation Database (EU-LT-001). The second data set was sampled using the plot method. Four 20 m long transects were arranged in different meadow communities. Each transect was arranged from the edge of *H. sosnowskyi* stand towards its centre and divided into twenty 1-m^2 sampling plots. Diversity of plant species and their cover were recorded in each plot. As a result of hierachical cluster analysis (square-root transformation, distance measure Sorensen (Bray-Curtis), Beta-flexible $\beta = -0.25$) of relevés, four groups of communities were distinguished. The first two groups include forest communities of the *Querco-Fagetea* and *Alnetea glutinosae* classes. The third group includes meadow communities of the *Molinio-Arrhenatheretea* class at various successional stages and degrees of degradation. The fourth group of relevés includes ruderal and anthropogenic communities which can be ascribed to the *Artemisietea* class. Significant reduction of the total number of plant species and the number of species characteristic of meadow habitats was revealed in communities invaded by *H. sosnowskyi*. Statistically reliable negative correlation between the cover of *H. sosnowskyi* and the total number of species in a community ($r_s = -0.88$, $p < 0.05$) as well as the number of characteristic meadow species ($r_s = -0.84$, $p < 0.05$) was found. Results of Principal Component Analysis (PCA) suggest that different plant communities increase their similarity under the impact of increasing cover of *H. sosnowskyi*. The higher is the cover of *H. sosnowskyi*, the higher is homogeneity of plant communities.

Rasran L.

Poster with lightning talk D-25

Factors determining distribution and population structure of endangered orchid species in the Danube floodplain

Session: Vegetation science serving nature conservation

Leonid Rasran *, Alexandra Plicka, Antonia Ettwein & Karl Georg Bernhardt

Department of Integrative Biology and Biodiversity Research, Institute of Botany, University of Natural resources and Life Sciences, Vienna, Austria

* Presenting author: Leonid.rasran@boku.ac.at

The Natura 2000 area of Austrian Danube floodplain harbours large populations of endangered orchids (*Orchis militaris*, *O. ustulata*). This area is currently affected by large scale restoration measures with expected impacts of orchid populations. We studied spatial distribution and population structure of orchids under consideration of the key factors: current land use, vegetation structure/light availability, litter accumulation, dominance of invasive *Solidago gigantea*, and activity of wild boars. The monitoring of orchid populations was performed in 2014 during the flowering time. We preselected 80 grassland sites within the area of lower Traisen based on aerial photos and estimated the population strength of both orchid species regarding flowering individuals. At representative subplots within the sites, vegetation structure (dominants, especially *Solidago gigantea*), litter accumulation and light availability were recorded. At two sites with the highest density of *Orchis militaris* and traces of wild boars the complete population (incl. juvenile and non-flowering individuals and their fitness-parameters) was recorded in 100 1-m² subplots (50 with and 50 without wild boar activities). About 1/3 of sites appeared to be overgrown with wood. The distribution of orchids within the remaining sites was rather inhomogeneous. The most sites harboured only a few individuals, while several sites close to the territory of the Altenworth water-power plant included thousands of flowering *Orchis militaris*. *Orchis ustulata* is sensitive to litter accumulation and occurs only at meadows without *Solidago gigantea*, while the taller-growing *O. militaris* seemed to coexist with *Solidago*, as far as the areas remain regularly managed. Shading by *Solidago* is less critical, as the main above-ground biomass of this species is developed in late summer, while the most important phase of live cyclus of orchids takes place in May-June. *Orchis militaris* in the area of Traisen is mainly threatened by abandonment and the invasion of riparian grassland sites by trees and shrubs, while the dominance of *Solidago* at regularly mown sites is tolerable. Wild boars selectively predating the tubers of flowering orchids can probably harm the low density population, but they produce gaps for the recruitment and establishment of juvenile plants. In large and dense populations of *Orchis militaris* positive and negative effects of wild boar activity are supposed to be in balance.

Reczyńska K.

Poster D-26 (young scientist)

Temporal changes of thermophilous oak forest communities against the background of their conservation status

Session: Vegetation science serving nature conservation

Kamila Reczyńska * & Krzysztof Świerkosz

Museum of Natural History, University of Wrocław, Wrocław, Poland

* Presenting author: kamila.reczynska@gmail.com

The maintenance of biodiversity is mainly based on the network of protected areas. Therefore, it is commonly accepted that the most valuable plant communities are protected within national parks or nature reserves. An example of such communities in Central Europe are thermophilous oak forests which, due to their great species richness, contribute to the protection of biodiversity at the local scale. Therefore, we wondered if the nature reserves continued to play their role in the protection of these communities. We focused on thermophilous oak forests in SW Poland. We selected two areas which were located within nature reserves and a further two which were similar in terms of habitat conditions but were used under the forest management. We analysed 148 semi-permanent plots sampled between 1967 and 2014. The transformation of vegetation within selected areas was assessed using relative changes in species density and ordinations (PCA). Habitat conditions were specified using Ellenberg indicator values (EIVs). A modified permutation test was used to assess the correlation of EIVs with the sample scores of the PCA main axes. Additionally, we analysed changes in Simpson diversity index within the studied objects. The results show that in both nature reserves there were no statistically significant changes in species composition of thermophilous oak forests over time. However, in analogous areas which were influenced by forest management the differences were statistically significant. We also found an increase in Simpson diversity index within all studied objects which was probably caused by the presence of new microhabitats where species (not strictly connected with forests) occurred. This process may have its origin in both forest management (within unprotected areas) as well as climate change, air pollution and high game density within all studied objects. Additionally, in all types of areas we observed statistically significant increase in EIV for soil reaction or/and nutrients which suggests that the probable reason for the observed changes may be an increasing deposition of nitrogen. The results confirmed that the nature reserves fulfilled their role during the studied period of time. However, analyses of both species diversity and EIVs suggest that some changes occur within protected areas, though they are slower than within analogous managed areas.

Rédei T.

Poster C-12

Estimation of the plant biodiversity of a biogeographical region with stratified sampling

Session: Patterns and drivers of alpha and beta diversity in plant communities

Tamás Rédei [1,*], Zoltán Botta-Dukát [1], János Bölöni [1], Anikó Csecserits [1], Attila Lengyel [1], Barbara Lhotsky [1], Attila Molnár [1], József Nagy [2], Gábor Ónodi [1] & Miklós Kertész [1]

[1]Institute for Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary; [2]Faculty of Horticultural Science, Corvinus University of Budapest, Budapest, Hungary

* Presenting author: redei.tamas@okologia.mta.hu

In this work we test the effectiveness of the estimation of the plant biodiversity in the Pannonic biogeographical region. We selected six most characteristic habitat complexes of the region: loess forest-steppe, sand forest-steppe, dolomite forest-steppe, alkaline vegetation, colline broad-leaved forests and wetlands. In each type four sampling areas of the size of 2 × 2 km were selected, two "sanctuaries" and two moderately disturbed. In each sampling area we collected three independent 20 × 20-m large phytosociological relevés in each floristically different vegetation type. To test the effectiveness of the estimation we compared the species richness of the whole study with the checklist of the Hungarian flora. We found 1157 vascular plant species in the relevés. This is 50% of the Hungarian flora, but 64% of the native species were present. Alien species and the flora of anthropogenic habitats were under-represented because of the semi-natural character of the sampling sites. Rare species with limited geographical distribution and/or small population were also under-represented. The flora of rare and not sampled habitats such as peat bogs, mud vegetation or acidic sands is completely missing. As a conclusion the method seems to be suitable to estimate the richness of the native flora of an unexplored biogeographical region. Additional sampling of rare habitats may increase the accuracy. However it is unsuitable to find rare or extremely local species.

Ricotta C.

Oral presentation

Biotic homogenization of Central European urban floras by alien species: the role of species turnover and richness difference

Special session: Urban vegetation

Carlo Ricotta [1,*], Zdeňka Lososová [2], Milan Chytrý [2], Lubomír Tichý [2] & Jiří Danihelka [2,3]

[1]Department of Environmental Biology, Sapienza University of Rome, Roma, Italy; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic

* Presenting author: carlo.ricotta@uniroma1.it

Human activities have progressively weakened biogeographical barriers to dispersal, such that the global spread and establishment of an increasing number of alien species has become one of the key processes affecting biodiversity all over the world. In this view, it has been repeatedly shown that alien species with different residence times have different impacts on the diversity of urban communities. In European cities, archaeophytes (species introduced before AD 1500), which are typically weeds of arable fields or ruderal species, now distributed over large areas tend to promote floristic homogenization of urban floras, whereas neophytes (species introduced after AD 1500) usually show the opposite effect. Still, our understanding of the effects of alien species on the diversity of the invaded biotas remains inadequate. Variations in beta diversity may reflect two different phenomena: species turnover and species loss (or gain) leading to richness differences. These patterns may be caused by different ecological and biogeographic processes, such that disentangling richness differences from species turnover is crucial for the complete understanding of the impact of alien species on the diversity of urban floras. The objective of this study is thus to test whether alien plant species affect the diversity of 32 European urban floras in terms of species turnover and richness differences, and how these patterns vary in distinct urban habitats. To gain insight into this matter, we analyzed the homogenizing effect of alien species on the native urban floras separately for archaeophytes and neophytes in order to assess whether the observed patterns differ between these two groups with contrasting historical, geographical and ecological features and different residence times in the invaded region.

Riibak K.

Oral presentation (young scientist)

Dispersal and establishment limitation determine large-scale dark diversity in Central and Northern Europe

Special session: The relevance of “dark diversity” for theoretical and applied ecology

Kersti Riibak *, Argo Ronk & Meelis Pärtel

Department of Botany, Institute of Ecology and Earth Sciences, University of Tartu, Estonia

* Presenting author: kersti.riibak@ut.ee

Dispersal and establishment limitation may be among the most important factors determining species distribution patterns at multiple spatial scales. Previous large-scale studies have shown that many plant species present in a given region are absent from environmentally suitable sites (i.e. they belong to dark diversity). Here, we test which species characteristics relating to seed production, dispersal and establishment limitation affect presence in dark diversity for seven regions across Central and Northern Europe. In addition, we explore how anthropogenic activities, local climate, and landscape heterogeneity affect seed production, dispersal, and establishment limitation. To explore these issues, we used data on vascular plant species distributions in 9834 grid cells (10 × 10 km) across Iceland, Finland, Estonia, the British Isles, the Netherlands, Germany and Switzerland. To estimate dark diversity for each grid cell, we applied geographic, biogeographic, and environmental filters. To estimate maximum dispersal distance, we used simple plant traits (e.g. dispersal syndrome, life form and seed characteristics). We also used seed size as an indicator of establishment potential and seed production. Dispersal limitation was detected in every region – species in dark diversity were characterized by shorter dispersal distances than observed species. Dark diversity species also had lighter seeds than observed species, suggesting that lower germination abilities for dark diversity species limited establishment of species. Both dispersal and establishment limitation decreased with increasing human population density and agricultural land-use intensity. We conclude that many species are absent from environmentally suitable sites in Central and Northern Europe because of a low ability to disperse over long distances and to establish in new localities. However, human activities have helped to promote species dispersal and to facilitate the establishment of small-sized seeds.

Rissi M.N.

Poster with lightning talk J-24 (young scientist)

Does fire season affect the phenological patterns in Cerrado?

Session: Patterns of vegetation change across landscapes

Mariana Ninno Rissi * & Alessandra Fidelis

Department of Botany, Universidade Estadual “Júlio de Mesquita Filho” UNESP, Rio Calro, SP, Brazil

* Presenting author: mariananinno@yahoo.com.br

Understanding the effects of different fire seasons on the local plant community is critical to effective management and restoration efforts. However, little is known about the phenological pattern of herbaceous layer of open physiognomies of Cerrado (Brazilian tropical savanna). Will fire season affect the phenological pattern in an open area of tropical savanna? We established 16 plots with different fire season treatments (4 plots/treatment, 10 subplots/plot): early- (EF, burned in May at the end of rainy season), mid- (MF, burned in July in the dry season), late-season fires (LF, burned in October at the beginning of the rainy season) and control (not burned). We counted the number of flowering and fruiting species, and calculated the percentage concerning the entire plant community. We analyzed for the plant community and for the different functional groups (graminoid, forb and shrub). All phenological observations were conducted before the prescribed fires and 3, 6, 9 and 12 months after experiments. Fire season affected phenological patterns for the plant community and different functional groups. More graminoid species flowered two months after fire in the EF plots. Forbs had more species flowering during the rainy season when burned in the late-dry season fire. A peak of species flowering occurred two months after the EF experiments. The results indicate different phenological patterns in post-fire environments. The different functional groups showed different responses to fire season.

Rocchini D.

Oral presentation

Uncertainty surfaces and maps of ignorance: the possibility of spatially estimating dark diversity

Special session: The relevance of “dark diversity” for theoretical and applied ecology

Duccio Rocchini [1,*], Matteo Marcantonio [1], Giles M. Foody [2], Carol X. Garzon-Lopez [1], Kate S. He [3], Ingolf Kühn [4], Markus Metz [1], Markus Neteler [1], Woody Turner [5] & Joaquin Hortal [6]

[1]Department of Biodiversity and Molecular Ecology, Research and Innovation Centre, Fondazione Edmund Mach, San Michele all’Adige, Italy; [2]School of Geography, University of Nottingham, Nottingham, United Kingdom; [3]Department of Biological Sciences, Murray State University, Murray, KY, USA; [4]Department of Community Ecology, Helmholtz Centre for Environmental Research – UFZ, Halle, Germany; [5]Earth Science Division, NASA Headquarters, Washington, DC, USA; [6]Departamento de Biogeografía y Cambio Global, Museo Nacional de Ciencias Naturales (CSIC), Madrid, Spain

* Presenting author: ducciorocchini@gmail.com

In ecology, a number of studies have dealt with the prediction of species diversity over space and its changes over time based on a set of predictors related to environmental variability, productivity, spatial constraints, and climate drivers. However, the observed diversity is a portion of the species pool which is strictly related to abiotic conditions and evolutionary history of species in the pool. In this study we aim to explicitly show uncertainty of the prediction of species distribution at a global scale. This is in line with the “dark diversity” concept extended to a global spatial scale. We will not deal with problems in the detectability of species but with hidden patterns in the probability of their distribution. Thus far, species distribution estimates based on field data sampling do not represent reality in a deterministic sense and are only estimates of potential presence. Therefore, the use of “maps of ignorance” representing the bias or the uncertainty deriving from species distribution modeling, along with predictive maps, is strongly encouraged. Uncertainty can derive from a number of input data sources, such as the definition or identification of a certain species, as well as location-based errors. The spatial distribution of uncertainty should explicitly be shown on maps to avoid ignoring overall accuracy or model errors. We propose methods mainly based on Bayesian logistic regression coupled with simulation-based Monte Carlo techniques and Cartograms applied to European and worldwide datasets for explicitly mapping uncertainty in the distribution of species in a Free and Open Source environment.

Rodríguez-Rojo M.P.

Oral presentation

Vegetation classification of the lowland hay meadows and mesic pastures in Western and Central Europe

Maria Pilar Rodríguez-Rojo [1,*], Borja Jiménez-Alfaro [2], Ute Jandt [3,4], Helge Bruelheide [3,4], Philip Perrin [5], Zygmunt Kącki [6], Federico Fernández-González [1] & Milan Chytrý [2]

[1]Environmental Sciences Institute, University of Castilla-La Mancha, Toledo, Spain; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Department of Geobotany and Botanical Garden, Institute of Biology, Martin-Luther-University Halle-Wittenberg, Halle, Germany; [4]German Centre for Integrative Biodiversity Research (iDiv), Leipzig, Germany, [5]Botanical Environmental & Conservation Consultants Ltd., Dublin, Ireland; [6]Department of Biodiversity and Plant Cover Protection, University of Wrocław, Wrocław, Poland

* Presenting author: MPilar.Rodriguez@uclm.es

European phytosociological classifications have always conceived the separation of the traditional lowland hay meadows from the mesic pastures with the description of the following alliances: *Arrhenatherion* and *Brachypodio rupestris-Centaureion nemoralis* for the hay meadows (mown once or two times a year), and *Cynosurion* for grazed mesic grasslands. However, management practices are often not clearly differentiated in the field or are subject to change over time. There are also ongoing debates among authors about the position of some associations, especially concerning the delimitation of *Arrhenatherion* meadows versus *Cynosurion* pastures. Therefore, a syntaxonomical revision is needed on a continental scale. The aims of this study is to establish the vegetation types of lowland hay meadows and pastures in Atlantic and Central Europe, and to describe their floristic composition and their correlation with geography and environmental factors. We compiled a vegetation database with *Arrhenatherion*, *Brachypodio-Centaureion nemoralis* and *Cynosurion* grasslands as assigned by the original authors. Data are from eleven countries (Austria, Belgium, Czech Republic, France, Germany, Ireland, the Netherlands, Poland, Spain, Switzerland, United Kingdom) covering the territories of Atlantic and Central Europe (Alps and Carpathians were excluded). 36 phytosociological associations were analyzed using semi-supervised k-means classification (with fixed centroids) on a geographically stratified dataset of 7583 relevés. The relevés classified into the established vegetation types were submitted to a detrended correspondence analysis (DCA). Results indicated that four main vegetation groups can be defined: (1) Atlantic and Submediterranean hay meadows and pastures; (2) Continental meso-hygrophilous hay meadows; (3) Continental and Pyrenean mesic and meso-xeric meadows; (4) Intensive hay meadows and mesic pastures. Soil trophic status and water content was the strongest driver of the variation in the floristic composition, followed by biogeographic factors. The definition of the European habitat 6510 (lowland hay meadows) is evaluated based on these results.

Rola K.

Poster G-12

Vascular plant species responses to soil factors in highly contaminated post-smelting dumps

Special session: Species and plant community responses along soil gradients

Kaja Rola [1,*], Piotr Osyczka [2] & Marcin Nobis [1]

[1]Department of Plant Taxonomy, Phytogeography and Herbarium, Institute of Botany, Jagiellonian University, Kraków, Poland; [2]Department of Polar Research and Documentation, Institute of Botany, Jagiellonian University, Kraków, Poland

* Presenting author: kajaskubala@interia.pl

The development of vegetation on heavy metal contaminated sites is difficult due to the unfavorable physical and chemical properties of the substrate, as well as the limited pool of species capable of colonizing them. The contamination has been usually expected to be the major factor that limits vegetation and determines community structure. However, also the other important habitat properties, e.g. pH and carbonate content, are crucial for plant development. This study aims to determine the effect of heavy metal contamination and other soil factors on particular species responses and the structure of plant communities occurring on nine post-smelting dumps located in the Upper Silesian Industrial Region (S Poland). Vascular plants were examined in 43 study plots and chemical properties of corresponding substrate samples, including pH, C org., N tot., Ca, Mg, P, K, and heavy metals Zn, Pb, Cd, As, were analyzed. The results showed that several vascular plant species are characterized by high constancy and frequently occur abundantly at the dumps. *Cardaminopsis arenosa*, *Silene vulgaris*, *Calamagrostis epigejos*, *Agrostis alba*, *Plantago lanceolata*, *Festuca ovina* and *Festuca tenuifolia* could be included to this group. These seven species appeared to be the most effective plant colonisers of the studied dumps. As regards heavy metal contamination, *Cardaminopsis arenosa*, *Festuca ovina* and *Silene vulgaris*, prove to be the most resistant to high concentrations of elements. In contrast, *Centaurea jacea*, *Lotus corniculatus*, *Agrostis capillaris* and *Erigeron acer* are associated with slightly less contaminated and macronutrient-rich dumps with high Ca and Mg contents and high pH values. Surprisingly, we did not record typical metallophytes on the studied dumps which have been frequently noted in metalliferous soils in other parts of Europe. Perhaps other adverse factors, such as strong isolation, unfavorable physical structure of slag dumps and poorly developed soil profile, prevent the occurrence of metallophytes that alternatively could colonize examined dumps. At least some of them occur in the vicinity of the study area. Nevertheless, we found several typical pseudometallophytes, i.e., *Silene vulgaris* and *Agrostis capillaris*, which could be recognized as beneficial for phytostabilization of slag dumps.

Acknowledgements: The project was financially supported by the National Science Centre (Decision No. DEC-2012/05/N/NZ8/00842).

Roleček J.

Oral presentation

Towards improved understanding of species coexistence in the extremely species-rich grasslands

Jan Roleček [1,2,*], Michal Hájek [2], Zuzana Plesková [1,2] & Petra Hájková [1,2]

[1]Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: honza.rolecek@centrum.cz

East-central European semi-dry grasslands belong to extremely species rich vegetation types and they even hold several world records in small-scale vascular plant species richness. During a thorough literature review and a brief field survey, we identified serious gaps in our knowledge of this phenomenon. We found without much effort new sites of extremely species rich grasslands in the Czech Republic and beyond. We found clear relationships between species richness and species composition in some of these grasslands, but have doubts about their generality. We had to admit we know very little about commonness, spatial distribution, ecological determinants and temporal stability of extreme species richness in these grasslands. We wonder what is the relative role of local and regional drivers of extreme species richness – particularly of species pool size and its historical roots. We suggest that such inquiry is of general ecological interest, as it concerns our understanding of species coexistence, and propose a framework for such inquiry.

Ronk A.

Oral presentation

Observed and dark diversity of alien and native plant species in Europe: association with natural and anthropogenic factors

Special session: The relevance of “dark diversity” for theoretical and applied ecology

Argo Ronk *, Robert Szava-Kovats, Martin Zobel & Meelis Pärtel

Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: argo.ronk@ut.ee

Aim: Invasion by alien species is a growing threat to native biodiversity but detailed distribution patterns of alien species remain largely unknown even for a well-studied taxonomic group, such as vascular plants, and in a long-studied region, such as Europe. Since the effect of invasion likely depends on native biodiversity and species pools size, we aimed to explore observed alien species richness in relation to both observed native species richness and dark diversity (alien species within the study region yet to invade suitable sites).

Location: Europe.

Methods: We used plant distribution data from the Atlas Florae Europaeae (plant species mapped in sites consisting of 50 × 50 km grid cells) and eight different European regions (sites of 10 × 10 km grid cells). We distinguished alien and native species at each site. We used several relative biodiversity measures: relative alien richness (compared to native species), alien and native completeness of species site diversity (log-ratio of observed to dark diversity) and completeness difference between alien and native species. These metrics were mapped across Europe and related to natural and anthropogenic variables.

Results: The relative richness of alien species was highest in NW Europe. Alien completeness was correlated with native completeness. Some regions have greater alien than native completeness, suggesting a threat of future invasions. The pattern throughout Europe of both alien and native completeness is scattered, indicating several regional hotspots. Invasion of alien species in Europe is related primarily to human population density and agricultural land-use, but variation in climate and habitat heterogeneity also play a role.

Main conclusions: We suggest that relative diversity metrics provide a novel toolbox to identify regions threatened by current or future invasion by alien species. Such analyses, however, are based on recorded species occurrences and more thorough inventories would allow for more precise estimates.

Rota C.

Poster F-03 (young scientist)

Spatio-temporal variation in water availability modulates the effect of grazing on taxonomic and functional diversity of annual plant communities

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Cristina Rota [1,*], Pablo Manzano [1,2], Carlos P. Carmona [3], Juan E. Malo [1] & Begoña Peco [1]

[1]Terrestrial Ecology Group, Department of Ecology, Autonomous University of Madrid, Madrid, Spain; [2]FAO Pastoralist Knowledge Hub, Roma, Italy; [3]Department of Botany, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic

* Presenting author: cristina.rota@uam.es

Analyses of the effect of grazing and productivity on grassland diversity usually lack a detailed quantification of grazing gradients and information about the effects of inter-annual variation on productivity, which can be particularly relevant in annual grasslands. We assessed the effect of grazing along highly detailed gradients on the taxonomic diversity (TD) and functional structure of annual grasslands and how spatial and inter-annual variations in water availability (a proxy of productivity) modulate this effect.

Rupprecht D.

Oral presentation (young scientist)

Effects of year-round grazing on the vegetation of nutrient-poor grass- and heathlands – evidence from a large-scale survey

Denise Rupprecht *, Kristin Gilhaus & Norbert Hölzel

Institute of Landscape Ecology, University of Münster, Münster, Germany

* Presenting author: denise.rupprecht@mail.de

Year-round grazing by cattle or horses has recently become a common tool in conservation management in north-western Europe. Though many of these projects claim positive effects on vegetation development, evidence is still largely anecdotal and there are no more comprehensive regional surveys allowing the detection of general patterns beyond single case studies. This applies even more to nutrient-poor sites where year-round grazing systems were only recently established and concerns about potentially negative effects on plant diversity are still prevalent. Hence, this study investigates the impacts of year-round grazing on plant species richness, species composition and vegetation structure on nutrient-poor sites using a regional multi-site approach. Surveys were carried out at five different study sites in the diluvial plain of north-western Germany and the Netherlands comprising sand grasslands, dry grasslands and heathlands. Grazed plots were compared with abandoned plots of similar site conditions. The results show positive effects of grazing: Plant species richness, the number of endangered plant species and the proportion of open soil increased significantly. In contrast, productivity, litter cover, vegetation height and the cover of woody species could be significantly decreased under year-round grazing. Moreover, a shift in plant species composition was observed: At grazed sites there were more small light-demanding species with a ruderal or stress tolerating strategy compared to taller, mesophilic species of a competitive strategy type at abandoned sites. Based on broad regional evidence, we conclude that year-round grazing is a suitable tool for the restoration and management of open habitats on nutrient-poor sandy sites. However, due to mostly low productivity and poor nutritional quality causing seasonal bottlenecks in fodder supply issues of animal welfare are particularly relevant.

Saar S.

Oral presentation

Consequences of plant kin recognition for microbial soil feedback and root decomposition

Sirgi Saar * & Marina Semchenko

Institute of Ecology and Earth Sciences, Tartu University, Tartu, Estonia

* Presenting author: sirgi.saar@gmail.com

Some plants recognise their relatives and engage in kin selection, that affects not only biomass, but root morphology as well. In addition to direct interactions via root exudates, plants can affect each other also with root litter and soil microbial feedback. So far the consequences of kin recognition to soil processes like microbial feedback and root litter decomposition are not known. To answer the question about kin recognition's role in ecosystem functioning we conducted an experiment, where *Deschampsia caespitosa* was used as focal plant in all soil feedback treatments to test for kin and stranger effects on plant growth. Sterilization treatment was made to compare root litter decomposition. First, *D. caespitosa* was grown in groups of 15 plants. There were three treatments, consisting of plants related to each other (kin) and unrelated plants from two communities (same and other community than focal plant). After 13 weeks of growing plants were harvested and soil with roots was chopped for using in feedback experiment (single plants in pots. We found that the soil feedback tended to be stronger on soil previously occupied by siblings, particularly for seedlings at early stages of development, and changes in root characteristics due to kin recognition resulted in slower root decomposition. Less biomass remained in non-sterile treatment, where decomposing microorganisms were present, especially in treatments with unrelated plants. Roots of kin had higher C:N ratio, explaining slower decomposition and suggesting possible investment in defence instead of competitive ability.

Sabatini F.M.

Oral presentation (young scientist)

The decrease of beta diversity with increasing altitude in Central European forests

Francesco Maria Sabatini [1,*], Sabina Burrascano [1], Borja Jiménez-Alfaro [2], Andrea Lora [3] & Milan Chytrý [2]

[1]Department of Environmental Biology, Sapienza University of Rome, Roma, Italy; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Institute of Crystallography, National Research Council (CNR), Bari, Italy

* Presenting author: francescomaria.sabatini@uniroma1.it

Patterns of beta diversity variation can provide insights into the assembly processes that shape plant communities. However beta diversity metrics are linked to variation in gamma and alpha diversity which make statistical comparisons difficult. Recently null models have been proposed to disentangle the multi-scale effects of processes operating either at the plot-scale (affecting alpha diversity) or at large biogeographical scales (influencing gamma diversity). Thus, the deviation between the beta diversity observed and that expected under a null model indicates the existence of ecological processes that generate non-random spatial patterns in vegetation assemblages along biogeographic or environmental gradients. We aim at testing whether a significant relationship exists between beta diversity and altitude after controlling for the confounding effect of alpha and gamma diversity with the use of null models. We used the forest vegetation of the Czech Republic as a case study. More than 19,000 vegetation plots were extracted from the Czech National Phytosociological Database, and were divided into 10 altitudinal transects, i.e. ecoregions comprising altitudinal gradients from lowland to mountain tops. We implemented three resampling schemes to alleviate possible bias due to the uneven distribution of plots across the study area, and tested the robustness of the inference by comparing the results obtained using the whole dataset and different resampling schemes. We used GLMMs to model the patterns of beta diversity and of its deviation from random expectations, along the altitudinal gradient while controlling for climatic and topographical variability, and the geographical spread of the plots. Model selection was performed using an Information-Theory approach that fully exploits the information contained across permutations. Beta diversity declined with increasing altitude because of a steeper decline in gamma than in alpha diversity. After controlling for the effects of alpha and gamma diversity using null models, this trend disappeared. This result was relatively robust both across different resampling schemes and across diversity metrics that give progressively less weight to rare species. Our study supports the hypothesis that the decreasing beta diversity (compositional heterogeneity) of forest communities with increasing altitude depends on the reduced species pool of high-altitude vegetation, and not on the variation of community assembly processes.

Sabatini F.M.

Poster D-27 (young scientist)

A Life+ Nature project for the enhancement of structural heterogeneity in priority habitat (9210* and 9220*) Apennine beech forests

Session: Vegetation science serving nature conservation

Francesco Maria Sabatini [1,*], Anna Barbati [2], Sabina Burrascano [1], Luigi Portoghesi [2], Daniele Di Santo [3], Silvia De Paulis [3], Walter Mattioli [2] & Carlo Blasi [1]

[1]Department of Environmental Biology, Sapienza University of Rome, Roma, Italy; [2]Department for Innovation in Biological, Agro-food and Forest Systems, University of Tuscia, Viterbo, Italy; [3]Servizio Agro Silvo Pastorale, Gran Sasso e Monti della Laga National Park, Assergi, Italy

* Presenting author: francescomaria.sabatini@uniroma1.it

The Apennine Natura 2000 priority habitats 9210* 9220*, i.e. beech forests with respectively European yew (*Taxus baccata*) and European holly (*Ilex aquifolium*), or silver fir (*Abies alba*) are unique thanks to the occurrence of these species. Nowadays, these habitats have been extensively altered and reduced in extension due to forestry practices that favour beech over the other tree species and lead to a generally homogeneous overstorey structure. The Life+ project (11 NAT/IT/135) "FAGUS – Forests of the Apennines: Good practices to conjugate Use and Sustainability" aims at ensuring the long-term conservation of these priority habitats in two Italian National Parks: Cilento and Vallo di Diano NP, and Gran Sasso Laga NP. The focus of the project is to implement concrete conservation actions aimed at enhancing the structural heterogeneity and biological diversity of the stands, while fulfilling the needs of local population for timber and firewood. The concrete actions included experimental harvesting treatments aimed at promoting the regeneration of yew, holly and silver fir, and at enhancing the diversity levels of vascular plants, lichens, birds, saproxylic fungi and beetles. Secondary objectives of the FAGUS projects are to involve local stakeholders in the development of locally-tailored sustainable forest management practices, and to disseminate among local forest SMEs and forest professionals the know-how necessary to the application of the good practices developed during the project. The concrete conservation actions took place in late 2014-early 2015. The outcomes of the treatments on the biological diversity of different taxa are being currently monitored using a Before-After-Control-Intervention approach. Pre-treatment biodiversity data were analyzed for cross-taxon congruence using Species Accumulation Index and Procrustes analysis, respectively for richness and composition data. Results indicated that species diversity was significantly related to forest structural heterogeneity. We noted a relatively weak but significant congruence between some pairs of taxa, with these relationships being stronger for taxa either sharing the same habitat (e.g. saproxylic fungi and beetles) or being linked by direct trophic interactions (e.g. plants and saproxylic beetles). In light of these results, the interventions aimed at enhancing the structural complexity of these stands are expected to have a positive effects on the overall diversity of forest taxa.

Saccone P.

Poster with lightning talk I-10

Extrapolating long-term changes even from medium-term experiments can be risky: evidence from high-latitude tundra

Special session: Long-term perspectives on vegetation change

Patrick Saccone * & Risto Virtanen

Department of Ecology, University of Oulu, Oulu, Finland

* Presenting author: patrick.saccone@gmail.com

A strong issue of experimental plant ecology is the discrepancy between the short-term responses of community to manipulation and their long-term changes. Here we investigated the predictive value of medium-term dynamics looking for some signs of longer-term divergence in response to experimental manipulations. We analysed plant community dynamics from a 23-years transplant experiment in the Fennoscandian mountain tundra testing the joint effects of biotic and abiotic drivers. Sod-blocks of tundra heath vegetation were transplanted to a snowbed 150 m higher in elevation from their origin, where, with contrasting levels of soil wetness, half of the transplants were protected from mammalian herbivores. Throughout the experiments, community changes strongly depended on both plant functional types and treatments. The first 12 years were mainly characterized by a response to transplantation to the snowbed showing a strong increase of graminoid and a decrease of shrub abundances in the transplants. In the longer time scale, the community divergence increased in particular in response to the significant effect of grazing and soil wetness within the snowbed, while graminoid dominance disappeared. Markov Chain Models captured the main trends during the first 12 years but they failed to predict their relative abundance after 23 years. In particular, the late dominance of bryophytes in the wet snowbed, the recovery of shrub in the dry exclosures, and the subordinate status of graminoids deviated from the extrapolation based on the medium-term trends. Differences in the temporal scale of both treatment effects and plant functional type responses limited the ability to extrapolate long-term trajectories even from medium-term dynamics. We suggest that maintain field experiments over long time periods could deepen our understanding of plant community functioning and represent a crucial step in ecology.

Saccone P.

Oral presentation

Responses of tundra and forest heath communities to environmental severity changes: evidence from a reciprocal transplantation along elevation gradient

Patrick Saccone * & Risto Virtanen

Department of Ecology, University of Oulu, Oulu, Finland

* Presenting author: patrick.saccone@gmail.com

The historical debate between the deterministic and stochastic approaches of community ecology leads to the emerging balance theory that both kind of processes operate in nature and their relative contributions to community assembly and dynamics depend on environmental conditions. Environmental favourability or severity are expected to enhance community saturation due to density-dependent processes and habitat filtering respectively while intermediate conditions could give more place to stochasticity. In the context of the response of plant communities to global environmental changes, such balance between community drivers are susceptible to inflect vegetation dynamics and trigger states shifts. Here we investigated these poorly known processes in the tundra communities of the northern Fennoscandia which count among the habitats suspected to be particularly affected by the global environmental changing in particular by climate changes. The plant community composition of blocks of heath vegetation reciprocally transplanted between three sites along an altitudinal gradient was monitored during 6 to 9 years. The transplantation simulated a strong environmental perturbation as well as a change in local species pool. We analysed the changes in α- and β-diversity, community functional composition and the divergence between the transplants experiencing the different experimental conditions. The community from the highest altitude showed the strongest changes in their functional composition due to transplantation downslope with a decrease in graminoid abundance and a subsequent decrease of functional evenness. The benign environmental conditions and the local species pool of the two lowest recipient sites induced a homogenisation of plant communities regardless their origins. Finally, the magnitude of the perturbation affected the resistance of the community, since the community from the highest altitude showed immediate response when transplanted to the lowest site and a certain biological inertia in the mid-altitude site. Our results emphasized the hypothesis that plant communities from high elevation are more vulnerable to change because they constitute poor competitors vulnerable to competitive displacement Moreover, we suggest that the fact that harsher conditions from high elevation did not affect the composition of community from low elevation represent a biological inertia process due to competitive abilities of established species.

Sagyndykova M.

Poster D-28

About the medicinal herb *Ferula foetida* in Mangyshlak

Session: Vegetation science serving nature conservation

Akzhunis Imanbayeva [1], Kanat Sarsenbayev [2] & Meruyert Sagyndykova [1,2,*]

[1]Mangyshlak Experimental Botanical Garden, Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan, Aktau, Kazakhstan; [2]L.N. Gumilyev Eurasian National University, Astana, Kazakhstan

* Presenting author: m.sagyndykova@mail.ru

Mangistau region is located on the east coast of the Caspian Sea. Zonal brown and grey-brown soils of Mangistau are salted overall, often solonized, poorly saturated with organic matter and moisture, and are close to the dense limestones. Mangistau's flora has about 700 species of plants from 300 genera and 69 families among which there are a lot of medicinal taxa from the following families: *Steraceae*, *Chenopodiaceae*, *Apiacae* and *Lamiaceae*. Species from the following genera have the greatest value: *Ferula*, *Ephedra*, *Glycyrrhiza*, *Artemisia* and others. Herbs of *Ferula* L. genus has been used in folk phytomedicine of various countries (Central Asia, Iran, China, India, etc.) to treat various diseases since ancient times. Many species of *Ferula* containing valuable medicinal resin and gum have been used as anticonvulsant and antihelminthic, arthronosos, at some nervous and blood diseases. Representatives of this genus grow in the east Mediterranean region, Central Asia, Afghanistan, Pakistan, Iran, Turkey, China and Italy. Oleo-gum-resin is obtained from aerial organs. Oleo-gum-resin, according to literary data, contains from 4 to 29.2% essential oil, which includes sulphur-containing compounds (up to 6%) with unpleasant garlic smell. Therefore *Ferula foetida* is one of the perspective species for introduction to practical usage as medical herb. In Mangistau desert *Ferula foetida* is widespread in the East Mangyshlak geobotanical district. In the south of the Mangyshlak Peninsula it occurs on loamy plains, fixed and semi-fixed sand of middle and south deserts, in wormwood, saxaul and saltwort communities. It is frequently a co-dominant of communities. Observation of the massifs with *Ferula* showed that brushwoods are widespread in Tuyesu's sand, forming the *Kraschenninikovia-Ferula-Carex* and *Haloxylon-Ferula-Artemisia* associations; in Karynzharyk depression on sands forming the *Artemisia-Ferula-Haloxylon* and *Carex-Artemisia-Salsola-Haloxylon* association. On the hills and Tynymbay shoky mountain vicinities it forms the *Haloxylon-Ferula-Artemisia-Artemisia* association. The area of the production and valuable *Ferula foetida* at Tuyesu sands is estimated at 600 ha with a productivity of 3 t/ha. The operational stock of underground organs was calculated at 1800 t and the volume of possible collected raw materials was 18 t. The same stocks were identified in other communities of South Mangyshlak Peninsula.

Sakio H.

Poster with lightning talk J-25

Changing patterns of fluctuation in the flower and seed production of *Fraxinus platypoda* over 27 years

Session: Patterns of vegetation change across landscapes

Hitoshi Sakio

Sado Station, Field Center for Sustainable Agriculture and Forestry, Faculty of Agriculture, Niigata University, Sado, Japan

sakiohit@gmail.com

Background and aims: Climate is a major determinant of vegetation patterns. Past climate changes have driven shifts in the ranges of vegetation worldwide, and recent global warming is affecting vegetation in arctic and alpine regions in particular. Global warming also affects plant reproductive phenology, as seen in changes to the cherry-blossom front over time. However, there are few long-term, quantitative studies on flower and seed production in trees. We examined annual fluctuations and long-term changes in the flower and seed production of *Fraxinus platypoda* Oliv. (*Oleaceae*), a deciduous riparian tree that reaches 40 m in height and is found in the cool-temperate zone of Japan, over the course of 27 years (1987–2013).

Study sites and methods: Research took place at the Ooyamazawa Riparian Forest Research Site (JaLTER) in the cool-temperate deciduous forest of the Chichibu Mountains, central Japan. We set 20 seed traps in a permanent 0.54 ha plot, retrieving the contents to the laboratory every month between May and November, and leaving the traps over winter. In the laboratory, we dried and weighed all *F. platypoda* flowers and seeds.

Results: We found clear annual fluctuations in flowering and seed production in female and male trees. Mast and lean years occurred at 3- or 4-year intervals in both females and males until 2001. During this period, largely synchronous flowering occurred between females and males. Flowering patterns changed after 2002, with male trees undergoing stably intermediate flowering, females displaying a shorter flowering cycle, and no synchrony between sexes. No masting occurred in either sex after 2007.

Discussion: There was no significant correlation between weather conditions and annual fluctuations in flower and seed production. This suggests that annual fluctuation in flowering and seed production may occur due to the resource balance in individual trees even without interannual environmental variation. The change in fluctuation pattern after 2001 might have resulted from increasing temperatures and the temporal extension of photosynthesis.

Schultz N.

Oral presentation

Habitat specificity reveals the importance of grazing refugia to plant diversity conservation in warm-temperate grassy ecosystems

Nick Schultz [1,*], Nick Reid [2] & John T. Hunter [3]

[1]School of Applied and Biomedical Science, Federation University, Ballarat, VIC, Australia; [2]School of Environmental & Rural Science, University of New England, Armidale, NSW, Australia; [3]School of Behavioural, Cognitive & Social Sciences, University of New England, Armidale NSW, Australia

* Presenting author: n.schultz@federation.edu.au

The effects of pastoralism on grassy vegetation are predicted to vary across spatial scales. However, local-scale effects have generally been better considered than large-scale effects that may be just as pertinent for plant diversity conservation. We asked: How do patterns of plant diversity vary among land uses at large spatial scales in an agricultural landscape? On the North-West Slopes of New South Wales, Australia, we compared the patterns observed at large and local scales for each land use. We surveyed 127 quadrats of grassy vegetation across four land uses: previously cultivated and never-cultivated native pastures, and grazed and ungrazed woodlands. We assessed (1) species density at the quadrat scale, and (2) regional scale diversity patterns across land uses, using rarefaction curves and a measure of habitat specificity (Gamma Diversity Contribution, GDC). At the quadrat scale, differences in species density among land uses were not pronounced, and species density did not significantly differ between the highest and lowest land-use intensities. In contrast, habitat specificity was highest in ungrazed woodlands, and negatively correlated with land-use intensity. Overall, grazed land uses were species dense at the quadrat scale (47.3 ± 1.4 species per 400 m^2), but were comprised of a limited suite of native and exotic grasses and forbs, with relatively homogeneous composition across sites. In the region studied, ungrazed land uses – which comprised only a small proportion of the region – were important for conserving a large number of native species, and should be protected. Simple measures of native or total species density were not sufficient for evaluating conservation value, as they did not distinguish habitats with large numbers of common, generalist native species from those with species that were rare or restricted in the landscape. Habitat-specificity analyses may be powerful for identifying patches and landscape elements with high numbers of rare or restricted species with high regional conservation value, and may overcome the potential pitfalls of basing conservation management decisions on site-scale measures.

Schwabe A.

Poster D-31

Is the creation of newly designed inland-dune complexes suitable to stimulate the development of new Fauna-Flora-Habitat areas?

Session: Vegetation science serving nature conservation

Linda Freund, Jimena Carrillo, Christian Storm & Angelika Schwabe *

Vegetation Ecology and Restoration Ecology, Technische Universität Darmstadt, Darmstadt, Germany

* Presenting author: schwabe@bio.tu-darmstadt.de

In the EU stands of xeric sand calcareous grasslands (priority habitat of the EU: 6120) are threatened and mostly highly fragmented. Knowledge about the impact of abiotic and biotic measures to restore this vegetation type characterized by *Koelerion glaucae* vegetation is crucial. Therefore, a dune complex (around 2 ha) was created as a study model in the Upper Rhine Valley (Germany), which included sites with different substrate conditions, grazing impact and minimized inoculation with diaspore-containing plant material. The financial realisation was possible by compensation payments after construction of a commercial centre. The restoration area is divided into two halves with different substrate conditions, on which the effects of inoculation (raked plant material) and grazing by donkeys were studied in a full factorial experiment on systematically arranged plots (32 plots, randomised treatment distribution). Additionally the whole area was monitored by a grid-plot approach. Minimized inoculation was conducted with *Koelerion glaucae* plant material in small plots covering around 5–7% of the restoration sites. During the four-year study, vegetation development was examined in relation to the donor site (covered by stands of *Koelerion glaucae*) and an older restoration site. Seed bank and -rain were sampled, as well as the endozoochorous dispersal by donkeys. Target species ratios (TSR) were calculated. We used mixed linear models and DCA for data analyses. Substrate conditions had an impact on the number of target species and on vascular plant- and cryptogam cover. Inoculation enhanced both number and, without grazing, cover of target species since the first year. On not-inoculated plots and grid-plots, target-species numbers increased gradually. Grazing did not affect target-species numbers, but had a decreasing effect on target-species cover. Grazing reduced bryophyte cover, especially on inoculated plots. DCA revealed development of the experimental plots towards the donor site, as has occurred on the older restoration site. Seed bank and seed rain were rich in ruderal species. Endozoochory analysis revealed some target species to be effectively dispersed by donkeys. Minimized inoculation is suitable to overcome seed limitation and build up starter populations of target species for the colonization of larger restoration sites. However, within four years species composition of the donor site was not achieved and grazing had mainly structural effects.

Schweiger A.

Oral presentation (young scientist)

The legacy of a forgotten ecological disaster: Interactive ecological effects of 20th century acidification and climate change in central European spring bogs

Andreas H. Schweiger * & Carl Beierkuhnlein

Department of Biogeography, University of Bayreuth, Bayreuth, Germany

* Presenting author: andreas.schweiger@uni-bayreuth.de

The emission of acidifying airborne pollutants, which peaked in Europe and North America between the 1960's and mid-1980's, had detrimental ecological effects on large spatial scale. Legal regulations in the late 1980's led to a considerable reduction of emitted atmospheric pollutants, the main source of acidification. The reduction of acidifying pollutants, which induced a recovery of terrestrial ecosystems, caused a significant decrease of scientific interest for this topic during the last decade. However, the ecological repercussions of acidification may interact with emerging physical stressors like gradual climate warming or extensive drought events. The legacy of the ecological heritage of 20th century acidification could evoke complex responses of biodiversity in face of climate change. Here, we investigate the interaction of the respective abiotic stressors and their impact on community composition and biodiversity for spring bogs in Central Europe. Additionally, we focus on positive feedbacks of these abiotic stressors with biotic system elements (i.e. species) which are able to biotically modify the biochemical environment and, thus, may create inertia to adaptation for other species. Therefore we studied species dominance relations and composition as well as discharge hydrochemistry of more than 100 spring bogs in the mountain ranges of Central Germany over a period of 25 years (1989–2014). Both, dominance relations and community composition were found to be mainly driven by water temperature and by the concentration of acidification-related elements (Al, Cd, Ca and Mg). As a result of acidification three groups of spring plant communities could be identified which significantly differed in their ecological responses (resilience, elasticity) to the extreme summer drought of 2003. Furthermore, we observed significant positive feedbacks between past anthropogenic acidification and the biogenic acidification caused by the increasing occurrence of peat moss species (*Sphagnum* spp.), which lead to lasting shifts of anthropogenically acidified communities towards even more acidophilous communities. Our studies on spring bogs, which are a neglected but very sensitive ecosystem, show that complex interactions between past and present abiotic stressors as well as biotic system elements affect patterns of beta diversity until today although the initial abiotic trigger arose more than two decades ago.

Sengl P.

Poster D-29 (young scientist)

A simple measure of isolation, connectivity and edge effects on grassland diversity in fragmented landscapes

Session: Vegetation science serving nature conservation

Philipp Sengl [1,2,*], Martin Magnes [1] & Christian Berg [1]

[1]Institute for Plant Science, University of Graz, Graz, Austria; [2] Civil Engineering Office Kofler Umweltmanagement, Pernegg an der Mur, Austria

* Presenting author: nwsephi@gmx.at

Within the fragmented landscape of Central Europe the remaining areas of species-rich grasslands are often small and isolated. The combined efforts of the European Habitat Directive, non-profit organizations and local governments have been partially successful in conserving some of these remains. In addition to managerial shortcomings, species within these fragments have had to cope with the effects of isolation and edge effects resulting from intensively used croplands in surrounding areas. During our studies on semi-dry grassland remains in south-eastern Austria we found that small scale extinction and re-colonization events and the nutrient input from bordering croplands were the two most important drivers of grassland diversity. To reflect these factors we created a simple measure called isolation, connectivity and edge effects (ICE-index). The ICE-index calculates the proportion of non-grassland area in a radius of 20 m (r = 20) around the center of a given vegetation plot area. We designated a radius of 20 m because previous studies have shown that 20 m is the maximum distance that most grassland species can reach within a few years during re-colonization, given that microsites for seedling establishment are available. Thus the ICE-index combines both structural and functional approaches in measuring small-scale grassland connectivity. The index ranges from 0 to 1, where 0 is defined as "no connection to further grassland", and 1 is defined as "the whole perimeter lies within grassland". We field-tested the index within several regularly managed semi-dry grassland sites comprising a wide range of spatial area and abiotic conditions. The ICE-index reflected edge effects in a quantifiable manner showing inhibition of the on-site assertion and re-colonization of typically endangered, stress adapted species and the promotion of tall, competitive and common species. For semi-dry grasslands it proved to be a reliable predictor for Ellenberg indicator values for light and nutrients. Additionally, it reflected site relevance for species conservation and suitability of habitats for typical semi-dry grassland species. Consequently, ICE-index generated data underscores the importance of the creation of buffer zones around high-value grassland remains to avoid eutrophication from bordering croplands and local extinction events.

Seppä H.

Oral presentation

The Holocene range dynamics of hazel (*Corylus avellana*) in northern Europe

Special session: Long-term perspectives on vegetation change

Heikki Seppä [1,*], Guy Schurgers [2], Paul A. Miller [2], Anne E. Bjune [3], Thomas Giesecke [4], Norbert Kuhl [5], Hans Renssen [6] & J. Sakari Salonen [1]

[1]Department of Geosciences and Geography, University of Helsinki, Helsinki, Finland; [2]Geobiosphere Science Centre, Department of Earth and Ecosystem Sciences, Lund University, Lund, Sweden; [3]Uni Bjerknes Centre and Bjerknes Centre for Climate Research, Bergen, Norway; [4]Department of Palynology and Climate Dynamics, Albrecht-von-Haller-Institute for Plant Sciences University of Göttingen, Göttingen, Germany; [5]Institute of Palaeontology, University of Bonn, Bonn, Germany; [6]Department of Earth Sciences, Faculty of Earth and Life Sciences, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

* Presenting author: heikki.seppa@helsinki.fi

Palaeoecological records provide a rich source of information to explore how plant distribution ranges respond to climate changes, but their use is complicated by the fact that, especially when based on pollen data, they are often spatially too inaccurate to reliably determine past range limits. To solve this problem, we focus on hazel (*Corylus avellana*), a tree species with large and heavy fruits (nuts), which provide firm evidence of the local occurrence of species in the past. We combine the fossil nut records of hazel from Fennoscandia, map its maximum distribution range during the Holocene thermal maximum (HTM) and compare the fossil record with the Holocene hazel range shift as simulated by the LJP-GUESS dynamic vegetation model. The results show that the current northern range limit of hazel in central and eastern Fennoscandia is constrained by too short growing seasons and too long and cold winters and demonstrate that the species responded to the HTM warming of about 2.5 °C (relative to the present) by shifting its range limit up to 63–64°N, reached a rough equilibrium with the HTM climatic conditions, and retreated from there to about 60°N during the last 4000 years in response to the late-Holocene cooling. Thus, the projected future warming of about 2.5 °C would reverse the species' southward retraction and is likely to lead to hazel being a common, regeneratively reproductive species up to 63–64°N. In general, the range dynamics from the HTM to the present suggest a tight climatic control over hazel's range limit in Fennoscandia.

Sharma L.

Oral presentation

Changes in vascular plant species richness following two decades of forest protection: insights from disturbance diversity relationship in forest management

Lila Sharma * & Ole Reidar Vetaas

Department of Geography, University of Bergen, Bergen, Norway

* Presenting author: lila.sharma@geog.uib.no

Protection of forest is considered as an important tool to conserve biodiversity. Formerly used forests have been protected in many places and such efforts have largely been successful in attaining the goal of increasing forest cover, biomass and timber volume. However, outcome in terms of biodiversity protection does not always parallel with forest cover. Plant richness since forest protection may depend on the previous level of disturbance, types of forests and the extent of protection itself. We resampled quadrats in temperate oak forest in the mountains of central Himalaya to assess the changes in vascular plant richness between 1993 and 2013. We recorded all the vascular plant species in 64 quadrats of 10 × 10 m. During the two decades previously "open access" type forest has been managed under community control and forest use and harvest has much been regulated. Forest canopy cover has increased between two sampling periods. Species richness declined with the canopy cover in both sampling points. Total as well as mean species richness has declined during two decades of protection. Total richness when deconstructed in terms of plant life forms: woody species, climber and herbaceous species showed a different response. Woody and climber species have increased while herbaceous species have declined between the two sampling points. We argue that different trend of woody and herbaceous species may be related to different underlying ecological and disturbance related factors and highlight on diversity-disturbance theories to explain the observed changes in richness. We underscore that declined disturbance does not assure maintenance of plant richness and we suggest that integration of insights of disturbance-diversity relationships in forest management can increase heterogeneity and maintain plant richness in the forests.

Shi P.

Poster J-26

Tree recruitment and treeline change at treeline ecotones in the eastern Tibetan Plateau

Session: Patterns of vegetation change across landscapes

Peili Shi

Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences Beijing, Beijing, China

shipl@igsnrr.ac.cn

Treelines are sensitive to global warming. At the high altitude, significant warming may exert greater influences on tree growth and treeline dynamics. In the second half of the last century climate has envisaged the trends towards warming and wetting in the Eastern Tibetan Plateau. As such, treelines are expected to have potential response to warming in terms of tree growth, recruitment and dynamics of treeline ecotones. To explore this variation, tree regeneration, growth and treeline position change were sampled through altitudinal transect surveys at treeline ecotone from the boundary of close forests to the tree line. Five treeline species of *Abies*, *Larix*, *Juniperus* and *Betula* in the range of 30° N were sampled between eastern latitudes of 90°27' E and 100°24' E in eastern Tibetan Plateau. Trees were positioned and dated in order to monitor the temporal and spatial patterns and dynamics in the treeline ecotone. Contrary to the assumption, there was little advance of treelines in the eastern Tibetan Plateau, especially the east humid *Abies* and *Juniperus* treelines. However, tree recruitment significantly increased after the 1960s, depending on the sizes of forest gaps. Relatively, treelines of *Larix* were more likely to have advanced in the end of last century. The larch trees with diffuse form were likely to have advanced. Warmer conditions and facilitation by shrubs in diffuse treelines give *Larix* advantage for advance. It is concluded that there is little change of treeline positions, but greater potential for tree recruitment at treeline ecotones.

Shidolo E.

Poster with lightning talk D-30 (young scientist)

Assessment of vegetation diversity, structure, cover and the influence of fire in Alex Muranda research centre and Mutompo, Namibia using long-term data

Session: Vegetation science serving nature conservation

Emma Shidolo

Department of Natural Resources and Spatial Sciences, Polytechnic of Namibia, Windhoek, Namibia

emmashidolo@gmail.com

Savannah woodland still remains the main source of livelihood for people in the north-eastern part of Namibia. However, the rapid change in climate and increasing fire frequency in the region pose a threat to these woodland and therefore the productivity of the land. The aim of the study is to assess the impact of climate and fire occurrence on vegetation. The two study sites established for long-term vegetation assessment are located about 60 km south-west of Rundu. In each site 20 plots of 20 × 50 m (1000 m^2) was sampled each year, using the Braun-Blanquet sampling method. This resulted into 260 plots sampled for this study over a six-year period. Results show a slow but gradual decrease in species richness at both sites during the study period, while Shannon-Wiener diversity index (H') reflected little change in diversity with a mean H' of 4.29 in Alex Muranda and 4.31 in Mutompo over the years. With a decrease in trees and shrub cover there is an increase in herb cover, with intense variability in cover at Alex Muranda RC compared to Mutompo. The species richness in Alex Muranda RC (managed state land) is lower than that of Mutompo (communal land), which could be due to lack of disturbance within the research centre. However, on both sites most of the species richness is made up of herbs. Climatic variables used did not show significant variation over the study period except for wind speed that was relatively high in 2003. An increase in the herb cover and decrease in shrub and tree cover is linked with fire events. However, increases in shrub and tree cover appear to be responding to increase in rainfall. It is also noted that whenever relative humidity was low, there was fire occurrence. These results show clear effects of climate conditions on the vegetation change although other factors such as land use and geology also play a role. It is therefore recommended that outcomes of studies the studies like this are incorporated to help develop better management plans for these areas in order to maintain and improve the productivity of the land, with emphasis on the fire management as the biggest threat in the region.

Shimoda M.

Poster with lightning talk J-27

Factors influencing the aquatic vegetation dynamics of irrigation ponds: a case study in an urbanizing rural area in western Japan

Session: Patterns of vegetation change across landscapes

Michiko Shimoda

Faculty of Social Environment, Tokoha University, Fuji, Japan

michiko_shimoda@nifty.com

Rice fields are irrigated throughout the rice growing season. Irrigation ponds were constructed in the areas where people could not get enough water from rivers. Irrigation ponds have been the major habitats of aquatic plants where natural wetlands are few and fragmented. As a case study of Japanese irrigation ponds, I will show the dynamics of aquatic vegetation and discuss the factors affecting the vegetation changes in the Saijo Basin, western Japan. The Saijo Basin extends 12 km east to west and 10 km north to south. It is characterized by high pond density. The ponds are diverse in shapes, surrounding environments and vegetation. The population of the basin has increased since around 1970. With the progress of urbanization, land use changes have produced various effects on ponds. I investigated the pond vegetation and flora between 1974 and 2003 in the basin. In 2011 and 2014, I re-investigated 73 ponds where I had continued the field research since the 1970s and 1980s. The vegetation and the surrounding environments were stable in 26 ponds. The species characteristic of nutrient-poor water (e.g. *Nymphaea tetragona* and *Potamogeton fryeri*) grew and *Brasenia schreberi* dominated in the ponds surrounded by woods. *Trapa japonica*, known as a eutrophic and broadly tolerant species, dominated in the ponds surrounded by agricultural land and houses. Six other ponds dominated by *B. schreberi* showed a small vegetation change with the growth and increase of *T. japonica*. In the remaining 41 ponds, vegetation has greatly changed or disappeared due to land development, pond repair work, introduction of alien plants and pond abandonment. Species-rich communities changed to species-poor communities dominated by *T. japonica* in the ponds with land development of surrounding areas. In the abandoned ponds with shallow or little water, aquatic vegetation was replaced by wetland vegetation. Urbanization of the Saijo Basin was the main factor affecting the changes of pond environment and vegetation. Land development adjacent to the ponds caused the water quality changes, and it resulted in rapid vegetation changes. The decrease of rice fields has reduced the need of irrigation and the importance of ponds. Disused ponds have been left without water level control, maintenance and repair work. Agricultural lands are converting to residential lands, and rice fields are decreasing. Therefore, the irrigation ponds and their vegetation will continue to change from now on in the basin.

Shiyomi M.

Poster with lightning talk C-13

A frequency distribution model of species richness in grassland communities

Session: Patterns and drivers of alpha and beta diversity in plant communities

Masae Shiyomi [1,*], Norbert Gáborčík [2] & Jun Chen [3]

[1]Ibaraki Study Center, The Open University of Japan, Mito, Japan; [2]Ďumbierska 32, Banská Bystrica, Slovakia; [3]College of Animal Science and Technology, Northwest A&F University, Yangling, China

* Presenting author: shiyomi@mx.ibaraki.ac.jp

We devised a probability distribution model that best expressed species richness per quadrat in grassland communities, and clarified the mechanism that the mean of richness per quadrat was always larger than the variance among quadrats. The model is made on the bases of relatively simple but theoretical assumptions about the mechanisms in play in target communities; these are (1) the compaction level of species per quadrat and, (2) the randomness level of the spatial distribution of each species in a community. Any community is assumed in the model to feature (1) a few species that occur in many quadrats, (2) many species that occur in only a few quadrats, and (3) intermediate species. The probability $P(i)$ that i species occur in a quadrat is given by a Poisson-like distribution with two parameters k and λ:

$P(i) = 0$ for $0 \leq i < k$,

$P(i) = e^{(k-\lambda)} (\lambda-k)^{(i-k)}/(i-k)!$ for $i \geq k$,

where i and k is a non-negative integer measuring randomness level, and λ expresses the compaction level of species per quadrat ($\lambda > k$). The mean species richness in the probability distribution is expressed by λ, and the variance is $\lambda - k$. The proposed model afforded a good fit for the observed frequency distribution of species richness per quadrat. If even a species was common among quadrats, the mean number of species per quadrat was greater than the variance. The greater the number of common species, the more pronounced was the difference between the mean and the variance. We fitted the model to 55 datasets collected by ourselves from grasslands varying in location (Tibet, Inner Mongolia, Slovakia, or Japan), quadrat size (0.25 m^2, 0.0625 m^2, or 0.01 m^2), and management status (various stocking densities). Our frequency distribution model will aid in the understanding of community structures and allow comparisons among different communities.

Šibík J.

Oral presentation

The Alaska Arctic Vegetation Archive (Alaska-AVA): A report on the status of the Arctic Vegetation Archive and an application in northern Alaska, focusing along the Dalton Highway

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Amy L. Breen [1,2], Jozef Šibík [1,3,*], Lisa Druckenmiller [1], Keith Boggs [4], Tina Boucher [4], Silvia Chasníková [1,5], David J. Cooper [6], James J. Ebersole [7], Howard E. Epstein [8], Bill Gould [9], Stephan M. Hennekens [10], Torre Jorgenson [11], Anja Kade [1], Michael Lee [12], Robert K. Peet [12], Martha K. Raynolds [1], Udo Schickhoff [13], Stephen Talbot [14], Craig Tweedie [15], Sandra Villarreal [15], Lisa Wirth [16], Marilyn D. Walker [17], Patrick J. Webber [18] & Donald A. Walker [1]

[1]Alaska Geobotany Center, Institute of Arctic Biology, University of Alaska, Fairbanks, AK, USA; [2]International Arctic Research Center, University of Alaska, Fairbanks, AK, USA; [3]Institute of Botany, Slovak Academy of Sciences, Bratislava, Slovakia; [4]Alaska Natural Heritage Program, University of Alaska, Anchorage, AK, USA; [5]Institute of Landscape Ecology, Slovak Academy of Sciences, Bratislava, Slovakia; [6]Department of Forest and Rangeland Stewardship, Colorado State University, Fort Collins, CO, USA; [7]Department of Biology, Colorado College, Colorado Springs, CO, USA; [8]Department of Environmental Sciences, University of Virginia, Charlottesville, VA, USA; [9]Institute of Tropical Forestry, USDA Forest Service, San Juan, Puerto Rico; [10]Alterra, Wageningen, The Netherlands; [11]Alaska Ecoscience, Fairbanks, AK USA; [12]Department of Biology, University of North Carolina, Chapel Hill, NC, USA; [13]Institute of Geography, University of Hamburg, Hamburg, Germany; [14]U.S. Fish and Wildlife Service, Anchorage, AK, USA; [15]Systems Ecology Lab, University of Texas El Paso, TX, USA; [16]Geographic Information Network of Alaska, Geophysical Institute, University of Alaska, Fairbanks, AK, USA; [17]HOMER Energy, Boulder, CO, USA; [18]Michigan State University, USA (retired), Rancho de Taos, NM, USA.

* Presenting author: jozef.sibik@savba.sk

The Arctic Vegetation Archive (AVA) is a vegetation-plot database for the Arctic tundra biome. The goals of the AVA are to unite and harmonize circumpolar Arctic vegetation data and to apply the data to an Arctic vegetation classification, ecosystem and biodiversity models, management of Arctic resources, and Arctic education. High quality plot data and non-digital legacy datasets that are in danger of being lost have the highest priority for inclusion in the archive. A PanArctic Species List (PASL) provides a standard list of accepted vascular plant, bryophyte, and lichen species names. Work on the AVA is being accomplished within individual Arctic countries. Here we report progress on the Alaska portion of the AVA and provide a preliminary analysis of the data currently in the Alaska-AVA.

Šibík J.

Poster P-31

Wetland vegetation data for the Western United States: a database in Turboveg

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

David J. Cooper [1] & Jozef Šibík [2,3,*]

[1]Department of Forest and Rangeland Stewardship, Colorado State University, Fort Collins, CO, USA; [2]Institute of Botany, Slovak Academy of Sciences, Bratislava, Slovakia; [3]Alaska Geobotany Center, Institute of Arctic Biology, University of Alaska, Fairbanks, AK, USA

* Presenting author: jozef.sibik@savba.sk

Vegetation databases belong to basic tools recently used in vegetation science as well as in ecology. Data from large areas can be used for basic comparisons of vegetation variability, diversity and/or modeling or predicting of ongoing changes. This tool has a long tradition in Europe, but has started to be common all over the world in the last years. The use of Turboveg software and establishment of the European Vegetation Archive with participation of most European countries has led to unprecedented opportunities in analyzing the main gradients, variability and patterns in vegetation throughout the continent. We have assembled existing data on the vegetation composition for 5500 relevés from Colorado, Wyoming, and other western U.S. states. The data set covers the full range of wetland and riparian ecosystems occurring in floodplain forests, marshes, fens and salt flats. Each relevé has a complete list of species and cover abundance for each species in each plot. The plots cover a large elevation range from the Great Plains to the alpine tundra, an elevation gradient of more than 3000 m. It also includes samples from plains, valleys and mountains and the full range of variation of bedrock types including limestone and granite, as well as unique types such as serpentine and iron pyrite, and hot springs in Yellowstone National Park. Besides the Arctic Vegetation Archive that has been established in Alaska in the last few years, our database represents the second vegetation data set stored in Turboveg on the Northern American continent and the first in the lower 48 states. It will serve as a source of high quality data for the purposes of ecological, biogeographical and biodiversity research and will be a useful tool for nature conservation and monitoring. Using a Turboveg software for storing data creates many opportunities to share our data and participate in other projects regarding supranational comparisons and the analysis of vegetation composition and diversity and help researchers detect patterns on different scales.

Sichone P.

Poster with lightning talk C-14 (young scientist)

Patterns of vascular plant diversity in the Western Zambian Miombo woodlands

Session: Patterns and drivers of alpha and beta diversity in plant communities

Priscilla Sichone [1,*], Ute Schmiedel [1], Manfred Finckh [1], Patrick Phiri [2] & Norbert Jürgens [1]

[1]Working Group Biodiversity, Evolution and Ecology of Plants, University of Hamburg, Biocentre Klein Flottbek and Botanical Garden, Hamburg, Germany; [2]Copperbelt University, School of Mathematics and Natural Sciences, Kitwe, Zambia

* Presenting author: priscilla.sichone@uni-hamburg.de

Zambia's deforestation rate is estimated at around 1.5% per annum and it has become evident particularly with the formulation of the National Biodiversity Strategy and Action Plan for Zambia (2009) that detailed biodiversity inventories are absent upon which deforestation and development of natural resources management plans can be reviewed. To help to close this gap we established standardised biodiversity assessment and monitoring sites (Biodiversity Observatories) in the Miombo woodlands of Western Zambia. Three Observatories were installed at sites with different land use intensities (local forest, forest reserve and national park) at mean annual rainall of 1020–1120 mm per annum. Human activities are characterised by regular fires, extraction of wood and agricultural use. An Observatory encompasses an area of 1 km^2, subdivided into 100 hectare cells. Within 20 randomly selected cells per Observatory, two nested plots of 100 m^2 (10 m × 10 m) and 1000 m^2 (20 × 50 m) were sampled. We assessed species inventories and analysed for various diversity measures. The mean cumulative species richness for the three observatories was 115 species. Species numbers decreased with land use intensity at 100 m^2 (35 spp, 33 spp and 29 spp) and 1000 m^2 (58 spp, 52 spp, 51 spp), whereas mean *z*-value (100 m^2 to mean 1000 m^2) was lower at high (0.2009) compared to medium to low land use intensity (0.2341, 0.2244). Species richness at two comparable Biodiversity Observatories in Savanah woodlands of northern Namibia with about 500 mm per annum was considerably lower at 100 m^2 (22 and 20 spp, respectively) and 1000 m^2 (44 spp and 47 spp), but had higher *z*-values in all cases (0.2603 and 0.2939) (*www.biota-africa.org*). The higher species richness of Observatories in western Zambia responds positively to higher mean annual precipitation in that area. The higher species diversity of Miombo woodlands compared to other vegetation types in the Zambezian Phytoregion has been also found by other studies. The study forms part of the research portfolio of the SASSCAL initiative (*www.sasscal.org*). The baseline data on vascular plants in western Zambia will contribute to the initiative's biodiversity assessment and the regional vegetation mapping of southern Africa.

Škodová I.

Poster D-32

Population dynamics of *Tephroseris longifolia* subsp. *moravica*, Carpathian endemic of European importance

Session: Vegetation science serving nature conservation

Iveta Škodová [1,*], Monika Janišová [1], Katarína Vantarová [1], Judita Kochjarová [2], Zora Snopková [3], Alena Šuráňová [4], Janka Smatanová [5], Sylva Mertanová [6], Helena Vojteková [7] & Katarína Devánová [8]

[1]Institute of Botany, Slovak Academy of Sciences, Bratislava, Slovakia; [2]Botanical Garden, Comenius University in Bratislava, Detached unit Blatnica, Blatnica, Slovakia; [3]Slovak Hydrometeorological Institute, Banská Bystrica, Slovakia; [4]Centre Veronica, Bojkovice, Czech Republic; [5]State Nature Conservancy of the Slovak Republic, Landscape Protected Area Strážovské vrchy, Považská Bystrica, Slovakia; [6]State Nature Conservancy of the Slovak Republic, Landscape Protected Area Biele Karpaty, Nemšová, Slovakia; [7]State Nature Conservancy of the Slovak Republic, Landscape Protected Area Ponitrie, Nitra, Slovakia; [8]The Museum of Trenčín, Trenčín, Slovakia

* Presenting author: iveta.skodova@savba.sk

Tephroseris longifolia subsp. *moravica* is an endemic endangered taxon of European importance. Its distribution is restricted to nine population sites on the territory of Slovakia and the Czech Republic. The population sizes range from several individuals to several thousand individuals in two most abundant populations, but the number of flowering individuals varies strongly among the years. Based on a detailed census of eight populations during 2004–2014 we compared inter-annual dynamics in abundance of vegetative and generative individuals (genets) and ramets of this endangered taxon. Our aim was to assess between-year variation in emergent population size, structure and fertility as well as to identify factors associated with this variation. As explanatory variables we used 16 monthly and daily weather data from the nearest climatic stations, which are potentially important with regard to the species' biology. Correlation between weather variables and selected population and species characteristics (number of vegetative and generative genets and ramets, inflorescence height, number of capitula per generative ramet, length of the longest leaf per vegetative ramet) was examined. In the largest studied population (Radobica) number of flowering individuals ranged between 74 and 2117, and number of vegetative individuals ranged between 160 and 947 during the census period. In 2011, number of flowering individuals was the highest in all studied populations. In all populations, number of flowering genets and ramets was negatively correlated with consecutive number of days without precipitation during the growing season (April–September) in the year previous to flowering. Number of flowering individuals was positively correlated with precipitation totals during the growing season (April–September). In the largest population (Radobica), number of vegetative ramets was positively correlated with minimum temperature during March–May and number of frost days during March–April (in the year of flowering). Size parameters (inflorescence height and size of leaves) were not significantly correlated with selected climatic variables. Based on the results we can conclude that flowering of *Tephroseris longifolia* subsp. *moravica* is influenced by precipitation in the previous growing season.

Acknowledgements: Financial support for this research was provided by VEGA 2/0074/11.

Skowronek S.

Poster with lightning talk O-12 (young scientist)

Mapping of invasive plant species on the island of Sylt using hyperspectral data

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Sandra Skowronek [1,*], Michael Ewald [2], Raf Aerts [3], Jens Warrie [3], Ruben Van De Kerchove [4], Pieter Kempeneers [4], Olivier Honnay [3], Jonathan Lenoir [5], Ben Somers [3], Sebastian Schmidtlein [2] & Hannes Feilhauer [1]

[1]University of Erlangen-Nuremberg, Nürnberg, Germany; [2]Karlsruhe Institute of Technology, Karlsruhe, Germany; [3]Katholieke Universiteit Leuven, Leuven, Belgium; [4]Flemish institute for technological research (VITO), Mol, Belgium; [5]Jules Verne University of Picardie, Amiens, France

* Presenting author: Sandra.Skowronek@fau.de

The western coast of the island of Sylt in northern Germany mainly consists of protected heathlands. In the last decades, the moss *Campylopus introflexus* and the shrub *Rosa rugosa* have progressively invaded this ecosystem. While there is previous work on *R. rugosa* invasions, *C. introflexus* has not been mapped or investigated up to date. Firstly detected in Europe in England in 1941, *C. introflexus* has just recently invaded Sylt. Within the dunes, it mainly appears in open spaces created by natural or human disturbances, sometimes intermingled with native species, but mostly in monospecies patches. These patches are distributed all over the island in varying degrees. *C. introflexus* is difficult to map with traditional approaches for the whole island and the same applies for early invasion stages of *R. rugosa*. Advanced hyperspectral and LIDAR remote sensing data in combination with field data may enable to use a straight-forward mapping approach that requires presence-only data of the target species. The goals of this study are thus to (1) develop an approach that allows to map species invasion that is difficult to detect with traditional mapping approaches over large areas and (2) use this approach to create distribution maps for *C. introflexus* and *R. rugosa* on the island of Sylt. These maps are intended to offer the basis for further analysis of the impact of invasions on the heathland and to derive possible management options. For this purpose, we collected vegetation data together with soil and biomass samples for 90 plots of a size of 3 × 3 m with different cover fractions of *C. introflexus* across the whole island during a field campaign in 2014. For *R. rugosa*, we sampled 30 additional plots. The airborne hyperspectral data (APEX) which were simultaneously acquired in summer 2014 provide 285 spectral bands covering the visible, near infrared and short-wave infrared region with a pixel size of 1.8 × 1.8 m. The airborne LIDAR data have an average point density of 21 points/m^2. We use these data and a maximum-entropy modeling approach to create distribution maps for the detection of the two invaders. Here, we present the concept, data, and first results of our study.

Škvorc Ž.

Poster J-28

Influence of secondary succession on the mediterranean dry grasslands on Biokovo mountain, Croatia

Session:

Željko Škvorc *, Jozo Franjić, Daniel Krstonošić & Krunoslav Sever

Faculty of Forestry, University of Zagreb, Zagreb, Croatia

* Presenting author: skvorc@sumfak.hr

Biokovo mountain is situated in the south-eastern part of Croatia, near the eastern coast of the Adriatic Sea. It is the highest mountain in the coastal Dinarides (1762 m a.s.l.). Biokovo is characterized by interesting geomorphology with many karst phenomena and great biological diversity with many endemic species. Different types of mediterranean dry grasslands have been developed over a thousand of years of grazing and disturbance in this area. Dry grasslands have been studied in the altitudinal range between 700 and 1500 m a.s.l. For the numerical analysis 88 new and already published vegetation relevés have been used. Relevés have been made from 1985 to 2014, following the standard Braun-Blanquet method. Changes in the syntaxonomic status, floristic and ecological features of vegetation types belonging to the alliances *Scorzonerion villosae* Horvatić 1963 and *Saturejion subspicatae* Horvatić 1975 have been analyzed. Early spring ephemeral therophytic non-nitrophilous grasslands (*Romulion* Oberdorfer 1954) have been recorded for the first time in Croatia. Because of the specific geomorphology, different climate influences and secondary succession many of the grasslands show transitional features between different vegetation types and are characterized by a rich biodiversity with numerous endangered species. Due to the changes in traditional land use about 30 years ago (cessation of grazing) these grasslands have been under constant pressure of succession which is leading to losses of such habitats.

Šmilauer P.

Oral presentation

New statistical techniques supported by Canoco 5 software

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Petr Šmilauer

Department of Ecosystem Biology, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic

petrsm@jcu.cz

Version 5 of Canoco software, a “de facto” standard for ordination methods and a tool widely used in vegetation science and many other fields of natural sciences, offers to its users not only greater friendliness of its interface, but also an easy access to many statistical techniques more advanced than the usual unconstrained and constrained ordination methods. In my talk I will focus on the facilities available for variation partitioning, including the use of spatial predictors computed as distance-based Moran’s eigenvector maps (dbMEM, formerly called PCNM), but other techniques newly available in Canoco 5 will be also mentioned.

Somodi I.

Poster with lightning talk N-05

Warning of the prevalence dependence of the True Skill Statistics – a frequently used model goodness measure in vegetation modelling

Session: Vegetation in macroecological modelling

Imelda Somodi [1,*], Nikolett Lepesi [2,3] & Zoltán Botta-Dukát [1]

[1]Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary; [2]Geological and Geophysical Institute of Hungary, National Adaptation Centre, Budapest, Hungary; [3]Department of Plant Systematics, Ecology and Theoretical Biology, Eötvös Loránd University, Budapest, Hungary

* Presenting author: somodi.imelda@okologia.mta.hu

Predictive Vegetation Models (PVMs) and also Species Distribution Models (SDMs) followed by the detection of assemblages from species predictions are prominent and widespread within macroecological models for vegetation phenomena. These approaches provide a categorical or more typically a probabilistic estimate of the occurrence of vegetation types or other vegetation-related phenomena (e.g. disturbance). These models are typically evaluated by the observed match between observations and prediction to known data set aside for evaluation. Several indices have been applied for this purpose. Cohen’s Kappa was one of the most widespread among these. However Cohen’s Kappa has been heavily criticised among others for being dependent not only on model goodness, but also on the ratio of presence and absence observations within the training data (termed prevalence). The True Skill Statistic (TSS) has been proposed as an alternative to Cohen’s Kappa because it was believed to be free of prevalence bias. We show that both the theoretical basis and the simulation underlying this statement was flawed and this lead to an erroneous conclusion. We argue that TSS is in fact dependent on prevalence. Using a simulation approach we demonstrate the degree and level of reaction of the index to changes in the prevalence, while controlling for model goodness. TSS is typically calculated along a range of cutoffs along the probability gradient of predictions. Model goodness is usually compared using the maximum value of TSS values along possible cutoffs. Therefore we pay special attention to the reaction of the maximum value of TSS to prevalence changes. We conclude that not only Kappa but also TSS is sensitive to prevalence changes and therefore is not superior to Kappa in this aspect. We advice researchers to take this into account when comparing models of entities with differing prevalence. Such situations include species with different rate of presences in the training data and to vegetation types with different level of occurrence.

Son J.

Poster D-33

An analysis of the use patterns of Korean pond wetland plants in oriental medicine

Session: Vegetation science serving nature conservation

Jinkwan Son *, Banghun Kang, Minjae Kong, Siyoung Lee & Donghyeon Kang

National Academy of Agricultural Science, Rural Development Administration, Jeonju, Republic of Korea

* Presenting author: son007005@korea.kr

Owing to an increase in the demand for farm tours and the need for ecological experience, it has become necessary to obtain the contents and educational materials of ponds, farming space, and the ecological experience associated with these. Therefore, we analyzed the pond wetland plants with respect to their use patterns in oriental medicine. Despite being an old and traditional science, oriental medicine is still applied to various fields such as clinical and pharmaceutical sciences. The results of this study will be helpful to generate educational materials regarding ecological experience. This study surveyed the plant life of 40 pond wetlands in rural areas, and studied their use patterns in traditional medicine, by using the Korea Traditional Knowledge Portal contents managed by the Korean Intellectual Property Office. According to the vegetation survey of the 40 pond wetlands, there were a total of 457 taxa in 108 families, 309 genera, 392 species, 59 varieties, 5 forma, and 1 subspecies. Among these, 314 taxa in 53 families, 136 genera, 265 species, 45 varieties, 3 forms, and 1 subspecies provided information on the use patterns of traditional medicine. This means that 68.8% of the plants around pond wetlands have been used in traditional medicine. The above-mentioned 314 taxa used for traditional medicine showed efficacy in 570 symptom types and were applied in the treatment of 325 kinds of diseases. One taxon showed, on average, efficacy in 4.0 (0–20) symptom types and was applied in the treatment of 6.6 (0–20) kinds of disease. The medicines (plants) were effective for a range of illnesses involving the following organs: liver (123 taxa), lungs (82 taxa), spleen (57 taxa), stomach (57 taxa), heart (45 taxa), large intestine (43 taxa), kidney (40 taxa), bladder (23 taxa), small intestine (16 taxa), and gall bladder (8 taxa). Twenty-one (6.69%) out of the 314 taxa are naturalized plants that have origins outside of Korea. Plant life form is divided into hemicryptophytes, 77 taxa (24.5%); therophytes, 74 taxa (23.6%); megaphanerophytes, 65 taxa (20.7%); nanophanerophytes, 36 taxa (11.5%); geophytes, 35 taxa (11.1%); hydrophytes, 22 taxa (7.0%); and chamaephytes, 5 taxa (1.6%). We expect that our study results will be useful and applicable to various fields such as ecological experience, education, and medical science. Furthermore, pond wetlands are valuable, and it would be worthwhile to conserve them.

Acknowledgements: This study was supported by the Post-doctoral Fellowship Program (Project No. PJ009412) of National Academy of Agricultural Science, Rural Development Administration, Republic of Korea.

Sonkoly J.

Poster A-18 (young scientist)

Deceptive orchids compensate for their lower fruit-set by having more seeds in a fruit

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Judit Sonkoly [1,*], Anna E. Vojtkó [2], Jácint Tökölyi [3], Péter Török [4], Gábor Sramkó [5,6], Zoltán Illyés [7] & Attila Molnár V. [5]

[1]Department of Ecology, University of Debrecen, Debrecen, Hungary; [2]Department of Tisza Research, Centre for Ecological Research, MTA, Debrecen, Hungary; [3]MTA-DE "Lendület" Behavioural Ecology Research Group, University of Debrecen, Debrecen, Hungary; [4]MTA-DE Biodiversity and Ecosystem Services Research Group, University of Debrecen, Debrecen, Hungary; [5]Department of Botany, University of Debrecen, Debrecen, Hungary; [6]MTA-ELTE-MTM Ecology Research Group, Budapest, Hungary; [7]Zalaegerszeg-Botfa, Hungary

* Presenting author: judit.sonkoly@gmail.com

Among orchids more than one third of species are pollinated deceptively, i.e. they attract pollinators but do not produce any nectar. The evolutionary success of deceptive orchids is hard to explain, as species employing this strategy are generally thought to have lower reproductive success (less flowers yielding fruits) than nectar-rewarding species, mainly because of low pollination rates. However, due to the extremely small size and high number of their seeds, direct measurements of their seed production are scarce. As a consequence, conclusions on the lower reproductive success of deceptive species compared to nectar-rewarding ones may be questionable. Here, we hypothesize that deceptive species should compensate for their lower fruit-set by having either larger seeds or more seeds in a fruit. We quantified seed numbers in 1015 fruits belonging to 48 orchid species from the Pannonian ecoregion and obtained fruit-set and thousand-seed weight data for these species from the literature; then phylogenetic comparative methods were applied to test our hypothesis. In line with previous results, deceptive species had substantially lower fruit-set than nectar rewarding ones. In addition, we found that deceptive species have more seeds in a fruit but not larger seeds compared to nectar-rewarding ones. All in all, seed production per shoot did not differ between pollination types, based on which deceptive species can fully compensate for their lower fruit-set by having more seeds in a fruit. Along with other benefits of deceptive pollination (e.g. lower energy expenditure due to the lack of nectar production and higher genetic variability due to decreased probability of geitonogamous pollination), these results can explain the success and prevalence of deceptive strategy in the orchid family.

Sousa F.S.

Poster D-34 (young scientist)

Direct seeding of trees, shrubs and herbs to restore the Brazilian savanna: Testing the effects of seeding density in restoration success

Session: Vegetation science serving nature conservation

Fabiana Silva de Sousa [1,*], Keiko Fueta Pellizzaro [2], Daniel Luis Mascia Vieira [2], Isabel Belloni Schmidt [1] & Alexandre Bonesso Sampaio [3]

[1]Ecology Department, University of Brasília, Brasília, DF, Brazil; [2]Graduate Program in Ecology, University of Brasília, Brasília, DF, Brazil; [3]Chico Mendes Institute for Biodiversity Conservation, Brasília, DF, Brazil

* Presenting author: fabianasousath@gmail.com

The invasion of degraded areas by invasive alien grasses is one of the main challenges for ecological restoration. These species are commonly better competitors than natives, preventing their establishment and growth. Another limitation for restoration is the limitation of native propagules. To successfully restore savanna vegetation in areas invaded by alien grasses, it is necessary: (i) to reduce alien grass cover; and (ii) to reintroduce all life forms that compose savanna vegetation (native grasses, shrubs and trees). We tested direct seeding of these life forms in three seeding densities of shrubs and herbs aiming to understand their effects on native trees and invasive grass establishment. Direct seeding is an alternative restoration technique, easier and cheaper compared to planting of seedlings. The restoration area was an abandoned pasture dominated by invasive alien grasses (*Urochloa* spp., *Andropogon gayanus*, *Hyparrhenia rufa*) inside the Chapada dos Veadeiros National Park (Central Brazil). In October 2013, three 1-ha blocks spaced 100 m from each other were weeded and ploughed as a preparation for direct seeding. In each one, four plots of 20 × 20 m were randomly assigned to the following treatments: (i) medium density of seeds from 3 shrubs and 1 grass species (shrubs: *Vernonia aurea* 1.125 seed/m^2, *Solanum lycocarpum* 17 seeds/m^2, *Achyrocline satureoides* 111 seeds/m^2, and the grass *Aristida gibbosa* 1.176 seeds/m^2); (ii) half of the medium density of seeds of these 4 species; (iii) double of the medium density of seeds of these 4 species. In all plots 40 native tree species were seeded (1 seed/m^2 per species). One year after planting, the alien grass cover was reduced from 100% to 72%, whereas native plant cover was 12% in average, following the increasing trend as the density of planting treatments. On average, woody species establishment success was 8% with some large seeded species (*Dipteryx alata*, *Anacardium humile*) reaching up to 67% establishment success. Direct seeding is an efficient technique to reintroduce and establish some native savanna species, although invasive grasses still have high cover in the first months after planting. The seeding of different life forms (herbs, shrubs and trees) is essential to restore the Brazilian savanna, to help overcome alien grasses dominance and facilitate succession into the vegetation's original structure and diversity.

Štajerová K.

Poster O-13

The relative impacts of generalist versus specialist herbivores: comparison between native and invasive dominants

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Kateřina Štajerová [1,2,*], Lukáš Sekerka [3,4] & Petr Pyšek [1,2]

[1]Department of Invasion Ecology, Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [2]Department of Ecology, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [3]Department of Entomology, National Museum in Prague, Prague, Czech Republic; [4]Department of Zoology, Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic

* Presenting author: katerina.stajerova@ibot.cas.cz

The enemy release hypothesis (ERH), which argues that introduced plants can become invasive in their new ranges due to lower regulation by herbivores compared to native plants, is one of those in invasion ecology that has often been tested but with different results. Within this study we looked at the effects of insect herbivores (generalist vs specialist) on native and invasive plant dominants in grasslands of North America. We chose three model species from the plant family *Asteraceae* (*Cirsium arvense*, *Leucanthemum vulgare* and *Tanacetum vulgare*) native to Europe and invasive in North America, and compared the effects of herbivory with native dominants from the same family.

Standovár T.

Poster E-04

Fine-scale vegetation dynamics in the herbaceous layer of an ancient beech forest in the Kékes Forest Reserve, Hungary

Special session: Global change and vegetation dynamics: the use of historical data sets

Tibor Standovár [1,*], Soma Horváth [1] & Réka Aszalós [2]

[1]Department of Plant Systematics, Ecology and Theoretical Biology, Eötvös Loránd University, Budapest, Hungary; [2]Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary

* Presenting author: standy@caesar.elte.hu

Kékes Forest Reserve is the best relic of montane beech forests in Hungary. The aim of this study was to supplement the standard permanent plot studies on tree stand dynamics with that of the herbaceous layer. We were especially interested in the fine-scale dynamics related to simple stand dynamical events like opening and closure of small gaps. We studied abundance and diversity changes with special interest in the survival of closed forest specialists during the forest cycle. In 1996 we sampled a cca 1.5-ha patch using 576 plots of 0.25 m² placed along a 5 × 5 m grid. All species and their cover estimates were recorded. In 1997 a complete stand position map was created. Resampling of 306 plots was done in 2013 in five patches within the area that represented different stand dynamical situations. As permanent marking of the old plots was not feasible, we used blocks of four 0.25 m² plots (altogether 1224 plots) around original locations so that we can test the effects of inaccuracies in relocation. Observed changes in the number and cumulative cover of herbaceous species reflected the effects of both stand dynamics and differences in precipitation in the two studied years. We showed characteristic differences in the change of rank-relative cover curves: in closed canopy patches it followed the geometric model – often reported for pioneer communities. In gaps created between 1996 and 2013 the curve moved towards a log-normal distribution, whereas an opposite shift was observed in the patch characterised by gap closure. Of the 61 species found, we tested 31 herbs of which 23 showed significant (Chi²-test) reaction to changes in canopy structure. We showed differences in the ecological traits of species with different light reactions (shade-tolerant, light-flexible, light demanding). Light demanding gap species are characterised by higher moisture and nitrogen indicator values, late flowering, and they include species with different seed dispersal and seed bank types. Light flexible species have intermediate moisture and nitrogen indicator values, flower in mid-summer, transient seed bank but various seed dispersal mechanisms. The observed shade-tolerant species usually flower early in the season and have transient seed bank. We found that in spite of the dramatic local changes in absolute and relative importance of species, all closed forest specialists could survive within the patches characterised by different fine-scale stand dynamical processes.

Steinbauer M.

Oral presentation

Global diversity and the effect of long-term topographic isolation

Manuel Steinbauer [1, 2]

[1]Department of Bioscience, Aarhus University, Aarhus, Denmark; [2]Department of Biogeography, University of Bayreuth, Bayreuth, Germany

Manuel.Steinbauer@uni-bayreuth.de

High-elevation ecosystems are more isolated from each other, less connected and have smaller extent than lower-elevation ecosystems. I will show that this increase in isolation with elevation causes a globally consistent empirical relationship between elevation and endemism using entire floras of more than 50 high elevation islands and mountains. In contrast to these findings, leading theories that seek to explain the contribution of species evolution to global diversity patterns neglect isolation but focus on temperature, biotic interactions and area in influencing speciation rate. I will show that isolation may play a much more prominent role in generating the latitudinal diversity gradient than previously thought, an effect enhanced by the reduction by glaciation of absolute elevation at high latitudes. This enhances our understanding why there are so many terrestrial species overall, as well as why they increase in number towards the equator.

Stenzel S.

Oral presentation (young scientist)

Support monitoring of habitat types with remote sensing – "Yes we can!" or "See the limits!"

Stefanie Stenzel * & Sebastian Schmidtlein

Institute for Geography and Geoecology, Karlsruhe Institute of Technology KIT, Karlsruhe, Germany

* Presenting author: stefanie.stenzel@kit.edu

Monitoring of vegetation types becomes increasingly important due to global change and ongoing intensification of agricultural land-use systems. Programs of international interest like the Natura 2000 project (European Union Habitats Directive) or the High Nature Value Farmland (EU rural policy framework) demand an immense effort of mapping vegetation. Remote sensing may offer great potential for conservation monitoring. We would like to show opportunities but also limitations of working with vegetation cover reflection. We use high resolution satellite data and field data to map the distribution of several habitat types continuously over a broad area. Variations in the appearance of the very same vegetation type at different places and times are taken into account by including phenological information. The Maximum Entropy (Maxent) algorithm, often used in macroecology, has a great potential for identifying individual vegetation types in a matrix of complex vegetation patterns and was therefore used to deal with habitat occurrences and reflectance data. Also more established methods, like one-classSVM, biasedSVM, multiclassSVM and partial least square regression (PLSR) were analysed for their application possibilities in the field of habitat classification and condition description. Our field campaign took place in Bavaria, Southern Germany, and in Pomerania, Northeast Germany. We sampled more than 400 plots concerning the vegetation belonging to four different vegetation types according to the European Habitat Directive (*Molinia* meadows, degraded raised bogs, transition mires and quaking bogs, alkaline fens) or to High Nature Value Grassland (three quality-classes). Information on the surface reflectance was available from the RapidEye sensor. We used several approaches to relate point-based habitat type information to the corresponding reflectance. The final output consists of maps of occurring classes and measures of uncertainty. It is discussed if and with which limitations maps like this can support an assessment of habitat distribution, especially in inaccessible areas.

Suja J.

Poster J-29

The impact of historical land use on current species richness of mesic meadows in Slovakia

Session: Patterns of vegetation change across landscapes

Jozef Suja [1,*], Monika Janišová [2] & Tomáš Hlásny [3]

[1]Department of Biology and Ecology, Faculty of Natural Sciences, Matej Bel Univesity, Banská Bystrica, Slovakia; [2]Institute of Botany, Slovak Academy of Science, Banská Bystrica, Slovakia; [3]National Forest Centre, Forest Research Institute Zvolen, Zvolen, Slovakia

* Presenting author: jsuja86@gmail.com

Changes in land use, especially abandonment of the traditional management, lead to transformation of the land cover due to succession. This has a significant impact on the species composition of grassland communities. In the present paper we have attempted to determine whether and how change in land use on different bedrocks affects the species richness on the basis of a comparison of historical and contemporary maps of Slovakia. We evaluated 300 phytosociological relevés assigned to the *Arrhenatherion elatioris* alliance recorded on six types of geological bedrock. According to the historical orthophoto map from 1950 we indicated the historical land use (meadow, pasture, field) of each plot based on geograpic coordinates of each plot site. According to orthophoto map from 2010, current land use of the site (meadow, pasture, field, forest) was determined. Statistical evaluation was made by one-way analysis of variance (ANOVA) and for statistically significant results we used the Tukey HSD test for multiple comparisons. The analyses showed that the impact of historical land use was not statistically significant, mean values of species richness in the former meadows and fields were similar, and in the former pastures were slightly lower. A statistically significant difference was found in the analysis of the impact of bedrock on species richness, where the sites on a flysch bedrock represented species-richest areas and the areas poorest in species were on acidic bedrock.

Acknowledgements: This study was supported by the grant VEGA 2/0099/13.

Šumberová K.

Oral presentation

Distribution changes in wetland plant species: the role of life history traits and land use interactions

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Kateřina Šumberová [1,*], Pavel Dřevojan [2], Jan Prančl [3] & Michal Ducháček [4]

[1]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Department of Taxonomy, Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [4]Deparment of Botany, National Museum, Prague, Czech Republic

* Presenting author: katerina.sumberova@ibot.cas.cz

During the 20th century, changes of traditional use and management took place in many regions across Europe. Habitat and biodiversity change and/or loss are among the most important consequences of such processes. On the level of individual species, an ability or inability to cope with environmental changes is reflected as frequency and/or distribution change (either decline, or expansion). To analyse the impact of the processes in the changing landscape on selected wetland plant species and their communities in the Czech Republic, we explored both historical and recent data on flora and vegetation. We detected two groups of species that exhibit different types of frequency and distribution shift as a consequence of environmental changes. The first group involves the species related to specific plant communities, declining due to direct habitat and vegetation destruction (i.e. wet meadow or salt marsh drainage and transfer to arable land). These species are mainly perennials, e.g. *Gratiola officinalis* and *Pulicaria dysenterica*, and usually persist on sites where the suitable habitat and vegetation type have been maintained, even when the management changed (e.g. frequency and timing of mowing). The second group includes mainly the annual or shortly perennial species that in the past occurred in various wetland plant communities. Although the habitats and the appropriate vegetation have been maintained, these species declined markedly as a consequence of interactions between land use change on one side and specific life history traits on the other side. For instance, change in frequency, timing, intensity and length of management interventions (e.g. summer drainage of fishponds, various types of disturbances caused by grazing animals or agricultural mechanisms) are the most probable cause of large-scale retreat of wetland annual plant species that are competitively poor and at the same time exhibit either too long life cycles (e.g. *Pseudognaphalium luteo-album*, *Tillaea aquatica*) or germination under high summer temperatures (e.g. *Cyperus flavescens*, *Pulicaria vulgaris*). Especially in temporary wetlands the microsites suitable for germination and establishment of seedlings appear in unsuitable time of the year, later being overgrown by competitively strong vegetation. Although the factors as eutrophication also represent serious threats of wetland biodiversity, they are not the primary cause of the competitively poor annual species retreat.

Sun H.

Poster C-15

Cushion plants play an important role for increasing species diversity in the alpine subnival communities from Sino-Himalaya

Session: Patterns and drivers of alpha and beta diversity in plant communities

Yang Yang [1], Zhimin Li [2], Jianguo Chen [1] & Hang Sun [1,*]

[1]Key Laboratory for Plant Diversity and Biogeography, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming, China; [2]Life Science School, Yunnan Normal University, Kunming, China

* Presenting author: sunhang@mail.kib.ac.cn

We assessed the community-level of biotic process, in particular the importance of facilitation performed by cushion plants in determining patterns of diversity in alpine subnival communities of Sino-Himalaya (Hengduan Mountains) (SH) that supports the global richest alpine flora and was defined as one of hotspots for temperate biodiversity. The presence of cushion plants increased species richness and abundance in ten of eleven studied plant communities (> 90%). Generally, the net facilitation effect of cushions increased with increasing habitat severity, an effect that could be attributed mainly to a reduction in specie richness in cushion free areas with increasing severity. However, intra-species and inter-species comparisons of facilitation of particular cushion species growing at high and low severity habitats and co-occurring species sharing similar cushion morphology indicated the changes in the magnitude of facilitation by cushion plants could be dependent on both environmental severity (i.e. decreased soil nutrient availability within increasing altitude) and neighbor trait effects (variations in soil nutrient level beneath different benefactor species). Our results suggest that facilitation by cushion plants is key to structuring diversity and composition of natural communities at high elevations in the species-rich in SH, with the importance of the cushion effect increasing with habitat severity due to a buffering effects by cushions of the negative effect of habitat severity on species richness observed in cushion-free areas. This indicates the pivotal role of facilitative interactions among plant species in supporting high diversity in these severe environments. It is clear now that cushion plants act as nurse species as well as key stone species in these alpine habitats of SH.

Suwal M.K.

Poster J-30 (young scientist)

Dynamics of upper species limit of Himalayan Silver Fir (*Abies spectabilis*) in Central Himalaya during 20th century

Session: Patterns of vegetation change across landscapes

Madan Krishna Suwal [1,*], Krishna Babu Shrestha [3], Ole Reidar Vetaas [1], Laba Guragain [2], Rabin Shakya [2], Kalpana Shrestha [2] & Dinesh Raj Bhuju [2]

[1]University of Bergen, Bergen, Norway; [2]Tribhuvan University, Kirtipur, Nepal; [3]UniGlobal, Bergen, Norway

* Presenting author: madanksuwal@gmail.com

Aims: Global warming is triggering vegetation belts to shift towards the pole or higher elevation. The Himalaya is getting warm, reportedly at faster rate than the world's average. However, studies on climate change-driven vegetation shifts are limited in the region. We aim to analyze if the upper species limit of a tree line species *Abies spectabilis* D. Don has changed during the last century in response to warmer climate.

Location: The study was carried out at four sites in the Central Himalaya, namely Manaslu Conservation Area (MCA; 3 plots) and Gaurishankar Conservation Area (GCA; 1 plot).

Methods: The field works were carried out between 2009 and 2013. A belt transect with 20 m fixed width was laid at the upper species limit of *Abies spectabilis* starting from the uppermost individual and coming down to treeline and further down to treeline ecotone forest. Hence the plot length was varied in all the sites. Then census was carried out to report GPS location, elevation and age of *A. spectabilis*.

Results: This study reveals that there is an upward shift in the species upper limit, however the rate of shift varied from site to site. Per-decade shift is found to be 34.29 m (MCA-1), 10.89 m (MCA-2), 13.85 m (MCA-3) and 4.80 m (GCA-1). The rate of the shift after the 1950s is higher than before. Average range shift rate after the 1950s for MCA-1, -2, -3, is 34.29 m, 10.92 m, 49.62 m per decade. There is inverse relation of seedling and sapling density with altitude.

Conclusions: Species limit shift was found in central Himalaya due to disturbance and climate warming. More studies are needed to determine the most influencing causal factor among them.

Švamberková E.

Oral presentation (young scientist)

Experimental assessment of the role of biotic interactions in delimitation of the community species pool

Special session: The relevance of "dark diversity" for theoretical and applied ecology

Eva Švamberková *, Jan Lepš & Alena Vítová

Department of Botany, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic

* Presenting author: eva.sva@centrum.cz

Differences in species composition between a community and its species pool are expected to reflect the effect of biotic community filters; however this could not be the case if the definition of species pool excludes species that actually cannot live in a site because of competition. If we define the species pool as a set of species able to reach a site and form a viable population in a given abiotic environment (i.e. to pass the dispersal and abiotic filter), the difference in species composition should correspond to the effect of biotic interactions. However, most of the operational definitions of the species pool are based on co-occurrence patterns (including definitions based on the functional plant traits, Ellenberg indicators or Beals index) and thus also already reflect the effect of biotic relationships. We conducted an experiment on the moisture gradient (three contiguous locations) with aim to demonstrate that many species not accounted by current measures of species pools in a site should be included because they are in fact able to establish successfully if competition is removed. In a sowing experiment, we studied the establishment and survival of species after the removal of competition (i.e. in artificially created gaps) and in intact vegetation; the investigated species included 12 species resident in the locality and 18 species typical for different habitats (i.e. species not expected in the species pool according to existing algorithms). Many of the species with different habitat preferences were able to grow in the focal habitat if competition was removed, i.e. in gaps (including species typical for much drier conditions: *Sanguisorba minor* which reached the reproductive stage, and *Hypericum hirsutum*, *Nardus stricta*, *Origanum vulgare*, *Thymus pulegioides*, *Trifolium montanum* and *Carlina acaulis*), but none of them survived under the competition of the intact community. These species are thus not limited by abiotic conditions, but by competition. Beals index was the best predictor of species relative success in the intact community, followed by matching of the Ellenberg indicator for moisture to the community weighted mean of the plot where plants were transplanted; other Ellenberg indicators had no explanatory power. Comparison of realized vegetation composition with the corresponding species pool can greatly underestimate the potential impact of the biotic filter if the delimitation of the species pool is based on the realized niches of species.

Svoboda M.

Oral presentation

Three centuries of spatio-temporal variability in disturbance regime of primary mountain Norway spruce forests across Europe

Special session: Global change and vegetation dynamics: the use of historical data sets

Miroslav Svoboda [1,*], Pavel Janda [1], Volodymyr Trotsiuk [1], Vojtěch Čada [1], Martin Mikoláš [1], Radek Bače [1], Hana Mrhalová [1], Robert C. Morrissey [1] & Tom A. Nagel [2]

[1]Czech University of Life Sciences Prague, Prague, Czech Republic; [2]Department of Forestry and Renewable Forest Resources, Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenia

* Presenting author: svobodam@fld.czu.cz

Climate change could significantly alter disturbance regimes in forest ecosystems. In mountain regions of Central and East Europe, scenarios with increased frequency of severe windstorms and droughts, which could trigger large-scale bark beetle outbreaks, are predicted. During the past decade, this region has experienced severe blowdowns and bark beetle outbreaks. Based on our estimation, more than 50,000 ha of forests were disturbed during the last two decades. Thus, an important question whether these events are part of the historical range of variability or climate-induced change and past management practices is of crucial importance for future forest management towards higher resilience and resistance against such events. Our aim is to uncover 300 years of disturbance history in primary mountain spruce forests in the Carpathians and the Bohemian Forest based on dendrochronological methods. We used highly spatially and temporally resolved dendrochronological data of over 15,000 trees from more than 500 plots to reconstruct past disturbance history on plot, stand, landscape and mesoscale levels. Disturbances were reconstructed based on tree decrease in competition in the form of rapid early growth and abrupt increase in radial growth. Furthermore, all data were scaled based on the canopy area to minimize sampling depth influence towards the past. Our study provides strong evidence that the forest was mainly driven in the past by moderate severity disturbance regime. Importantly, despite high spatio-temporal variability of historical disturbances was observed on the plot level, we found a strong evidence of disturbance synchronisation over the mesoscale level. Broad mesoscale peaks of disturbances were evident across many sites in the 1820–1830, 1850–1890, and 1910–1930 periods. We discuss possible processes and agents that cause such disturbances, including windstorms and bark beetle. Furthermore, we indicate the role of past climate extremes as a possible trigger of such events. We conclude that alongside climate change or anthropogenic factors, these past synchronized mesoscale level development histories are likely be a driving factor of current large-scale diebacks.

Swacha G.

Oral presentation (young scientist)

A comparison of preferential and non-preferential sampling schemes in the assessment of environment- and land use-vegetation relationships in species-rich grasslands

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Grzegorz Swacha [1,*], Zoltán Botta-Dukát [2], Zygmunt Kącki [1], Daniel Pruchniewicz [3] & Ludwik Żołnierz [3]

[1]Department of Botany, University of Wroclaw, Wroclaw, Poland; [2]Institute of Ecology and Botany, MTA Centre for Ecological Research, Hungarian Academy of Sciences, Vácrátót, Hungary; [3]Department of Botany and Plant Ecology, Wroclaw University of Environmental and Life Sciences, Wroclaw, Poland

* Presenting author: gswacha@gmail.com

Preferential sampling is considered to give biased conclusions about vegetation parameters such as species richness, vegetation diversity and representation of plant groups like rare or invasive species. Therefore, non-preferential sampling is indicated as most the appropriate method for testing ecological hypotheses. However, both preferential and non-preferential sampling schemes are often used to study the effect of environmental factors and land use management on species composition and vegetation structure. The main question of our study is whether different sampling schemes provide similar or different conclusions about how environmental factors and land use management shape vegetation composition. In order to find answer to this question we compared three most common methods of plots arrangement: preferential, random and systematic. The present study was carried out within the same vegetation type comprising species-rich *Molinia* meadows in south-western Poland. Preferential sampling was in accordance with traditional Braun-Blanquet approach. This approach required choosing only most typical and homogeneous stands, and avoidance of transitional or disturbed patches of vegetation. Random and systematic plots were positioned based on grid of squares prepared a priori to the fieldwork, and without any other restrictions. The entire data set consisted of 306 vegetation plots, for which soil parameters were collected (pH, organic matter, total N, exchangeable forms of P, K, Ca, Mg). All data sets used for a comparison consisted of similar number of plots. The effect of environmental factors and management regime on vegetation was studied using distance-based redundancy analysis. We found out that drawing conclusions about the effect of site conditions and management on vegetation is highly dependent on sampling approach. Preferential and non-preferential data sets differed in terms of species composition within meadows with the same management regime. Further, best developed stands of *Molinia* meadows sampled preferentially also responded differently to pH, Ca and K. Our case study shows that subjectivity in vegetation surveys, which is typical for Braun-Blanquet approach, may overestimate the effect of environmental conditions on species composition. A similar bias can occur in the large scale assessment of species composition along environmental gradients, if preferentially collected vegetation-plots (e.g. from phytosociological databases) are used.

Swacha G.

Poster P-32 (young scientist)

Formal definitions for higher vegetation units: classification of *Molinia* meadows in Poland using Cocktail method

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Grzegorz Swacha * & Zygmunt Kącki

Department of Botany, University of Wrocław, Wrocław, Poland

* Presenting author: gswacha@gmail.com

Cocktail method has been proven to be a useful tool in reproducing the expert-based classification of vegetation. Recent studies on formalized classifications focused on creating Cocktail definitions only for vegetation units at the level of associations. In majority of studies, the first step in the classification process is to select only those relevés that have been assigned to vegetation units by the authors of the original data. However, phytosociological databases may also contain relevés without phytosociological assignment. Another way of data stratification is selection of relevés based on the list of diagnostic species, but in this case it is unlikely to select relevés that would represent exclusively the vegetation type of interest. In this study we present an approach of creating formal definitions for higher vegetation units, and as a test of this approach we made an attempt to delimit a group of relevés representing *Molinia* alliance in Poland. The study was performed using 53,541 relevés from the Polish Vegetation Database. We applied formal definition of the alliance *Molinion* to geographically stratified data set of 14,612 relevés. The resulting set of 586 relevés representing *Molinion* meadows was used for further detailed delimitation of units at the level of associations. 28% of the relevés assigned to the alliance by its formal definition did not contain information on phytosociological assignment. Finally, using Cocktail definitions we delimited four associations belonging to the *Molinion* alliance. Narrowly defined associations included only core relevés of vegetation units, and all together consisted of 52% of relevés that were assigned to the alliance. We consider creating formal definitions for higher vegetation units as an important step of data stratification. Group of relevés delimited by the alliance definition is a working-space data set for a detailed classification of low-rank vegetation units (associations). It also makes it more efficient to use supervised methods of relevé assignment. Often, vegetation classified at the level of alliances corresponds to types of vegetation comprising protected habitats in NATURA 2000 network, thus formalized classification of higher vegetation units seems to be of fundamental importance for nature conservation. A computer expert systems for identification of vegetation types at the level of alliances in Europe would be a practical tool for nature conservation managers.

Szabó G.

Poster D-35

Fine-scale spatial variability of diversity and biomass in grasslands as a potential indicator of naturalness and management

Session: Vegetation science serving nature conservation

Gábor Szabó *, Zita Zimmermann & Sándor Bartha

Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary

* Presenting author: szabo.gabor@okologia.mta.hu

Experimental studies suggest positive relationship between diversity and productivity. In contrast, field studies often found negative or neutral relationships at local spatial scales. We investigated these relationships in various grasslands and old fields assessing also the spatial stability (reliability) of these community attributes. We hypothesize that diversity has a stabilizing effect on the spatial varibility of productivity in grasslands and therefore spatial pattern of functioning can be used as indicator of community state. Sand steppes (Fülöpháza, Csévharaszt), loess grasslands (Battonya, Tiszaalpár), steppe meadows (Kunpeszér) and old fields (Battonya) were studied in Hungary. Coenological relevés and biomass samples was collected in 50 × 50 cm quadrats at regular 2 m intervals along 60 m transsects. Correlations between biomass, total cover, alpha and beta diversity were calculated and the coefficient of variation of these attributes were compared. To assess the relative importance of plant identity, dominance and diversity on productivity, species were ranked and analyses were repeated with a sequential elimination of less abundant species. Unimodal relationship was found between species richness and productivity at regional scale with neutral (loess grasslands, sand steppes) and negative (old fields, steppe meadow, sand steppe) relationships at local scale. Correlation between subdiversity and productivity increased with including more dominant and co-dominant species and stabilized around 4–8 species in old fields and sand steppes reflecting multispecies control. In contrast, this correlation decrease and approached zero in loess grasslands and steppe meadows. Beta diversity was positively related to the CV% of alpha diversity, while the spatial variability of biomass and diversity decreased with the increasing mean of these attributes. Our results suggest that community level attributes are more stable and probably regulated in closed, species rich and saturated communities. Neutral relationship indirectly indicates some regulation while the negative relationship found in open and early successional communities indicates some failure of regulation and strong dynamics. We suggest that spatial variability (CV%) of diversity and productivity can serve as a simple indicator of dynamical state in grasslands.

Acknowledgements: The study was funded by OTKA K 105608.

Szwagrzyk J.

Poster with lightning talk F-04

Patterns and drivers of the regeneration processes following catastrophic wind disturbances in forests

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Jerzy Szwagrzyk [1,*], Dorota Dobrowolska [2] & Zbigniew Maciejewski [3]

[1]Department of Forest Biodiversity, Institute of Forest Ecology and Silviculture, Agricultural University of Kraków, Kraków, Poland; [2]Department of Forest Ecology, Forestry Research Institute, Warszawa, Poland; [3]Roztocze National Park, Zwierzyniec, Poland

* Presenting author: rlszwagr@cyf-kr.edu.pl

We analyzed patterns of regeneration of forest communities following two types of catastrophic wind disturbances; summer storm, which destroyed large swaths of Pisz Forest in North-Eastern Poland in July 2002, and two tornadoes (August 1989 and August 2008) which hit forests stands in Roztocze, South-Eastern Poland. In both study sites wind-disturbed areas had been set aside for scientific and educational purposes. In Roztoczański National Park, the first tornado was located in a strictly protected zone of old-growth stands, while the second tornado hit a secondary stand with a permanent sample plot, which had been measured one year earlier. That created unique opportunity for studying tree mortality and regeneration processes. Forest communities differed strongly between booth study areas; in Pisz Forest the habitats were poor, and mixed forests of *Pinus sylvestris* prevailed. In Roztocze the disturbed stands were located in rich deciduous forests. Wind-related mortality in areas affected by tornadoes was higher (above 50%) and more concentrated, while in Pisz Forest the mortality rates were much below 30% and spatially very diverse. Many trees (especially *P. sylvestris*) were strongly bended, but not broken. In both study areas, many of the strongly damaged trees survived and developed secondary crowns in the years following wind disturbances. That was especially true for *Carpinus betulus* and *Acer pseudoplatanus* in Roztocze, and for *Betula pendula* in Pisz Forest. Natural regeneration of *B. pendula* in Pisz Forest was rapid; *P. sylvestris* has been regenerating slowly, with new seedlings arriving each year. After twelve years, a substantial part of the wind-affected area in Pisz Forest is still covered by patches of dwarf shrubs, mosses, and grasses without new generation of trees. In the rich deciduous forests in Roztocze the rate of regeneration processes was very fast. The first three years after windthrow were characterized by rapid development of herbaceous plants and blackberries. However, six years after the disturbance most of the area of windthrow has been already covered by a dense canopy, a mixture of regenerating crowns of trees which had survived the windfall, and fast growing advance regeneration of *A. pseudoplatanus*, *Fagus sylvatica* and *C. betulus*, released by the wind disturbance. Among them there is an admixture of young trees established just after disturbance, especially *B. pendula*, *Salix caprea* and *Cerasus avium*.

Szymura M.

Poster with lightning talk O-14

Landscape structure and socio-economic variables explain the spatial pattern of alien *Solidago* invasion

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Magdalena Szymura [1,*] & Tomasz H. Szymura [2]

[1]Department of Agroecosystems and Green Areas Management, Wrocław University of Environmental and Life Sciences, Wrocław, Poland; [2]Department of Ecology, Biogeochemistry and Environmental Protection, University of Wrocław, Wrocław, Poland

* Presenting author: magdalena.szymura@up.wroc.pl

Solidago species from America are among the globally most successful invaders. They have conquered Europe, large parts of Asia, Australia and New Zealand. In Central Europe four alien *Solidago* species occur: *S. altissima* L., *S. canadensis* L., *S. gigantea* Aiton and *S. graminifolia* (L.) Elliot. Their invasion has been observed for many years, and recently they occupy a vast area in Europe. The increase of alien *Solidago* cover in patches of vegetation is correlated with a decrease of vascular plants, birds and wild pollinator species richness. Their presence alters biogeochemical cycles and primary productivity of invaded habitats. The distribution of invasive *Solidago* species is not random; areas highly infested by goldenrods coexist with regions where these species are absent or rare. Despite extensive research concerning ecology and biology of goldenrods, the factors influencing their distribution at the regional scale have not been studied. In this study we examined the effect of landscape structure and socio-economic variables on the distribution of alien *Solidago* species at the regional scale. The field data was collected in a set of 309 sampling plots, regularly placed in nodes of 10 × 10 km grid, in south-western Poland (Silesia, Central Europe, study area ca. 32,000 km^2). Landscape metrics consisted of the land use/land cover data and length of roads, rivers and railways. Socio-economic variables consisted of human population density and total income per capita. The average values of metrics were calculated at three nested spatial resolutions (large – circular buffer with radius 5 km, medium – 2 km and small – 0.5 km). A model explaining the spatial pattern of invasion was developed using a classification tree method. Since the studied invasive *Solidago* species do not differ in habitat preferences, and their ranges overlap in the study area, we built one model for all species. The results showed that landscape structure and density of human population allow explaining spatial pattern of alien *Solidago* species invasion at the regional scale. Percentage of forests and length of roads, calculated at small resolution, had the highest importance in the model. The percentage of urban areas, sum of roads, rivers and railways length, as well as human population density calculated at large resolution had lower importance, but still significantly improved the model.

Szymura T.H.

Oral presentation

The effect of ecological niche and neutral processes on the diversity of oak forest vegetation

Tomasz H. Szymura [1,*] & Magdalena Szymura [2]

[1]Department of Ecology, Biogeochemistry and Environmental Protection, University of Wrocław, Wrocław, Poland; [2]Department of Agroecosystems and Green Areas Management, Wrocław University of Environmental and Life Sciences, Wrocław, Poland

* Presenting author: tszymura@biol.uni.wroc.pl

Both niche-based and neutral processes (stochastic events and dispersal limitation) shape the species composition of plant communities. However, their relative importance can vary considerably from one habitat to another, and it is also strongly related to spatial scale in which it was examined. Knowledge about relative importance of niche-based vs. neutral processes in certain vegetation types is required both from purely scientific and nature conservation perspectives. Unfortunately, studies focusing on this problem in European forest vegetation are scarce. In this research we determined the effect of environmental conditions and spatial processes at multiple scales on the species composition of forest vegetation. We studied it in a patchy system consisting of overgrown oak stands of coppice origin with high conservation value. The oak forests cover slopes with a southern exposure in a diverse submontane landscape in Silesia, Poland, Central Europe. The vegetation was sampled in circular plots sized 250 m^2 arranged in three, nested spatial scales: small (plots within sites), medium (sites within mountain ranges), and large (two mountain ranges). There were 63 plots in total. In each of them the following variables were measured: soil depth and texture, content of nitrogen, phosphorus, potassium and calcium, and soil moisture and light availability at forest floor. Soil water-holding capacity and potential heat load were calculated. The spatial component was surveyed with the principal coordinate analysis of neighbour matrices method (PCNM), using a “staggered” matrix to examine the effect of nested spatial scales. The variation partitioning procedure was applied to assess the relative influence of spatial and environmental components. To detect the effect of particular environmental variables, redundancy analysis was calculated. The results suggested that the relative importance of niche-based and neutral processes changes with spatial scales. Vegetation composition was related to environmental variables (mostly water-holding capacity and Ca content), as well as spatial processes, presumably dispersal limitation, at large (ca. 15 km) and medium (ca. 3.5 km–1.0 km) scales. At small spatial scale (< 1 km) we did not detect any effect of spatial processes.

Táborská M.

Poster J-31 (young scientist)

Dead wood inhabiting bryophytes and their relationship to tree species and decay stages in a natural fir-beech mixed forest in the Czech Republic

Session: Patterns of vegetation change across landscapes

Markéta Táborská [1,2,*], Tomáš Vrška [2] & Péter Ódor [3]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Forest Ecology, Silva Tarouca Research Institute, Brno, Czech Republic; [3]Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary

* Presenting author: taborska.mar@gmail.com

Species richness and composition of bryophyte communities in relation to the tree species and decay stage were explored on 57 logs of *Abies alba* and *Fagus sylvatica* in the natural forest reserve Salajka (Czech Republic). Bryophytes were represented by 68 species. On the stand level, species richness on *Fagus* was higher than that on *Abies*. On log level this difference disappeared and the average alpha diversity of *Abies* and *Fagus* logs was similar. Higher beta diversity (heterogeneity) of *Fagus* logs than that of *Abies* is explained by higher diversity of epiphytic species on *Fagus* in earlier decay stages, when the conditions of logs are heterogeneous and they provide more microhabitats than *Abies*. On the other hand *Abies* has higher diversity of epixylic species in later decay stages occurring on very acid and constantly moist substrates. Both on the stand and log level, intermediate decay stage had the highest species richness. It is a transitional phase in the succession of decay where species from all stages overlap and therefore their overall number is relatively high. The species composition differed significantly between the hosts, with two clearly defined groups of indicator species. In contrast, individual decay stages were not so sharply distinguished from the point of view of indicator species. It is concluded that both decay stage and tree species influence the species richness and composition of bryophytes on dead wood and their various combinations increase the total diversity. Therefore, successful bryophyte conservation should be focused on the preservation of mixed stands and the continuity of dead wood in the montane beech-fir zone of Europe.

Tang Z.

Oral presentation

Patterns of taxonomic and phylogenetic beta diversity in China's grasslands in relation to geographical and environmental distance

Zhiyao Tang *, Xiulian Chi & Jingyun Fang

Department of Ecology, College of Urban and Environmental Sciences, Peking University, Beijing, China

* Presenting author: zytang@urban.pku.edu.cn

Patterns and determinants of beta diversity can be used to explore the underlying mechanisms regulating community assembly. Despite being the most commonly used measure of beta diversity, species turnover does not consider the evolutionary differences among species, treating all species equally. Incorporating information on phylogenetic non-independence or correlatedness among species in the calculation of beta diversity may substantially advance our understanding of the ecological and evolutionary mechanisms structuring communities. Here, we investigate the relative influence of geographical distance and differences in environmental conditions (environmental distance) on the taxonomic and phylogenetic beta diversity between grassland communities expanding 4000 km across the Tibetan Plateau, the Inner Mongolia Plateau and the Xinjiang Autonomous Region in China. Both observed and standardized effect size of taxonomic and phylogenetic beta-diversity were significantly correlated with geographical and environmental distance across all regions. However, the effect of geographical distance on the standardized effect size of phylogenetic beta diversity disappeared when environmental distance was controlled. We also found that within different regions, the effect of environmental distance on both observed and standardized effect size of phylogenetic beta diversity was more significant than geographical distance. Among environmental variables, climate played a more important role in shaping observed phylogenetic beta diversity across and within regions, and standardized effect size of phylogenetic beta diversity across regions. Soil properties played a more important role in shaping standardized effect size of phylogenetic beta diversity within regions. The phylogenetic beta diversity of species from dicot and monocot clades exhibited similar patterns along environmental and geographical distance. The results suggest that at the study scale, phylogeny of grassland communities in China is predominantly structured by environmental filtering, and the dominant environmental factors may be scale-dependent.

Tang Z.

Poster with lightning talk A-19

Variation of leaf N and P concentrations in shrubland biomes across Northern China: phylogeny, climate and soil

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Zhiyao Tang[1,*], Xian Yang [1], Hongyan Liu [1], Wenhong Ma [2], Anwar Mohhamot [3] & Shunli Yu [4]

[1]Department of Ecology, College of Urban and Environmental Sciences, Peking University, Beijing, China; [2]College of Life Science, Inner Mongolia University, Hohhot, China; [3]Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, China; [4]Institute of Botany, Chinese Academy of Science, Beijing, China

* Presenting author: zytang@urban.pku.edu.cn

Aim: Concentrations of leaf nitrogen (N) and phosphorus (P) are key leaf traits in ecosystem functioning and dynamics. Previous studies on patterns of leaf N and P concentrations have focused on trees and grasses. Since foliar stoichiometry varies remarkably among life forms, exploring stoichiometric patterns of shrubs is needed to understand the macroecological patterns in plant stoichiometry and related driving factors.

Location: Northern China, extending 46.1 degrees (86.7°E –132.8°E) in longitude and 19.8 degrees (32.6°N –52.4°N) in latitude.

Methods: We measured N and P concentration of fully expanded sun leaves of 1486 samples composed of 163 shrub species, and soil samples from 361 shrubland sites. We differentiated the variation of N and P concentration into intra- and interspecific variations, and then explored the patterns of leaf N and P concentrations in relation to climate, soil and evolutionary history, by using general linear models and phylogenetic analysis.

Results: Leaf N concentration decreased with precipitation. Leaf P concentration decreased with temperature and increased with precipitation and soil P concentration. Both leaf N and P concentrations were phylogenetically conserved, but leaf P concentration was less conserved than leaf N concentration. At community level, climate explained more interspecific variation of leaf nutrient concentration, while soil nutrients explained more intraspecific variation.

Conclusions: Leaf N and P concentrations in shrubs were higher than those in trees but lower than those in herbaceous plants. Leaf N and P concentrations responded to climate, soil and phylogeny in different ways. Leaf N concentration was driven by precipitation and more phylogenetically conserved, whereas leaf P concentration was jointly driven by soil and climate, and was less phylogenetically conserved. Climate influenced the community chemical traits through the shift in species composition, whereas soil directly influenced the community chemical traits.

Tatarenko I.

Poster E-05

Resilience of floodplain productivity to environmental change

Special session: Global change and vegetation dynamics: the use of historical data sets

Irina Tatarenko [1,2,*], David Gowing [1], Inna Ermakova [2], Valeriy Tyurin [3], Lyudmila Shepeleva [3], Elena Neskryabina [4], Natalia Koroleva [5], Natalia Savinikh [6], Tatiana Parinova [7], Tatiana Gordeeva [8], Nikolaj Dajneko [9], Maria Merkusheva [10], Ksenia Schukina [11], Galina Shushpannikova [12], Evgenia Pizhikova [13] & Ekaterina Kopeina [5]

[1]Department of Earth, Environment and Ecosystems, Open University, Milton Keynes, United Kingdom; [2]Research and Education Biological Centre, Moscow Pedagogical State University, Moscow, Russia; [3]Surgut State University, Surgut, Russia; [4]Khoperskiy Zapovednik, Novokhopersk, Russia; [5]Laboratory of Flora and Vegetation, Polar-Alpine Botanic Garden-Institute of the Russian Academy of Science (RAS), Kirovsk, Russia; [6]Botany Department, Vyatka Humanity State University, Kirov, Russia; [7]Department of Botany, General Ecology and Nature Management, Northern (Arctic) Federal University, Arkhangelsk, Russia; [8]National Park "Ugra", Kaluga, Russia; [9]Department of Biology, Gomel' State University, Gomel', Belarus; [10]Institute of General and Experimental Biology of the Siberian Branch of the RAS, Ulan-Ude, Russia; [11]Botanical Institute of the RAS, Saint Petersburg, Russia; [12]Botany Department, Syktyvkar State University, Syktyvkar, Russia; [13]Department of Botany, Buryat State University, Ulan-Ude, Russia

* Presenting author: irina.tatarenko@open.ac.uk

In the floodplains, vegetation requires access to both water and oxygen in the root zone for maximal growth plus nutrients supplied from flood-deposited sediments. Meadow productivity reflects an annual balance between these three factors and can be considered as a measure of the ecosystem functioning. The hydrology of floodplains is inherently variable, driven by annual variations in precipitation and snow melt as well as temperature regime. Our project seeks to investigate floodplain meadows in a variety of climates from oceanic in Britain through a moderately-continental climate in Belarus and Northern European Russia to the strongly continental climate of Siberia. Floodplain meadows are categorised as "intra-zonal" vegetation because they display a high degree of conservatism in their species composition across climatic zones. They also show a strong resilience in their productivity across a range of contrasting environments. They have therefore been selected to investigate the mechanisms underpinning resilience in order that vegetation response to environmental change can be better represented in current predictive models. Belarussian and Russian research groups have studied the vegetation of these floodplains for a number of years and the resultant data could be immensely valuable in understanding relationships between productivity, community composition and climatic drivers. However, these data have not been published outside the Russian speaking world and their existence is largely unknown to the research community in Western Europe. The value of these vegetation records is enhanced by the existence of contemporaneous records of floodplain hydrology, as the former Soviet system was very effective at recording and stewarding such data. The project aims to develop an approach to compiling the existing data into a uniform format, so that analytical techniques could be used to explore hypotheses relating to the interdependence of the meadows' biodiversity, productivity and hydrology.

Těšitel J.

Oral presentation

New tool for grassland conservation and restoration: suppressing expansive *Calamagrostis epigejos* by root-hemiparasitic *Rhinanthus* spp.

Jakub Těšitel [1,*], Jan Mládek [1,2], Tamara Těšitelová [1], Jan Horník [1] & Vojtěch Adamec [1]

[1]Faculty of Science, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [2]Faculty of Science, Palacký University Olomouc, Olomouc, Czech Republic

* Presenting author: jakub.tesitel@centrum.cz

Calamagrostis epigejos is a clonal grass frequently expanding to semi-natural grassland communities in Central Europe. This expansion threatens biodiversity due to a massive spread of the grass and its ability to competitively exclude most co-occurring species. *C. epigejos* conserves mineral nutrients in its underground tissues and displays a highly effective resorption of nutrients from the photosynthetic tissues at the end of growing season. As a result, thick layer of slowly decomposing litter is produced preventing establishment of seedlings of other species. In addition, other species do not have access to nutrients captured by *C. epigejos* providing further competitive advantage to the grass. Due to the massive underground resource storage in its roots and rhizomes, suppressing *C. epigejos* by standard management practices (mowing etc.) is difficult, laborious and costly. Root-hemiparasitic plants may attach to *C. epigejos* roots and consequently withdraw the nutrients directly from the storage organ of the host. Still, hemiparasites rarely occur in stands of *C. epigejos* spontaneously due to the suppressive effect of the litter layer. In a series of experiments, we demonstrate that hemiparasitic *Rhinanthus* species are able to parasitize *C. epigejos* if the litter layer is removed. The suppressive effect of *Rhinanthus* on *C. epigejos* is tremendous. Under certain conditions, *Rhinanthus* spp. can virtually wipe out *C. epigejos* from infested plant communities within two years. Therefore, we suggest the hemiparasites as a highly efficient tool to reverse *C. epigejos* expansion into species-rich grassland communities.

Thiele J.

Oral presentation

Using circuit theory to assess the role of dispersal through habitat corridors for community assembly

Jan Thiele [1,*], Sascha Buchholz [2] & Jens Schirmel [3]

[1]Institute of Landscape Ecology, University of Münster, Münster, Germany; [2]Department of Ecology, Technische Universität Berlin, Berlin, Germany; [3]Department of Environmental Sciences, University of Koblenz-Landau, Landau, Germany

* Presenting author: jan.thiele@uni-muenster.de

Random dispersal processes may be important for community assembly, particularly in homogeneous habitats and among species groups of similar ecology. However, in fragmented landscapes, dispersal depends strongly on spatial configuration of habitats and permeability of the landscape matrix.

We studied plant community composition in linear landscape elements (LLE), i.e. field margins and hedges, of highly-intensive agricultural landscapes of Central Europe that are largely deprived of semi-natural habitats, such as permanent grasslands and fallows. For assessing the role of dispersal through LLE in community assembly, we used a new method of measuring conductivity based on circuit theory where different pathways (margins, hedges) connecting two given points A and B (plots) are treated as parallel wires in an electrical circuit. Then, conductivity between A and B can be calculated as the inverse resistance according to Ohm's law (McRae 2006). The rationale behind this methods is that conductivity represents the likelihood of a random walker to reach from one point to the other.

Our hypothesis was that the floristic similarity of two plots in LLE depends on conductivity of the LLE network between them, given that variation in site conditions is controlled for in the statistical analysis. Correlation between conductivity and similarity could be interpreted as the influence of dispersal on community assembly. Further, we hypothesized that the importance of dispersal varies among different groups of plant species according to dispersal syndromes and life forms.

We collected 100 vegetation relevés in eight study areas (each 1 km^2) in Northwest Germany. The pairwise similarity of relevés was assessed using Sörensen's index. Land-use/land cover of the study areas was mapped from aerial images in order to calculate various landscape metrics and, particularly, circuit conductivity of LLE between all possible pairs of plots. We also assessed site productivity by nurtrient analyses of plant biomass samples. Using GLMM, we tested the significance and assessed the relative importance of dispersal (conductivity) and site conditions for community composition by partitioning of variation. The results will be presented for the first time at the IAVS conference 2015 and implications for community ecology and conservation of biodiversity will be discussed.

References

McRae, B.H. 2006. Isolation by resistance. *Evolution* 60: 1551–1561.

Tichý L.

Oral presentation

The JUICE program for vegetation classification and brief information about its less known functions

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Lubomír Tichý

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

tichy@sci.muni.cz

JUICE is a Microsoft® WINDOWS® application for editing, classifying and analysing large phytosociological tables. It includes many functions for easy manipulation of table and header data. The program is optimised for use with TURBOVEG software (Hennekens & Schaminée 2001), which is currently the most widespread database program for storing phytosociological data in Europe; however, it is also possible to import data into JUICE from a clipboard or a spreadsheet data format file as Microsoft® EXCEL® or others. In addition to basic functions useful for editing and publishing phytosociological tables, the program includes various analysis functions (such as Beals smoothing, Ellenberg indicator values, similarity indices, beta-diversity calculation, interspecific associations, and analysis of diagnostic, dominant and constant species of synoptic tables) and classification functions using COCKTAIL (Bruelheide 1996, 2001), TWINSPAN (Hill 1979) or cluster analysis included in the PC-ORD package (McCune & Mefford 1999). It supports supervised and semi-supervised classification using KMEANS and PAM algorithms. JUICE can simply create artificial data for testing, analyse synoptic tables and it is connected with R project, which improves possibilities of the data analyses. JUICE is continuously being developed (since 1998) by the Working Group for Vegetation Science at the Department of Botany, Masaryk University, Brno, Czech Republic. Free distribution of the program via internet has been available since 2001. The presentation will be a short off-line overview of the program and some information about newer and hidden functions (COCKTAIL improvements, semi-supervised classification, expert classification systems etc.), which are available for the analysis of (not only) vegetation data.

Torca M.

Poster D-36

Study of intrapopulation and interpopulation variation in the coastal dunes species *Marcus-Kochia littorea* (L.) Al-Shehbaz

Session: Vegetation science serving nature conservation

Marta Torca [1,*], Mauro Sanna [2], José María Arjona [2], Mercedes Herrera [1] & José Antonio Fernández Prieto [2]

[1]Department of Plant Biology and Ecology, Faculty of Science and Technology, University of the Basque Country (UPV/EHU), Bilbao, Spain; [2]Departamento de Biología de Organismos y Sistemas, Universidad de Oviedo, Oviedo, España

* Presenting author: marta.torca@ehu.es

Marcus-Kochia littorea (= *Malcolmia littorea* (L.) R. Br.; *Brassicaceae*) is a Mediterranean species which lives in coastal dunes. In the Basque Country (N Spain) there are two populations in Protected Natural Areas whose origin is unknown and which represent its westernmost distribution limit. They were detected in 2003 with no previous records despite the large number of studies carried out in those dunes. In 2010 the area cover of one of these populations was mapped and it was about 306 m^2. Nowadays it covers most of the sand dunes showing an invasive pattern. The aim of this study was to clarify the origin of these two populations and to determine if they could be considered as native or introduced. Material from four different populations of the Iberian Peninsula was collected and compared with the two Basque populations. Four nuclear and four chloroplastidial microsatellites were used as genetic markers. Regarding intrapopulation genetic variation inbreeding coeficient (Fis) ranged from 0 to 0.5, which means a deficit of heterozygotes. Interpopulation genetic variation indices (Fst, Gst and G'st) showed low values in both nuclear and chloroplastidial markers, indicating a low interpopulation variation. An AMOVA (Analysis of Molecular Variance) was also performed. For nuclear markers 81.04% of the variance was due to intrapopulation variation and for chloroplastidial markers the intrapopulation variation variance was 93.10%. Pollen-to-seed migration ratio was calculated following Petit et al. (2005), showing a higher contribution of pollen than seeds. Despite of comparative results being not conclusive, it could be said that the Basque populations showed higher affinity with the Cantabric population and to a lesser extent with the population from northwestern Spain. The affinity with the populations from the southwestern Iberian Peninsula and the Mediterranean one was remarkably lower.

References

Al-Shehbaz, I.A., German, D.A., Mummenhoff, K. & Moazzeni, H. 2014. Systematics, tribal placements, and synopses of the *Malcolmia* s.l. segregates (*Brassicaceae*). *Harvard Papers in Botany* 19(1): 53–71.

Petit, R.J., Duminil, J., Fineschi, S., Hampe, A., Salvini, D. & Vendramin, G.G. 2005. Comparative organization of chloroplast, mitochondrial and nuclear diversity in plant populations. *Molecular Ecology* 14: 689–701.

Török P.

Oral presentation

Effect of cattle grazing on grassland biodiversity along a moisture gradient in alkali landscapes

Péter Török *, Orsolya Valkó, Balázs Deák, András Kelemen & Béla Tóthmérész

MTA-DE Biodiversity and Ecosystem Services Research Group, Debrecen, Hungary

* Presenting author: molinia@gmail.com

The re-introduction of traditional pastoral grazing is a crucial issue in grassland conservation actions worldwide. Extensively managed pastures are of crucial importance in sustaining grassland biodiversity at multiple scales. Traditional herding or free grazing of robust cattle breeds in relatively low stocking rates is considered to be especially useful in conservation, but, well documented case-studies are surprisingly rare on this topic. Our aim was to evaluate the effectiveness of traditional Hungarian Grey cattle grazing as a conservational action in alkali landscapes. We asked the following questions: (i) How does cattle grazing affect species composition and diversity of the grasslands? (ii) What are the effects of grazing on short-lived and perennial noxious species? (iii) Are there distinct effects of grazing in dry, mesophilous and wet grassland types? Vegetation of fenced and unfenced plots in a 200 ha sized habitat complex (secondary dry grasslands and pristine mesophilous and wet alkali grasslands) was sampled from 2006–2009 in Hortobágy Puszta. We found higher plant diversity in grazed plots compared to fenced ones in mesophilous and wet grasslands. Higher cover of noxious species was typical in fenced plots compared to their grazed counterparts in the last year regardless to studied grassland type. We found an increasing effect of grazing along the moisture gradient from the dry to the wet grassland type. The year-to-year variances also followed a quite similar pattern: the site-dependent effects were the lowest in the dry grassland and an increasing effect was detected with increasing moisture. We found that pastoral Hungarian Grey cattle grazing is effective to suppress noxious species and to create a mosaic vegetation structure. It can feed in open habitats along long moisture gradient, thus, it can maintain highly mosaic landscapes and a high patchiness and species richness in alkali habitats.

Tóth E.

Poster D-37 (young scientist)

Year-round and pastoral grazing differently affect the vegetation composition of alkali grasslands: managing for composition or species diversity?

Session: Vegetation science serving nature conservation

Edina Tóth [1,*], Orsolya Valkó [2], Balázs Deák [2], András Kelemen [2], Béla Tóthmérész [2] & Péter Török [2]

[1]Department of Ecology, University of Debrecen, Debrecen, Hungary; [2]MTA-DE Biodiversity and Ecosystem Services Research Group, Debrecen, Hungary

* Presenting author: toth.edina033@gmail.com

The type and intensity of grazing have a high importance in the management of species composition and diversity in extended open habitats of Europe. Pastoral grazing of local breeds and year-round grazing are increasingly involved in conservation management to preserve grassland biodiversity. These management types are increasingly involved in the recent conservation of alkali steppic grasslands, which were sustained by regular grazing in ancient times. However, there is a lack of studies on the effects of different grazing types on the vegetation composition and diversity in dry steppic grasslands. We selected *Artemisia* steppes to study the vegetation composition and diversity along a grazing intensity gradient. We recorded the cover of vascular plant species, total cover of mosses and lichens in 150 plots of 2 × 2 m of 15 alkali grassland stands in late May 2014. The grasslands were managed either by year-round grazing (3 stands, 0.1 animal unit/ha), traditional Hungarian Grey cattle grazing (low, moderate and high intensity: 0.5, 1.5, and 2.5 animal unit/ha, respectively, 3 stands each), and there were heavily overgrazed stands (4 animal unit/ha, Grey cattle and sheep, occasionally donkey grazing, 3 stands). We found that the total cover of perennial grasses, mosses and lichens decreased with increasing grazing intensity. The total species richness was very similar in each grassland stand regardless of the management type or intensity. The highest diversity and evenness was found in grasslands managed by moderate grazing intensity, while the lowest scores were typical in year-round grazed stands. A very similar vegetation composition with high cover of grassland specialists was detected in grassland stands managed by year-round and low-intensity traditional grazing. Our results suggest that for maintaining high cover of grassland specialists, low intensity grazing management would be necessary, but for the highest diversity moderate grazing intensity is required. We emphasise that the use of both type of management alternating in space and/or time can be the best way to maintain the suitable conservation status of alkali steppic grasslands.

Tóth K.

Poster D-38 (young scientist)

The role of seed banks in sustaining alkaline grassland biodiversity

Session: Vegetation science serving nature conservation

Katalin Tóth [1,*], Béla Tóthmérész [2], Péter Török [1], András Kelemen [2], Tamás Miglécz [1], Szilvia Radócz [1], Edina Simon [1], Balázs A. Lukács [3] & Orsolya Valkó [1]

[1]Department of Ecology, University of Debrecen, Debrecen, Hungary; [2]MTA-DE Biodiversity and Ecosystem Services Research Group, Debrecen, Hungary; [3]Department of Tisza River Research, MTA Centre for Ecological Research, Debrecen, Hungary

* Presenting author: kissa0306@gmail.com

We studied the vegetation, soil seed banks and environmental factors in three alkaline grassland types: *Artemisio santonici-Festucetum pseudovinae* dry alkaline grasslands at the highest elevations; *Puccinellietum limosae* at medium elevations and *Agrostio stoloniferae-Caricetum distantis* at the lowest elevations. We tested the following hypotheses: (i) Both species diversity in the seed banks and seed density are the highest in the most stressed grassland type; (ii) Seed density of hygrophytes increases with decreasing elevation. We detected a mean seed bank density ranging from 30,104 up to 51,410 seeds/m^2, which was higher than in most dry grasslands. The findings did not support our first hypothesis; both the lowest seed bank diversity and seed density were detected in the most stressed *Puccinellietum limosae* grasslands, where *Spergularia salina* and *Juncus compressus* were the only abundant seed bank species (possessing at least 1000 seeds/m^2). We detected the highest seed densities of the hygrophyte species in the lowest-elevated *Agrostio stoloniferae-Caricetum distantis* grasslands. The results partly supported the second hypothesis; most of the hygrophyte species were missing from the seed bank at the medium-elevated but most saline *Puccinellietum limosae* grasslands. We detected more species in the seed banks than in the aboveground vegetation which underlines the importance of seed banks in sustaining the diversity of alkaline grasslands. However, most of the graminoid species possessed no considerable seed bank, except for *Juncus compressus* (up to 38,619 seeds/m^2). Our results suggest that persistence and establishment of most alkaline grassland species are not supported by the local seed banks.

Tóthmérész B.

Oral presentation

Large-scale grassland restoration: high diversity seeding and regional seed propagation in Hungary

Béla Tóthmérész [1,*], Balázs Deák [1], Szilvia Radócz [1], Anita Kirmer [2], Sabine Tischew [2], Katalin Tóth [1], Péter Török [3], András Kelemen [3], Tamás Miglécz [1], Edina Tóth [1], Judit Sonkoly [1], Réka Fekete [4], István Kapocsi [5] & Orsolya Valkó [2]

[1]Department of Ecology, University of Debrecen, Debrecen, Hungary; [2]Anhalt University of Applied Sciences, Köthen, Germany; [3]MTA-DE Biodiversity and Ecosystem Services Research Group, Debrecen, Hungary; [4]Hungarian Department of Ecology, Babeș-Bolyai University, Cluj-Napoca, Romania; [5]Hortobágy National Park Directorate, Debrecen, Hungary

* Presenting author: tothmerb@gmail.com

We aimed at to develop an innovative concept for grassland restoration in the Pro-SEED DBU project (a cooperation of Hungarian and German partners). In Hortobágy National Park (East-Hungary) we used a two-stage restoration approach that was especially feasible for large-scale restoration. In the first stage altogether 760 ha alkali- and loess grasslands were restored on former arable lands by sowing low-diversity seed mixtures between 2005 and 2008. Due to the restoration efforts species-poor grasslands characterised by competitor grass species were formed. However, immigration of typical grassland species to the restored grasslands was hindered in many sites, because the proportion of loess grasslands acting as seed sources was low. In the second stage, species-rich target forb seed mixtures (comprising 35 species) were sown in establishment windows, which act as seed sources for further colonisation. In Hungary, native plant seeds of regional provenance have not been available commercially till now. We started seed propagation of ten forb and two grass species typical to loess grasslands to produce seeds of local provenance available for restoration projects. We also built a donor site register of species-rich grasslands in the Hortobágy National Park. This database supports the selection of sites suitable for the collection of seed material for propagation.

Toyama F.

Poster with lightning talk B-19 (young scientist)

Aquatic, small, herbaceous, and/or annual plant species as key drivers of successional changes in functional composition in irrigation ponds

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Fumiya Toyama [1,*] & Munemitsu Akasaka [1,2]

[1]Department of Environment Conservation, Tokyo University of Agriculture and Technology, Fuchu-shi, Tokyo, Japan; [2]School of Biological Sciences, The University of Queensland, Queensland, Australia

* Presenting author: gyakutensu@gmail.com

Human activities, including agricultural development, are the major threats to biodiversity, though decline in human activities such as management abandonment can also threat biodiversity. This is because management abandonment triggers succession in habitats. Biodiversity is highly maintained by management activities such as using irrigation water and periodic mowing. Given that global aging and depopulation are predicted in the future, management abandonment should be a potentially serious threat to biodiversity. Therefore, understanding change in plant assembly after management abandonment is essential for biodiversity conservation. However, successional changes in plant assembly triggered by management abandonment were rarely reported, and no study reported the changes in wetland habitats. In this study, we investigated 218 irrigation ponds on Awaji Island, western Japan, where aging and depopulation are evident. Using field data, we assessed the relationship between years after abandonment of irrigation ponds, and taxonomic species richness (SR), functional richness (FR) and functional diversity (FD) to understand response of plant assembly to management abandonment. When data on all ponds were used for modeling, SR increased with increase in years after abandonment, while when waterless ponds data were excluded, SR remained stable with change in years after abandonment. In contrast, FR decreased with increasing years after abandonment and FD remained stable with change in years after abandonment, regardless of inclusion or exclusion of waterless ponds. This suggests that plant assembly changed functionally after abandonment. Increase in years after abandonment decreased SR of aquatic plant species, and occurrence of small, herbaceous, and/or annual plant species. Therefore, plant species having such traits may perform as the key drivers in functional changes in plant assemblies, and should be conserved preferentially.

Tsakalos J.T.

Oral presentation (young scientist)

Exploring functional redundancy in species-rich kwongan shrublands of Western Australia

James L. Tsakalos [1,*], Ladislav Mucina [1,2] & Mark P. Dobrowolski [1,3]

[1]School of Plant Biology, The University of Western Australia, Crawley, Perth, WA, Australia; [2]Centre for Geographic Analysis, Department of Geography and Environmental Studies, Stellenbosch University, Stellenbosch, South Africa; [3]Iluka Resources Limited, Perth, WA, Australia

* Presenting author: james.tsakalos@research.uwa.edu.au

Background and aim: Species diversity in plant communities is a product of long-term evolutionary and short-term ecological processes that act as filters on the regional species pool, forming systems called "plant communities". If vegetation communities have many species with similar traits, they could be seen as functionally redundant. This study quantifies functional redundancy in kwongan vegetation to assist restoration after cessation of mineral sand mining.

Materials and methods: Three data matrices were compiled: (1) a vegetation matrix (Matrix A: 801 species × 542 plots) featuring vegetation of the Northern Sandplains Eneabba, Western Australia, (2) environmental matrix (Matrix B: 105 environmental–climatic, topographic and soil–variables scored for subset of 201 plots), and (3) a trait matrix (Matrix C: 26 soft traits × 564 species). The data were analysed following 5 steps: 1: Relevés were classified into floristic communities, using Matrix A. 2: Plant species were classified into functional syndromes (FS) using Matrix C. 3: New matrix (D) was constructed by replacing species by syndromes, the syndromes belong to: FS × relevés. 4: Matrix D was classified to determine the functional communities (FC). 5: Patterns and drivers of floristic and functional communities were explored using canonical correlation analyses (CCA).

Main results & interpretations: Analysis of Matrix A and C produced 24 floristic communities and 18 plant FSs. Classification of Matrix D revealed 4 FCs relating to, shrubs, trees, herbs and graminoids. Using CCA the environmental distribution of functional communities could be determined; trees were located in areas of high sand content, shrubs in moderate to high clay content soils, graminoids on wet sand and herbs in intermediate areas of sand-clay and precipitation. Although soil as a driver of major vegetation patterns has been suggested (Griffin et al. 1983), this provides quantitative support and adds a novel functional component.

Acknowledgements: Support was received by The University of Western Australia and Iluka Resources Ltd. We thank Merten Ehmig for the initial generation of the Matrix C, Jaroslav Hruban and Monika Držková for collection of soils and contribution to Matrix C, and to the assistance from Iluka Resources staff at Eneabba.

References

Griffin, E.A., Hopkins, A.J.M., & Hnatiuk, R.J. 1981. Regional variation in mediterranean-type shrublands near Eneabba, south-western Australia. *Vegetatio* 52: 103–127

Ujházy K.

Poster C-16

Species diversity and community differentiation of beech forest vegetation in the Alps, the Bohemian Massif and the Carpathians

Session: Patterns and drivers of alpha and beta diversity in plant communities

Mariana Ujházyová [1], Karol Ujházy [2,*], Milan Chytrý [3], Wolfgang Willner [4], Marek Čiliak [1], František Máliš [2] & Michal Slezák [2]

[1]Department of Applied Ecology, Technical University in Zvolen, Zvolen, Slovakia; [2]Department of Phytology, Technical University in Zvolen, Zvolen, Slovakia; [3]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [4]VINCA – Vienna Institute for Nature Conservation & Analyses, Vienna, Austria

* Presenting author: karol.ujhazy@tuzvo.sk

Beech forests are a major type of natural vegetation broadly distributed in the Central European mountain ranges. Their floristic and community diversity described in the national syntaxonomical surveys differs significantly, both in the numbers and names of the recognized types. Therefore, broad-scale differentiation of Central-European beech forest vegetation is still unclear. Here we use a recently compiled large data set of vegetation plots to compare species diversity and community differentiation among three mountainous regions: North-Eastern Alps (A), Bohemian Massif (B) and Western and Eastern Carpathians (C). A set of 6972 plots including 1023 species of vascular plants was extracted from the national vegetation databases of Austria, Czech Republic and Slovakia. Selection was constrained by *Fagus sylvatica* cover > 50% in the tree layer and the plot size of 200–625 m^2. Measures of alpha-diversity (species richness), beta-diversity (distance from the centroid in PCoA) and gama-diversity (species pool) of vascular plants were calculated and tested using ANOVA and PERMANOVA within regions and altitudinal zones (< 500, 500–800, > 800 m). Species pool size estimated for 1000 plots by rarefaction (613 in the region A, 445 in B and 617 in C) did not differ significantly between A and C, but it was significantly lower in B. Average species richness per plot differed significantly among the regions (34 in A, 23 in B and 29 in C). The richest were communities at higher altitudes of the Alps (36 species). An increase in richness with altitude was found both in A and C but not in B. Most of diagnostic and unique species of beech forests occur in the Alps. PERMANOVA based on the Sörensen dissimilarity indicated significant differences in floristic composition among the regions. Beta diversity was highest in the Carpathians, followed by the Alps. In conclusion, the most specific communities of beech forests occur in the Alps (with the highest species richness and the best floristic differentiation from the other regions), especially at high altitudes. Carpathians have comparably diverse beech forests as the Alps with large species pool and high beta-diversity. Similarity is highest at lower altitudes. Therefore, vegetation units of colline beech forests are widespread in Central-Europe, whereas montane units are more regionally specific.

Acknowledgements: This work is supported by the Slovak Grant Agency VEGA (1/0186/14 and 1/0362/13).

Vadkerti Á.

Poster with lightning talk J-32 (young scientist)

Long-term vegetation dynamics of a loess grassland with special attention to the changes induced by *Calamagrostis epigejos*

Session: Patterns of vegetation change across landscapes

Ágnes Vadkerti [1,*], Klára Virágh [2] & Imelda Somodi [2]

[1]Department of Ecology, University of Szeged, Szeged, Hungary; [2]Institute of Ecology and Botany, MTA Centre for Ecological Research, Hungarian Academy of Sciences, Vácrátót, Hungary

* Presenting author: agnesvadkerti@gmail.com

Long-term ecological studies can contribute to better understanding of the changes in species composition and cover ratio within communities. The vegetation dynamics in a loess grassland at the foot of Bükk Mountains was followed in permanent quadrats since 1979, which gave us an exceptional opportunity to analyse the spontaneous succession in an abandoned loess grassland for 35 years. The area was originally used for sheep grazing until the abandonment in the early 1980s. The aim of our research was to investigate the changes of species number, composition and abundance structure during this period with special regard to the effect of *Calamagrostis epigejos*, which appeared in the study site in 1983. The background of species number change was investigated using a generalized linear model (GLM) with elapsed time and the degree of *C. epigejos* presence (binary variable: dominant/not dominant) as explanatory variables. We explored the changes in species composition and abundance with the help of Principal Component Analysis (PCA) using the species' percentage cover values and also binary data. According to our results, the elapsed time and the dominance of *C. epigejos* have a negative impact on species number. In terms of species composition, vegetation dynamics proceeded in two main directions: on the one hand, the closing of gaps was observed, indicated by the dominance of *Festuca rupicola*. Parallel to this new species became frequent: *Campanula rotundifolia*, *Helictotrichon adsurgens*, *Danthonia alpina* and *Dianthus pontederae*. On the other hand, *C. epigejos* appeared and became the dominant at half of the site inducing a specific vegetation dynamics trajectory with typical subordinate species (*Teucrium chamaedrys*, *Thesium linophyllon*). Woody species such as *Quercus cerris*, *Acer tataricum*, *Rosa gallica* and *Crataegus monogyna* are becoming more frequent and their presence is particularly conspicuous in the *C. epigejos*-dominated parts. We conclude that the dynamics proceed towards the formation of a forest steppe, with the temporary expansion of *C. epigejos*.

Väli V.

Oral presentation

Reconstructing past vegetation compositions and diversity in Karula, South Estonia over the last two millennia

Special session: Long-term perspectives on vegetation change

Vivika Väli [1,*], Anneli Poska [2,3], Kersti Kihno [1,4], Tiiu Alliksaar [2], Miguel Villoslada Pecina [1], Triin Reitalu [2], Leili Saarse [2], Normunds Stivrins [2], Pille Tomson [1] & Jüri Vassiljev [2]

[1]Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Tartu, Estonia; [2]Institute of Geology, Tallinn University of Technology, Tallinn, Estonia; [3]Department of Physical Geography and Ecosystems Analysis, Lund University, Lund, Sweden; [4]Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia

* Presenting author: vivika.vali@gmail.com

Quantitative reconstructions of past vegetation enable us to define major drivers of observed land-cover and biodiversity changes which led to the development of today's cultural landscape and biodiversity. The studies of long-term cultural landscape dynamics are essential in order to determine its resilience and sensitivity to changes in climate and management strategies and have a high potential to serve as a basis for management plans for nature and cultural heritage conservation. The aim of the study is to reconstruct the past development of the mosaic cultural landscape over the last two millennia in South Estonia, placed at the border of boreal and nemoral forest zone, with high sensitivity to climate change and anthropogenic deforestation, and assess the accuracy of the reconstructions by comparing them with historical maps and other documents. The investigation area is located at the Karula National Park established to preserve the mosaic landscape, the cultural heritage and sustainable lifestyle. The used Landscape Reconstruction Algorithm (LRA) provides pollen-based estimates of past land cover at regional and local spatial scales. The regional and local reconstructions of Karula reveal the dominance of woodlands until to the beginning of the last millennium. The reconstructed forest composition exhibits an overall increase of early successional species as birch, alder and pine at the expense of nemoral broad-leaved ones throughout the last millennium. An increase in the agrarian activities led to a large scale deforestation during the first three centuries of the last millennium. From the 14th to the 18th century, the woodland cover decreased drastically both at regional and local scales, causing an open agrarian landscape dominated by croplands and grasslands to emerge. During the last century, the woodland cover has increased again to reach > 60% today.

Valkó O.

Oral presentation

The role of micro-topographic heterogeneity in grassland recovery

Orsolya Valkó [1,*], Balázs Deák [2], Péter Török [1], András Kelemen [2], Tamás Miglécz [1], Katalin Tóth [1], Szilárd Szabó [3], Gergely Szabó [3] & Béla Tóthmérész [1]

[1]Department of Ecology, University of Debrecen, Debrecen, Hungary; [2]MTA-DE Biodiversity and Ecosystem Services Research Group, Debrecen, Hungary; [3]Department of Physical Geography and Geoinformatics, University of Debrecen, Debrecen, Hungary

* Presenting author: valkoorsi@gmail.com

We studied the spontaneous vegetation recovery of alkaline grasslands on soil-filled drainage channels in East-Hungary. To test the effects of fine-scale micro-topography on vegetation recovery, we studied the initial vegetation of recently filled (1-year-old), and established vegetation on old (7-years-old) soil-filled channels. We hypothesised that (i) recently filled channels are characterised by high species diversity and a high cover of ruderal species and (ii) high micro-topographic heterogeneity increases the diversity of species and plant strategy types in early stages but later on this effect diminishes. We found that diversity of species and plant strategy types was higher in recently filled channels compared to old filled channels. We found that recently and old filled channels were characterised by a similar level of micro-topographic heterogeneity. Micro-topographic heterogeneity had no effect on the studied vegetation parameters in recently filled channels. Conversely, in old filled channels higher micro-topographic heterogeneity resulted in higher diversity and lower cover of the dominant grass *Festuca pseudovina*. Higher micro-topographic heterogeneity resulted in increased ruderality and decreased stress-tolerance, but it did not increase the diversity of plant strategy types. In contrast with former studies, we found that a couple of centimetres of micro-topographic heterogeneity had no effect on vegetation in recently filled channels, but supported a high diversity in old filled channels. An important practical implication of our study is that in grassland restoration projects, micro-topographic heterogeneity has a crucial role in sustaining biodiversity.

Van Calster H.

Poster H-03

A within-between model formulation for the analysis of multiple vegetation observational studies with explanatory variables measured at plot-level

Session: Data sources for broad-scale vegetation studies

Hans Van Calster *, Els De Bie & Paul Quataert

Research Institute for Nature and Forest, Brussels, Belgium

* Presenting author: hans.vancalster@inbo.be

The combined analysis of multiple vegetation surveys or studies is becoming commonplace. Often, the response of interest is related to explanatory variables measured at plot level and at study level. These data are examined with classical meta-analysis methodology using summarizing measures of study effect sizes, or, when the original data are available, they may be examined with (generalized) linear mixed modelling methodology, where study is included as random effect. The random effect captures variation between studies in a parsimonious way. We focus here on the latter approach. Because plot-level explanatory variables vary within studies and between studies, the assumption of orthogonality of explanatory variables with the random study effect may be jeopardized. If a plot level explanatory variable is included in the model, the estimated regression parameter (beta) will treat the variable as if within and between study effects are the same. This may not be the case and in extreme cases the separate effects may cancel each other out. Therefore, a within-between model formulation is needed. It involves splitting the plot-level explanatory variables into two parts. One part is the study level means, which account for between study effects, the other part are the study-centered versions of the original plot-level explanatory variables, which explain the within-study effects. The price to pay is that two parameters need to be estimated instead of one. This elegant solution is around for some time and known in economics and the social sciences (Mundlak 1978; Snijders & Bosker 1999), but it is not well known in ecology (but see Van de Pol & Wright 2009) and vegetation science. The purpose of this poster is to raise awareness of the issues arising with these kinds of data and to illustrate the solution with theory and an example. The solution may be very relevant in cases where the effect of one factor may be replaced by or modified by the effect of other factors.

References

Mundlak, Y. 1978. On the pooling of time series and cross section data. *Econometrica* 46: 69–85.

Snijders, T. & Bosker, R. 1999. *Multilevel modeling: An introduction to basic and advanced multilevel modeling*. Sage, London, UK.

Van de Pol, M. & Wright, J. 2009. A simple method for distinguishing within- versus between-subject effects using mixed models. *Animal Behaviour* 77: 753–758.

Van Couwenberghe R.

Oral presentation

Linking disturbance and resources to herbaceous forest communities

Special session: Species and plant community responses along soil gradients

Rosalinde Van Couwenberghe [1,2,*], Catherine Collet [1,2], Eric Lacombe [1,2] & Jean-Claude Gégout [1,2]

[1]AgroParisTech, UMR1092, Laboratoire d'Etude des Ressources Forêt Bois, Centre de Nancy, Nancy, France; [2]INRA, UMR1092, Laboratoire d'Etude des Ressources Forêt Bois, Centre de Nancy, Champenoux, France

* Presenting author: rosalinde.vancouwenberghe@agroparistech.fr

Background and aim: in temperate forest, the amount of light reaching the soil is traditionally seen as a key factor shaping herbaceous forest communities in time and space. Light is mainly determined by the presence of canopy gaps with different sizes. However, the role of light in secondary vegetation dynamics is often obscured by the significant effects of the soil environment and the forest stand which are intricately linked. For this, we studied plant community dynamics after canopy opening after a major natural canopy disturbance, in relationship with the local forest stand characteristics and along a regional soil gradient.

Methods: floristic inventories were performed 3 years, 6 years and ten years after disturbance, in 253 plots located in northeastern France. Soil pH, stand structure (canopy openness) and stand type was assessed in each plot. Multivariate analyses, which included parameters reflecting soil and stand characteristics, plant species presence, Ellenberg indicator value and CSR strategy for each plant species were used to determine differences in plant community richness, composition and dynamics. Finally, we analysed temporal differences in individual species abundances and frequencies.

Key results: forest plant community composition and dynamics were impacted by canopy openness and soil pH. Soil pH was shown to be the primary driver of community composition, followed by canopy openness. On the other hand, plant community richness was primarily affected by canopy openness, followed by soil pH. Highest richness was found 3 years after perturbation in large gaps on calcareous soil conditions. Differences in plant community composition and richness along canopy openness declined over time. Both early and late successional species were present at the beginning of secondary succession dynamics, presenting abundances modulated by canopy openness.

Synthesis: by focusing on spatial-temporal patterns in herbaceous forest communities we managed to identify heterogeneous vegetation dynamics, which are conditioned by local stand characteristics and a regional soil gradient. These results provide new insights into the trajectories of vegetation change, progressing the shifting mosaic model of a temperate forest cycle.

Van Kley J.E.

Poster O-15

Twenty years of vegetation change in a Texas USA *Taxodium distichum* swamp during multiple non-native species invasions

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

James E. Van Kley * & Alexandra Martynova-Van Kley

Department of Biology, Stephen F. Austin State University, Nacogdoches, TX, USA

* Presenting author: jvankley@sfasu.edu

Caddo Lake, on the Texas-Louisiana USA border, includes extensive *Taxodium distichum* swamps and is an internationally important wetland under the Ramsar Convention. In 1995 we described wetland plant communities along a hydrological gradient. In 2005 we established GPS points marking 56 permanent plots of 1000 m^2 at the 1995 locations and re-sampled them in 2005, 2009, 2011, 2012, and 2014. 1995 non-woody vegetation was largely dominated by native species with *Eichhornia crassipes* restricted to a limited area. By 2005 *Eichhornia* had become widespread and *Alternanthera philoxeroides* and *Hydrilla verticillata* had also increased. By 2009, *Salvinia molesta* had appeared (likely first in 2007) and become abundant while *Eichhornia* remained abundant. During 2011, a severe drought year with low water levels, *Salvinia* and *Eichhornia* declined in abundance but were still widely distributed spatially. *Salvinia* recovered strongly in 2012, apparently at the expense of *Eichhornia* which did not regain former abundances. By 2014, marked declines were observed in several formerly dominant native species including *Wolfia columbiana*, *Spirodella polyrrhiza*, *Nuphar lutea*, and *Nelumbo luteum* while *Salvinia* and *Alternanthera* remained abundant. Non-natives *Hygrophylla polysperma* (2005) and *Najas minor* (2014) also appeared during the study. These changes were reflected in canonical correspondence analysis results where plots for each period occupied largely different regions in ordination space. The ordination showed relationships not only between vegetation and the underlying hydrologic gradient but also with the sample-year and annual water levels. Several novel communities appeared during the study including floating mats dominated by *Salvinia* and *Oxycaryum cubense* (after 2009) and mats of *A. philoxeroides*, *S. molesta*, and the formerly uncommon native *Hydrocotyle ranunculoides* (mainly in 2014). The events at Caddo Lake are an unplanned "experiment" in community re-organization following introduction of multiple invasive species. Marked year-to-year differences in vegetation continue to be observed; relationships between invaders and native species have not yet stabilized as evidenced by marked 2012-to-2014 declines in formerly-abundant native species. Continued monitoring will enable us to observe longterm outcomes and may contribute data that enhance our general understanding of biogeographic changes associated with species invasions.

Večeřa M.

Poster with lightning talk C-17 (young scientist)

Fine-resolution patterns of plant species richness across European forests

Session: Patterns and drivers of alpha and beta diversity in plant communities

Martin Večeřa [1,*], Milan Chytrý [1], Jan Divíšek [1,2] & data contributors

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Geography, Masaryk University, Brno, Czech Republic

* Presenting author: martinvec@seznam.cz

Describing and understanding species-richness patterns and their drivers across large regions has been one of the traditional goals of ecology and biogeography. Richness of vascular plant species has been explored in numerous studies performed all around the world. However, there is still a lack of studies examining species richness across broad spatial scales based on fine-resolution, spatially referenced data, because such data are poorly available. Therefore, up to now, most studies have used coarse-resolution (i.e. spatially highly generalized) data based on atlases or inventories of large areas, which considerably limits our understanding of species-richness patterns and underlying factors. Here we attempt to create predictive maps of local vascular plant species richness in forest vegetation across a major part of Europe and to examine the underlying factors. Our study is based on a large data set of vegetation plots from different European countries and regions, which have been recently integrated in the European Vegetation Archive. This type of data allows to analyse species richness even at the level of single forest types (e.g. coniferous or broadleaf deciduous) and according to dominance of selected tree species (e.g. oak forests). In total, we used 98,363 vegetation plots of all forest communities in the area from the Iberian Peninsula in the west to the Black Sea coast in the east and from southern Scandinavia in the north to Sicily in the south. However, only 25–55% of plots appear to be suitable for analyses, depending on the selection criteria applied. Our preliminary results suggest that if all forest communities are considered together, the richest forests occur in the mountainous regions with high proportion of calcareous bedrock, e.g. in the Southern Limestone Alps. On the other hand species-poor forests predominate in north-western Europe, e.g. on the British Isles and in the Netherlands.

Velbert F.

Oral presentation (young scientist)

Functional differentiation between mowing regimes – evidence from a 25 year field experiment in wet meadows

Special session: Old wine in new bottles: trait-based understanding of plant responses to disturbance

Frederike Velbert [1,*], Till Kleinebecker [1], Ondřej Mudrák [2], Peter Schwartze [3] & Norbert Hölzel [1]

[1]Institute of Landscape Ecology, University of Münster, Münster, Germany; [2]Department of Functional Ecology, Institute of Botany, The Czech Academy of Sciences, Třeboň, Czech Republic; [3]Biological Station of the County Steinfurt, Tecklenburg, Germany

* Presenting author: frederike.velbert@uni-muenster.de

Nowadays, ecosystems that depend on regular human-mediated disturbance often need a customized management to protect or restore their biodiversity and ecosystem functions. However, species and functional turnover in the succession after the installation of new management schemes is often delayed due to species replacement processes creating time lags in extinction or immigration. To address the long-term functional response to management and to avoid the pitfalls of space for time substitution, ecological long-term experiments are needed. Here, we analysed the functional composition (community weighted means) and diversity (Rao's quadratic entropy) of a 25 year long management experiment in wet lowland meadows, comprising three different mowing regimes without fertilization and a fallow treatment. The functional composition reflected clearly the different managements. In particular, the vegetation of the fallow treatment showed strong competition for light, investment into an internal nutrient cycle and a patch holding strategy. Over time, all treatments developed towards more stressful conditions due to nutrient depletion and biological rewetting, leading to a more nutrient retentive and patch holding strategy and little investment into competitive seedlings. The high competition and loose environmental filters in the fallow treatment led to a niche separation in foliar traits. Mowing induced a trait convergence in height and leaf traits, but acted as an equalizing mechanism on traits related to reproduction. We also detected long-term fluctuations and ongoing changes in functional composition and diversity. Especially early succession was characterized by a transient loss of functional diversity, caused by strong time lags in immigration and extinction of species.

Venanzoni R.

Poster D-39

The SUN LIFE+ Project: a strategy for monitoring N2000 plant species and habitats in Umbria (Central Italy)

Session: Vegetation science serving nature conservation

Daniela Gigante [1], Fabio Maneli [1], Paolo Papa [2], Raoul Segatori [2] & Roberto Venanzoni [1,*]

[1]Department of Chemistry, Biology and Biotechnologies, University of Perugia, Perugia, Italy; [2]Umbria Regional Office, Natural Systems and Animal Husbandry Service, Regional Observatory for Biodiversity, Perugia, Italy

* Presenting author: roberto.venanzoni@unipg.it

The SUN LIFE 13 NAT/IT/000371 Project is an emblematic example in Europe of the possibility of using public funds for nature management and conservation, while fulfilling obligations from N2000 EU legislation. Its area of application is Umbria Region (Central Italy, 845,600 ha), where N2000 is represented by 102 sites (135,000 ha), hosting 41 Annex I Habitats and 8 Annex II-IV-V plant species from the 92/43/EEC Directive. In 2007 the Region developed Management Plans for all its N2000 Sites, including maps of species and habitats (scale 1:10,000). This huge data set, together with the georeferenced phytosociological relevés stored in the national DB VegItaly, represents the starting point for developing a strategy to manage N2000 in Umbria and for implementing a monitoring plan for species and habitats. The project is currently ongoing and will end in 2017. A suitable set of indicators is under construction, aimed at evaluating the "favourable conservation state" of species (S) and habitats (H). A preliminary draft has been developed, formed by two main groups of indicators: quantitative (H1 – habitat's surface, based on phytosociological mapping; H2 – habitat's fragmentation, based on GIS processing tools; S1 – species' surface, based on floristic mapping; S2 – population's demography) and qualitative (S3 – presence of alien taxa; H3 – plant community's floristic coherence with the reference habitats; H4 – habitat's structure/physiognomy; H5 – dynamic stage, based on specific diagnostic species with reference to the Vegetation Series). Potential and actual pressures and threats will be tackled at the regional and site-scale, to properly focus on the actual trends. The methodological protocol will be tested on a group of S and H, prioritized on the base of the occurrence of (i) fast dynamic processes, (ii) strong environmental changes, (iii) very restricted/fragmented distribution. One of the most important targets of the SUN LIFE Project is to address the regional policy and to help implementing a Prioritized Action Framework based on the peculiar conservation priorities at the regional level, in order to orient other financial tools (e.g. the Rural Development Funds). The added value of the project is represented by the challenge to profit from the available funding opportunities to conserve and manage biodiversity inside N2000, and to integrate these with complementary national and regional resources, assuring the good functioning of the N2000 network.

Vetaas O.R.

Oral presentation

Phylogenetic niche continuum: an intercontinental comparison of woody genera along temperature gradients

Ole Reidar Vetaas [1,*], John-Arvid Grytnes [2] & Bradford A. Hawkins [3]

[1]Department of Geography, University of Bergen, Bergen, Norway; [2]Department of Biology, University of Bergen, Bergen, Norway; [3]Department of Ecology & Evolutionary Biology, University California Irvine, Irvine, CA, USA

* Presenting author: ole.vetaas@global.uib.no

Phylogenetic niche conservatism predicts that closely related species will have similar distributions along important environmental gradients, including temperature gradients. We test the conjecture that woody-plant genera have temperature optima (i.e. maximum congeneric species) towards the centre of the temperature range of a genus. Then we test if these genera have a similar order along temperature gradients from Andes (Peru), Himalaya (Nepal), and China, which is consistent with phylogenetic niche conservatism, whereas strong differences among regions indicates niche divergence and significant plasticity of species and genera. Elevation and temperature range data of all species belonging to 15 monophyletic genera of woody plants common to all three study regions were compiled. Variation in numbers of congeneric species along the temperature gradient represents a comparative generic order. This order along the temperature gradient was established by means of ordination and temperature average (weighted on number of species in the genera) within each region. We compared this order among regions by simple correlations, scatterplots of ordination scores and optima temperature based on weighted average temperature. Most genera respond in a bell-shaped or curvilinear pattern with the maximum number of congeneric species in the centre of the temperature interval, which resembles the variation of species abundance along extensive gradients. Some curvilinear responses and monotonic increases were found in the Andes, but clear bi-modal or flat uniform responses were absent. The orders of generic optima along the temperature gradient in each region were highly correlated ($r > 0.8$), verified for both ordination scores and weighted average of optima temperature. The analyses verify the conjecture that maximum numbers of congeneric species are found towards the centre of the temperature range of the genus. This may be due to inherent temperature tolerances and that newly evolving species do not disperse far away from their ancestors, but the consistency of the order of disjunct genera along temperature gradients between continents must relate to inherent phylogenetically conserved traits. Hence temperature tolerances within a clade are conserved over time and space. This demonstrates that continuum theory in combination with niche conservatism applies to higher taxonomic levels, such as genera, and may represent a macro-ecological tool.

Vild O.

Oral presentation (young scientist)

How would historical litter raking have affected forest vegetation: a field experiment in a central European forest

Ondřej Vild [1,2,*], Jesse M. Kalwij [1,3] & Radim Hédl [1,4]

[1]Department of Vegetation Ecology, Institute of Botany, The Czech Academy of Sciences, Brno, Czech Republic; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Department of Zoology, DST-NRF Centre of Excellence for Invasion Biology, University of Johannesburg, Johannesburg, South Africa; [4]Department of Botany, Faculty of Science, Palacký University Olomouc, Olomouc, Czech Republic

* Presenting author: ondrej.vild@gmail.com

Throughout history, the export of biomass from central European woodlands has played an important economic role. Together with coppicing, timber cutting and wood pasture, litter raking was once a widespread activity in the woodlands. In this study, we focus on the impact of simulated historical tree litter removal on understorey plants and soil properties in a temperate deciduous forest. We also ask what the role of seasonal timing of tree litter removal is on understorey plants. The experiment was conducted in Podyjí National Park, Czech Republic, where we established 45 plots (5 × 5 m) in a randomized complete block design. Each block consisted of one plot for each treatment. Treatment consisted of (i) tree litter removal during spring, (ii) tree litter removal during autumn, or (iii) no litter removal as control. These treatments were repeated for a duration of four years. In each plot we recorded the understorey plant species composition and collected soil samples prior to treatment (year 0) and in each subsequent year (years 1–4). Total species richness per plot significantly changed over time, but this was not related to treatment. Annual species richness increased significantly, but only for the autumn treatment. Annual species also showed the highest inter-annual variation. Endangered species were not affected. When compared to the control treatment, the effect of autumn raking on species composition was stronger than the effect of spring raking. Although the amount of removed nutrients substantially exceeded ambient nitrogen input, no changes in soil conditions were detected. To conclude, the season in which tree litter removal took place had a significant impact on the understorey vegetation, in particular affecting the germination and establishment of annual species. The large inter-annual variation in species richness calls for a long-term field experiment.

Vítová A.

Poster with lightning talk B-20

Regeneration of small-scale disturbed sites in a mesotrophic meadow

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Alena Vítová [1,*], Petr Macek [2] & Jan Lepš [1,3]

[1]Department of Botany, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [2]Centre for Polar Ecology, University of South Bohemia in České Budějovice, České Budějovice, Czech Republic; [3]Institute of Entomology, The Czech Academy of Sciences, České Budějovice, Czech Republic

* Presenting author: alena.vitova@prf.jcu.cz

Seedling establishment and survival in meadow communities are often dependent on local disturbances. Generally, disturbed sites, gaps, represent important sites for regeneration of competitively weaker species (often dicots). In a three-year experiment, we monitored regeneration in intact vegetation and artificially created small-scale gaps in a mesotrophic meadow to estimate the ratio of generative to vegetative propagation, roles of seed bank and seed rain, and dynamics of regeneration in time. In gaps, we combined suppression of vegetative spreading by bounding and seed bank devitalization treatments in a factorial design. All recruits, seedlings as well as vegetative sprouts, were recorded, identified, and their position was labelled to follow temporal changes of recruit survival and species composition. In gaps, generative regeneration was far more common than vegetative colonization; furthermore, seedlings of *Juncaceae* and especially *Poaceae* in gaps greatly outnumbered their seedlings in controls. Clonal propagation into gaps became more frequent later during the experiment. Graminoids grew clonally preferentially into gaps; in contrast, dicots propagated vegetatively mostly within intact vegetation. In intact vegetation, numbers of sprouts and seedlings were almost constant during the whole monitoring. In contrast, seedling numbers in gaps were increasing until the half of the second year. Seedlings suffered great mortality in gaps at the beginning of the experiment, and only few successfully established before the end of the first year, most probably due to temporal desiccation in vegetation-free gaps. Pioneer colonizers were mostly dicots (preferring open microsites), followed by *Poaceae* and *Cyperaceae*. Gaps with intact and devitalized seed bank differed in species composition at the beginning of the experiment, but species composition became similar in all plots after three years. It suggests that seed bank is very important for species composition of a newly disturbed microsites, however, with time, its role can be replaced by the seed rain. Undisturbed meadows are communities with strong competition; in our case, vegetative regeneration almost doubled generative one, whereas the generative regeneration was effective in disturbed microsites. Dicots acted as pioneer colonizers there, but were later partially displaced by competitively stronger graminoids.

Vojtkó A.E.

Poster B-21 (young scientist)

Does propagule bank diversity reflect the aboveground diversity of native and alien aquatic plant species in a European thermal river?

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Anna E. Vojtkó [1,*], Attila Mesterházy [2], Kristóf Süveges [3] & Balázs A. Lukács [1]

[1]Department of Tisza Research, MTA Centre for Ecological Research, Debrecen, Hungary; [2]Institute of Botany and Nature Conservation, University of West Hungary, Sopron, Hungary; [3]Department of Botany, University of Debrecen, Debrecen, Hungary

* Presenting author: vojtko.anna@okologia.mta.hu

For effective conservation and management in freshwater ecosystems it is essential to understand mechanisms sustaining biodiversity. It is especially crucial to gain further knowledge of stressed habitats harbouring a unique flora and fauna, such as thermal rivers. In this study propagule bank and aboveground vegetation were studied in native and alien aquatic plant communities in a thermal river in West Hungary. We tested the following hypotheses: (i) Propagule bank species diversity and density are higher in the alien community where both the original native vegetation and the alien species have propagules. (ii) Propagule bank diversity and density of native species is similar in the native and alien communities, thus the regeneration of native species by seeds is equally ensured in native and alien communities. The mean seed bank density ranged from 52 up to 1819 seeds/m^2, which is lower than in most aquatic plant communities. The lowest overall propagule bank density and diversity was detected in the alien communities, where *Chara vulgaris* and *Nymphaea alba* were the most abundant species. These results did not support our first hypothesis. The propagule bank diversity of native species was significantly lower in the alien communities compared to that of native communities. This result contradicted to our second hypothesis. In total we detected a smaller number of species in the propagule bank than in the aboveground vegetation, which emphasises that propagule banks play only a secondary role after vegetative reproduction in sustaining the aquatic plant diversity of thermal rivers. We can conclude that alien aquatic species depauperate the overall diversity of the propagule bank in the sediment, which would make future restoration managements more difficult.

Vymazalová M.

Poster J-33 (young scientist)

Patterns of forest vernal species: Can forest continuity or soil pH be an important factor of vernal species richness in Central Europe?

Session: Patterns of vegetation change across landscapes

Marie Vymazalová [1,2,*] & Lubomír Tichý [1]

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Department of Forest Ecology, Silva Tarouca Research Institute for Landscape and Ornamental Gardening, Brno, Czech Republic

* Presenting author: meri@seznam.cz

Forest vernal species form a group of geophytes and therophytes with special ecological adaptations to take advantage of bright light, moisture, nutrient and also, to some extent, heat availability in broad-leaved deciduous forests of the temperate zone during early spring. Although the luxuriant spring covers of these summergreen forests are well known, there is a lack of information about their environmental requirements and basic patterns, especially in Central Europe. Therefore, we aim to investigate the relationship between richness of vernal species and forest continuity and also, between vernal species and soil pH, and put the results in context with other environmental variables. We used field data from permanent plots (recorded in spring and summer) to examine the relationship between richness of vernal species and forest continuity and measured soil pH using Generalized Linear Models. Other environmental variables were tested using both field data and data provided by the Czech National Phytosociological Database. The number of vernal species was regressed against the average Ellenberg indicator values (EIVs) calculated for relevés excluding vernal species. We found no relationship between richness of vernal species and forest continuity expressed as forest age. In contrast, richness of vernal species showed positive relationship with measured soil pH as well as soil pH/calcium content assessed using EIVs for soil reaction in both data sets. Although occurrence and richness of forest vernal species is definitely connected with recent forest management, our study did not support the relationship with forest continuity expressed as forest age, i.e. the duration of time since the last major disturbance caused by logging or new forest establishment. Besides human disturbances, we found a positive relationship between richness of vernal species and soil pH/calcium content. To sustain high biodiversity in deciduous forests, we should pay attention to vernal species recovery to damaged, but suitable sites or stands, which probably depends mostly on the scale of the fragmentation of occupied sites.

Vynokurov D.

Poster P-33 (young scientist)

Phytosociological differentiation of the steppe vegetation of the Azov Sea coastline

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Denys Vynokurov [1,*] & Vitalii Kolomiychuk [2]

[1]M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, Kyiv, Ukraine; [2]State Ecological Academy of Postgraduate Education and Management, Kyiv, Ukraine

* Presenting author: phytosocio@ukr.net

Syntaxonomy of the *Festuco-Brometea* in Ukraine is still scantily explored. There is some scattered and local data, mainly within the Forest-Steppe zone, that needs a critical revision. We have carried out large-scale comparison of relevés from the Azov Sea coastline with the data from other regions of Ukraine and also of Europe and Russia. Narrow and hardly distinguishing species were combined into aggregates. All data were processed using JUICE 7.0 and Modified Twinspan Classification. Relevés from the Azov Sea coastline were divided into three main clusters. In the first cluster the ruderal and xero-halophytic vegetation was separated, which represents alliances *Artemisio-Kochion prostratae* Soó 1964 and *Artemisio tauricae-Festucion valesiacae* Korzhenevskij et Kljukin 1991. The first alliance presents ruderal steppe vegetation dominated by rhizomatous grasses *Elytrigia repens*, *Agropyron pectinatum*, *Poa angustifolia* (*Goniolimoni tauricі-Poetum angustifoliae* Tyshchenko 1996). The second alliance unites salt steppe vegetation on sites affected by the sea or saline ground water (*Ferulo orientalis-Agropyretum pectinati* Tyshchenko 2000, *Agropyro pectinati-Artemisietum taurici* ass. nov. prov., *Cerastio syvashici-Poetum bulbosae* ass. nov. prov.). Few relevés were separated in a cluster which combines the forb-bunchgrass steppe vegetation that belongs to the recently described alliance *Stipo lessingianae-Salvion nutantis* Vynokurov 2014 (association *Stipo lessingianae-Salvietum nutantis* Vynokurov 2014). Such communities are widespread in the Don estuary. Large proportion of data was found in the third cluster, which represents bunchgrass steppes. This type of vegetation was proposed to consider as a new alliance *Tanaceto millefolii-Galatellion villosae* all. nov. prov. It combines 4 associations: *Stipo brauneri-Bromopsidetum cappadocici* ass. nov. prov., *Ephedro distachyae-Stipetum capillatae* ass. nov. prov., *Tanaceto millefolii-Salvietum nemorosae* Krasova et Smetana 1999 and *Stipo ucrainicae-Agropyretum pectinati* Tyshchenko 1996. In total 8 associations, 2 subassociations, 4 alliances and 1 order from the *Festuco-Brometea* class were identified on the Azov Sea coast.

Wagner V.

Poster O-16

A large-scale comparison of alien plant species richness and abundance across European forests

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Viktoria Wagner [1,*], Milan Chytrý [1], Ilona Knollová [1], Borja Jiménez-Alfaro [1], Jan Pergl [2], Petr Pyšek [2,3] & data contributors

[1]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [2]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [3]Department of Ecology, Faculty of Science, Charles University in Prague, Prague, Czech Republic

* Presenting author: wagner@sci.muni.cz

In Europe, over 1700 plant species have arrived from other continents and established across different vegetation types. In order to limit the impact of invasive alien plants, the European Union has declared their management as a key objective of its biodiversity strategy. However, our knowledge on large-scale patterns of alien plant invasions across Europe for some vegetation types is still scarce. The InvasEVe project is the first study to analyze the levels of alien plant invasion across European vegetation. It focuses on forest vegetation types for which an updated EUNIS habitat classification was recently elaborated. Forests are thought to have low levels of alien plant invasion but some recent local and regional studies have contradicted this view. We assembled a dataset of 184,977 plots by combining records of the European Vegetation Archive (EVA) and regional datasets. In this study, we report on patterns of levels of invasion by species alien to Europe. We derived species status information from several sources (incl. DAISIE, USDA GRIN, Euro+Med, Flora Europaea and the unpublished GloNAF database). In our analysis we contrasted the levels of invasion across EUNIS forest habitat types by quantifying the species pools and species richness of alien plants. The results will enhance our understanding of alien plant invasions in Europe and help European land managers to make informed management decisions.

Wagner V.

Oral presentation

Taxonomic proofreading: How useful are software applications for cleaning vegetation data?

Special session: Ecoinformatics: demonstrations of new software developments and analytical methods

Viktoria Wagner

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

wagner@sci.muni.cz

The last decade has seen a rapid increase of electronically stored vegetation data. Given the importance of these data for science and environmental policy and cross-links with other databases, its crucial to create reliable and efficient error-detection mechanisms. Taxon names are the most essential information in vegetation databases, yet they are notoriously full of spelling mistakes and typos, which can be introduced at different stages of data retrieval. Unlike manual detection, which is laborious and error-prone, software applications have the potential to increase data quality reliably and efficiently. Several software applications have been written in recent years to automatically detect and correct spelling mistakes and typos in taxon names. I compared the usefulness of seven programs with regards to the following needs of vegetation scientists: (1) ability to recognize orthographic mistakes across different taxonomic groups (vascular plants, bryophytes, lichens, and fungi) and (2) different taxonomic levels (genera, species, subspecies, and hybrids), (3) capacity to handle large data volumes, (4) fast data processing, and (5) possibility for semi-automated or prompted correction.

Wamelink W.

Poster with lightning talk D-40

Can plants grow on Mars and the moon: a growth experiment on Mars and moon soil simulants

Session: Vegetation science serving nature conservation

Wieger Wamelink [1,*], Joep Frissel [1], Wilfred Krijnen [2], M. Rinie Verwoert [2] & Paul Goedhart [3]

[1]Alterra, Wageningen UR, Wageningen, the Netherlands; [2]Unifarm, Wageningen UR, Wageningen, the Netherlands; [3]Biometris, Wageningen UR, Wageningen, the Netherlands

* Presenting author: wieger.wamelink@wur.nl

When humans will settle on Mars or the moon they will have to eat there. Food may be flown in but a cheaper and more reliable alternative could be to cultivate plants at the site itself, preferably in native soils. We report on the first large scale controlled experiment to investigate the possibility of growing plants in Mars and moon soil simulants (delivered by NASA). Fourteen different plant species, four crops, four nitrogen fixers and eight wild plants were sown and subsequently their development was monitored. The results show that plants are able to germinate and grow on both Martian and moon soil simulant for a period of 50 days without any addition of nutrients. Growth and flowering on Mars regolith simulant was much better than on moon regolith simulant and even slightly better than on our control nutrient poor river soil. Reflexed stonecrop, the crops tomato, wheat and cress and the green manure species field mustard performed particularly well. The latter three flowered and cress and field mustard also produced seeds. Our results show that in principle it is possible to grow crops and other plant species in Martian and Lunar soil simulants. However, many questions remain about the simulant's water carrying capacity and other physical characteristics, and also whether the simulants are representative for the real soils.

Wamelink W.

Oral presentation

Over- and under representation of red list species along abiotic soil gradients

Special session: Species and plant community responses along soil gradients

Wieger Wamelink

Alterra, Wageningen UR, Wageningen, The Netherlands

wieger.wamelink@wur.nl

For conservation purposes, but also to understand plant species behavior, knowledge on their abiotic preferences is essential. Based on a large database with vegetation relevés and abiotic soil measurements the general species number and the number of rare species and red list species preferences along abiotic axes were investigated. The ranges of the species, defined as the range between the 5 and 95 percentile of the response curve of the species for an abiotic factor, were used. These ranges were used to calculate the number of species along the abiotic gradient. The abiotic axes, e.g. for soil pH, were cut in small sections and per section the number of species and the number of rare and red list species was counted. Subsequently, the relative red list and rare species number per section was calculated and visualized. The number of species clearly changes along the abiotic axes, with for soil pH high number of species at intermediate pH values and in general for nutrients high number of species at low nutrient levels and low number of species at high nutrient values. For total phosphorous content of the soil also a low number of species is present at very low phosphorous contents. Red list and rare species showed a different pattern along the axes. At low pH values they are underrepresented and at high pH values over-represented. The same pattern appears for chloride content. For nitrate and total phosphorous content of the soil red list and rare species are over-represented at low concentrations and underrepresented at high concentrations.

Wang A.

Poster K-05 (young scientist)

Winter mobile carbohydrates in sink tissues of *Quercus aquifolioides* decrease with increasing altitude

Special session: Vegetation patterns, processes and dynamics of timberlines

Ao Wang [1,*], Xue Wang [2,3], Fei-Hai Yu [1], Yong Jiang [2] & Mai-He Li [2]

[1]School of Nature Conservation, Beijing Forestry University, Beijing, China; [2]Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang, China; [3]Forest Dynamics (Ecophysiology), Swiss Federal Research Institute WSL, Birmensdorf, Switzerland

* Presenting author: 395557626@qq.com

Previous studies proposed two hypotheses (carbon source limitation vs. growth sink limitation) to explain the formation and dynamics of the alpine treeline, but the truthfulness of these two hypotheses are currently actively and intensely being debated. Given that the elevational limits of all plants are mainly controlled by temperature, so far no study has investigated the resource balance and dynamics of non-tree plants (e.g. shrubs with a height of < 2 m) at their upper limits, in comparison with those found in the alpine treeline trees (> 2 m in height). We, hence, investigated the contents of nitrogen (N), phosphorus (P), non-structural carbohydrates (NSC = starch + soluble sugars), and $\delta^{13}C$ (in leaves only) in source tissue (leaves) and sink tissues (branches, stem sapwoods, roots) of *Quercus aquifolioides* growing at 3590 m (the upper limit), 3420 m, 3330 m, 3135 m, 2980 m, and 2840 m a.s.l. on Balang Mt. (30°53'N, 102°57'E). Samples (n = 6) were taken on 18th July (i.e. at the time of peak growth) and on 6th November 2014 (dormancy time), when the plots were thinly covered by snow. Tissue N and P seemed to not affect the upper limit formation of *Q. aquifolioides*, since no difference in N and P contents in tissues for both summer and winter along the elevational gradient was found. However, NSC contents showed tissue- and time-dependent patterns along the gradient. Leaf NSC concentration did not change with elevation for both growing season and dormancy season. NSC concentrations in sink tissues (stem sapwood and fine roots) did not decrease with increasing elevation in summer but did decrease with elevation in winter. Results of leaf $\delta^{13}C$ in both growing and dormancy season showed a significant increase along the altitude, which means plants in higher altitude had lower water-use efficiency. Our results suggest that the winter NSC storage may play an important role in determining the growth and survival of *Q. aquifolioides* at the upper limit. As we know that the winter NSC-storage can prevent intracellular ice formation and support the early spring regrowth of plants in cold conditions. The present study provides insights into the function-structure relationships in mountain plant belts. This study will not only significant contribute to a better understanding of the carbon-physiological mechanisms underlying the formation and dynamics of the upper limits of plants, but also to a better prediction of the mountain landscape patterns in a changing world.

Warghat A.R.

Poster N-06 (young scientist)

Vegetation and environmental data sets matter in ecological niche modelling: a case study on reintroduction of *Dactylorhiza hatagirea* in Ladakh region of India

Session: Vegetation in macroecological modelling

Ashish R. Warghat *, Prabodh K. Bajpai, Sahil Kapoor, Ashwani Bhardwaj, Tsering Stobdan, Bhuvnesh Kumar & Om P. Chaurasia

Defence Institute of High Altitude Research, Defence R & D Organization, Leh-Ladakh, India

* Presenting author: ashishwarghat@hotmail.com

Biodiversity hotspots have significant role in conservation ecology for the understanding vegetation and ecological complexities of hotspot. Ladakh belongs to the region with the highest recorded and unique type of flora and fauna, which includes some vascular plant species that ascend to near the highest elevation (5359 m a.s.l.) on record. Critically rare and endangered species are the most lacking for the outcomes from habitat modelling for conservation and management purposes. They are also complicated to model due to restrictions forced by available data. Because of this, there is a need to gain knowledge regarding species distributions and causes for extinction under a climate change and habitat fragmentation. *Dactylorhiza hatagirea* (D. Don) Soó (family: *Orchidaceae*) is native and near endemic to Indian Himalayan region. Its distribution extends to Pakistan, China, Afghanistan, Nepal, Tibet and Bhutan. In India, it is reported from Jammu and Kashmir, Sikkim, Arunachal Pradesh, Uttarakhand and Himachal Pradesh. However, overexploitation and habitat fragmentation from its natural habitat had led to its population decline and is considered as critically endangered. Documentation and overall distribution of the species in cold desert Ladakh part of India is lacking till date. As such in order to overcome the constrictions of the region remoteness and rugged terrain for field surveys, the present study utilized the species occurrence information using vegetation analysis and remotely sensed environmental variables to generate the distribution map of *D. hatagirea* and its validation. The data were analysed using univariate and multivariate methods. Results showed that 21 species belonging to 16 families were encountered and found that 1812 individuals of *D. hatagirea* present in our surveyed area with low density (i.e. 6.9%). The AUC of 0.98 and 0.96 observed for the training and test data, respectively, indicated higher success rates. This study revealed that the Enhanced Vegetation Index (EVI) proposed by the MODIS play an important role in providing dependable spatial and temporal information of vegetation cover and can be suitably applied to species distribution modelling. It was further hoped that the results drawn in the current study will act as an effective tool for monitoring as well in preparation of effective conservation planning of the species in cold desert Ladakh region of India.

Weekes L.

Poster with lightning talk D-41

National vegetation classification system for Irish rivers – identification of high status reference vegetation communities to aid critical conservation management requirements in Ireland

Session: Vegetation science serving nature conservation

Lynda Weekes [1,2,*], Úna FitzPatrick [2] & Mary Kelly-Quinn [1]

[1]School of Biology and Environmental Science, University College Dublin, Belfield, Dublin, Ireland; [2]National Biodiversity Data Centre, Carriganore West Campus, Waterford, Ireland

* Presenting author: lynda.weekes@ucdconnect.ie

There are challenges when attempting to classify the vegetation of rivers in Ireland, as only 23% of the entire Irish river network is composed of larger river channels. The remaining 77% mostly consist of smaller bryophyte-dominated streams where aquatic vascular plant cover is generally low, or entirely absent. Where vascular plants do occur, vegetation community diversity tends to be poor compared to UK and European rivers. There has been no attempt to classify river vegetation on a National level in Ireland to date. Rivers at present are generally treated as one for conservation management purposes under the EU Habitats Directive Annex I river category (3260) which covers a broad range of lotic habitats and vegetation communities. The main purpose of this post-graduate research project is to construct a national vegetation classification system for Irish rivers. One of the aims is to generate a reference site data set of river plots from high status rivers (Q5 – highest water quality evaluation) and to identify plant communities that can be used as a proxy measure to assess the biodiversity value of Irish river types in the future. This is an urgent need due to the rapid decline of such rivers in recent times. In 2014, stratified sampling was carried out on 52 high status Irish rivers, from which 71 vegetation plots were recorded. These were combined with additional high status river plots from previous Irish studies and subsequently assigned to vegetation communities identified during analysis. The main environmental drivers of vegetation community composition were investigated including both physico-chemical and physical factors. Bryophytes and macroalgae were found to play an important role in vegetation community identification, but vascular plants alone were generally not adequate for the majority of rivers surveyed. A classification of river vegetation from high status rivers will inform river typology, status assessment tools and the programmes of measures required under the EU Water Framework Directive. Furthermore, a vegetation classification system is critical in order to meet legal reporting requirements on conservation evaluation and assessment under Article 17 of the EU Habitats Directive and is also essential for setting site-specific conservation objectives and developing a national conservation strategy for river habitats by the National Parks and Wildlife Service.

Wellstein C.

Oral presentation

Trait-based assembly rules across climatic gradients of European grasslands are affected little by extreme drought

Camilla Wellstein [1,*], Anke Jentsch [2,3], Stefano Chelli [4], Giandiego Campetella [4], Roberto Canullo [4], Iva Apostolova [5], Juliette Bloor [6], Kevin Cianfaglione [4], Jürgen Dengler [2,7,8], Philipp von Gillhaußen [2], Behlül Güler [9], Judit Házi [10], Cecília Komoly [10], Jürgen Kreyling [3,7], Julien Pottier [6], Desislava Sopotlieva [5], Gábor Szabó [10], Tsvetelina Terziiska [5], Emin Uğurlu [9], Zita Zimmermann [10] & Sándor Bartha [10]

[1]Faculty of Science and Technology, Free University of Bozen, Bozen, Italy; [2]Disturbance Ecology, University of Bayreuth, Bayreuth, Germany; [3]Bayreuth Center of Ecology and Environmental Research (BayCEER), University of Bayreuth, Bayreuth, Germany; [4]Plant Diversity and Ecosystems Management Unit, School of Biosciences & Veterinary Medicine, University of Camerino, Camerino, Italy; [5]Insitute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia, Bulgaria; [6]INRA, UR0874 Grassland Ecosystem Research Unit, Clermont-Ferrand, France; [7]Biogeography, University of Bayreuth, Bayreuth, Germany; [8]Synthesis Centre (sDiv), German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany; [9]Biology, Faculty of Science & Letters, Celal Bayar University, Muradiye, Manisa, Turkey; [10]MTA Centre for Ecological Research, Hungarian Academy of Sciences, Vácrátót, Hungary

* Presenting author: camilla.wellstein@unibz.it

Changes in climate such as extreme drought events might interfere with grassland ecosystem processes. European grasslands support a rich flora with high small-scale species density, mirroring complex mechanisms of coexistence in different habitat templates. Do these mechanisms differ in relation to climate, soil and land use history? Are they affected by extreme drought? We investigated fine-scale patterns of trait-based community assembly in European grasslands across continental and experimental climatic gradients within the framework of the BiodivERsA project SIGNAL. The gradient extends from mesic (FR, GE) to intermediate (IT, BG) and to xeric grasslands (TR, HU). The sites also differ in management, disturbance history, geology and edaphic factors and represent common grassland-types of the respective country. We sampled fine-scale patterns of species combinations (rooting individuals) in six 1.20 × 0.40 m blocks, subdivided into micro-quadrats of 100 cm^2, for each treatment (control, drought) at each site in two years (2013, 2014). Based on the key plant-traits specific leaf area (SLA), height and seed mass we calculated Rao's functional diversity (FD) and further diversity indices for each micro-quadrat and compared them to a null model using the randomization method of Schamp et al. (2008; *Journal of Ecology* 96: 204–212); deviation of FD from random expectation was interpreted as trait divergence or convergence. Strong seed-mass divergence in the dry Turkish grassland pointed towards complex disturbance history, while the other countries showed convergence. Plant-height convergence most likely indicated the importance to have similar best traits in productive grasslands (FR, GE) or trait-similarity due to environmental filters (HU, IT) as does the strong SLA-convergence in Italy. We conclude that assembly rules can be contrasting and context dependent at different grassland sites and climatic differences are often masked by local factors such as disturbance regime or soil heterogeneity. Experimental extreme drought led to a tendency towards trait-convergence in seed mass in Italy probably constraining the regeneration niche. The tendency of SLA-divergence in France could indicate a tempering of competitive situations. Apart from that, assembly rules were remarkably stable under drought as we found neither significant changes in trait divergence or convergence nor switches between them across countries.

Wieczorek M.

Poster with lightning talk K-06

Forest dynamics of *Larix gmelinii* along the treeline ecotone

Special session: Vegetation patterns, processes and dynamics of timberlines

Mareike Wieczorek [1,2,*], Stefan Kruse [1,2], Anatoly Nikolaev [3], Florian Jeltsch [4], Lyudmila Pestryakova [3] & Ulrike Herzschuh [1,2]

[1]Alfred Wegener Institute for Polar and Marine Research, Research Unit Potsdam, Potsdam, Germany; [2]Institute of Earth and Environmental Science, University of Potsdam, Potsdam, Germany; [3]North-Eastern Federal University in Yakutsk, Yakutsk, Russia; [4]Institute of Biochemistry and Biology, University of Potsdam, Potsdam, Germany

* Presenting author: mareike.wieczorek@awi.de

Treelines worldwide are threatened by climate change and trees are expected to react by an expansion of forest into tundra region, which in turn might lead to decreased albedo and changing biodiversity. In the Taimyr region, we find the northernmost forest worldwide with *Larix gmelinii* trees growing up to 72.4°N. But although the region is a hot spot of climate change, studies on tree stand structure in this region are rare. With the help of field studies, and supported by results from an individual-based vegetation model, we revealed differences in forest structure, tree growth and establishment along a treeline transect. At seven different sites from northern taiga to forest tundra and southern tundra, we surveyed trees of all size classes (seedlings, saplings and trees) and recorded height, stem diameter, vitality and the amount of cones. Furthermore we took dendrological samples and sampled cones from the same trees if available. Establishment data were correlated with climate data and information on reproduction was gained from seeds inside the sampled cones. The simulation model was then used to further analyse stand structure dynamics under the influence of risen mean temperature, decreased competitive strength and increased seed availability. Most of the sampled individuals are growing upright, only the northernmost site showed krummholz growth forms with erecting stems. Number of trees per hectare shows a maximum in the forest tundra region, tree height, stem diameter and basal-area index on the other hand decrease from south to north. Except in the very north, trees are present at all sites for about 300 years. At the krummholz site, maximum tree age is 129 years, but it depicts rather the point of changing growth form, than real tree age. Establishment history can be related to $\delta^{18}O$ data and recent establishment peaks in the forest tundra occur together with climatic changes. Seed quality decreases with latitude whereas quantity increases. Together with the simulation experiment, our data show, that different drivers influence stand dynamics and recruitment at different latitudes. Recent treeline changes occur rather by an infilling of sparse stands than by expansion of larch into tundra regions.

Wild J.

Poster H-04

Distribution of vascular plants in the Czech Republic: various data sources, their comparison and integration

Session: Data sources for broad-scale vegetation studies

Jan Wild [1,*], Jiří Danihelka [1,2], Petr Petřík [1], Zdeněk Kaplan [1], Dana Michalcová [2], Milan Chytrý [2], Karel Chobot [3], Jan Štěpánek [1] & Václav Zouhar [4]

[1]Institute of Botany, The Czech Academy of Sciences, Průhonice, Czech Republic; [2]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [3]Nature Conservation Agency of the Czech Republic, Praha, Czech Republic; [4]Forest Management Institute of the Czech Republic, Brno, Czech Republic

* Presenting author: jan.wild@ibot.cas.cz

Reliable and as far as possible complete plant distribution records are indispensable for understanding patterns in species diversity and providing important information for nature conservation authorities. There are several sources of such data. Owing to the long tradition of flora mapping and vegetation survey in the Czech Republic, a large amount of floristic information has been gathered and summarized in several atlases. However, documentation of background data of these atlases is missing and many species have never been mapped on the national scale. In addition to atlases, various electronic databases have recently become an important source of information on species distribution. Among the most important ones are the Database of the Distribution of Vascular Plants in the Czech Republic (FLDOK), the Czech National Phytosociological Database (CNFD) and the Species Occurrence Database of the Agency for Nature Conservation and Landscape Protection of the Czech Republic (NDOP). All of these sources cover the whole country, but differ in their focus, data sources and management. FLDOK includes mainly published records and its focus is primarily on taxonomy and phytogeography. CNFD collects vegetation-plot records (relevés) for the use in vegetation science and community ecology. NDOP is the largest database originally focused mainly on records of protected or red-listed species and storing data from inventories of nature reserves and other kinds of protected areas and from recent Natura 2000 habitat mapping. The ability of each individual database to provide comprehensive data on species distribution is thus limited. Their strength lies in their integration, which, however, raises many questions related to data compatibility. We analysed these data sources to assess: (i) the overlaps of their records both in space and time, (ii) the differences in coverage of different taxa and taxonomic groups and (iii) the differences in sampling activities across regions. We also tested how the use of different databases or of the pooled database influences the traditional analyses such as species distribution mapping, habitat suitability modelling or species richness estimations.

Willner W.

Oral presentation

Supervised and unsupervised determination of diagnostic species: the need for an expert-assisted consensus approach

Wolfgang Willner

Vienna Institute for Nature Conservation and Analyses, Vienna, Austria

wolfgang.willner@vinca.at

It is often overlooked that the Braun-Blanquet approach involves not only a classification of communities but the simultaneous classification of communities (relevés) and species. Diagnostic species are used to characterise vegetation units, and they allow to assign plots to these units. Unfortunately, numerical fidelity measures have similar drawbacks as the commonly used unsupervised classification methods: the results are strongly dependent on the data set and on the chosen algorithms and parameters. Thus, transferability of diagnostic species from one study to another is limited. In this talk, I will introduce a consensus approach which combines unsupervised numerical fidelity measures and external expert-knowledge. Examples are taken from regional and supra-regional classification studies of European grasslands. I suggest to accept those species as diagnostic that (i) reach certain minimum thresholds according to commonly used fidelity measures (especially phi value of association and constancy ratio) and that (ii) reflect the ecological and biogeographical characterisation of the vegetation unit according to existing knowledge on the species ecology and distribution. Special attention should be paid to the role of dominant species as well as to vegetation units characterised by the absence of certain diagnostic species (“central syntaxa”). Moreover, determination of diagnostic species should not be separated from the question on how these species are used to assign plots to vegetation units because otherwise inconsistencies in the classification could arise.

Wojciechowska A.

Poster J-34

The influence of a seabird colony on calorific value and content of selected ions in *Cochlearia groenlandica* plants (Hornsund, Spitsbergen)

Session: Patterns of vegetation change across landscapes

Anna Wojciechowska [1,*], Adam Barcikowski [1] & Adrian Zwolicki [2]

[1]Department of Plant Ecology and Nature Protection, Nicolas Copernicus University, Toruń, Poland; [2]Department of Vertebrate Ecology and Zoology, University of Gdańsk, Gdańsk, Poland

* Presenting author: ankawoj@umk.pl

For plants living in the harsh environment of Arctic tundra, proper amount of nutrients provided by large nesting colonies of sea birds is necessary for survival, and it enables the plants to move from vegetative to generative phase and to produce seeds. Efficient generative reproduction is rare among polar plant species, and their population survives due to vegetative reproduction. However, seed production becomes of utmost importance if a plant is not perennial but biennial, like *Cochlearia groenlandica*. This species is one of the few non-clonal plants native to Spitsbergen. As it occupies places with varying level of nutrients, its morphological forms vary accordingly, which constituted the basis for differentiating the ecotypes. The aim of this study was to determine whether the calorific value and the element ratio of *C. groenlandica* plants were changing with growing distance from a bird colony, and whether these parameters were correlated with the content of nutrients in soil. The results obtained for flowers, leaves and roots were analyzed separately. The research material was collected in 2009 at Hornsund fjord in south-western Spitsbergen, at the foot of Gnalberget cliff. The plant samples were collected within the impact gradient of a colony of black-legged kittiwakes and thick-billed murres. Within the same gradient, soil samples were collected and their physicochemical parameters determined. Back in Poland the plant samples were subjected to chemical analysis. The tests determined included calorific value of the biomass, percentage content of carbon, hydrogen, nitrogen, sulphur, oxygen and phosphorus as well as ash content. The results were quite surprising. The calorific value did not change significantly with increased distance from the colony despite visible morphological differences between plants growing next to the colony and those from the end of the transect. Correlating the element content in flowers and leaves with soil parameters revealed close relationships for most elements except for carbon. Conversely, for roots it was carbon content that was the sole parameter significantly correlated with all the tested properties of the soil.

Wójcik T.

Poster P-34

Diversity of meadows in the Wielkopolka River valley in the Karpackie Foothills

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Tomasz Wójcik

Department of Plant Ecology, Institute of Botany, Jagiellonian University, Kraków, Poland

antomi7@wp.pl

The investigations of the vegetation cover of the meadow communities in the Wielkopolka River valley were carried out in 2011–2014. The area is located in the Strzyżowskie Foothills, which belongs to the Western Carpathians. The Wielkopolka valley is distinguished in the Carpathians for its well-preserved large meadow stands receiving traditional management practices. The value of these phytocoenoses lies in their habitat diversity, species richness, and occurrence of many rare and protected species, e.g. *Gentiana cruciata*, *Gentianella ciliata*, *Dactylorhiza incarnata*, *Dianthus armeria* and *Salvia verticillata*. During the research, 350 phytosociological relevés were taken with the Braun-Blanquet method. In three selected transects, detailed analyses of the chemical and physical properties of soil were performed and the management practices employed in the plant communities were identified. The analysed transects were located along an elevation gradient from the lowest point in the river valley to the top of the slope. The diversity of the meadow communities was found to be dependent on multiple environmental factors: slope inclination, exposure, substrate type, soil moisture, and management practices. The tributaries of the valley with deluvial, alluvial, and gleyic black soils were covered by meadows from the alliances *Calthion* and *Magnocaricion*. In wet unmanaged areas, there were rush communities from the class *Phragmitetea* and scrub dominated by *Alnus glutinosa*. Fresh meadows from the order *Arrhenatheretalia* growing on grey brown, brown, and humus deluvial soils were a dominant element of the landscape in the middle part of the slopes. The grey brown and brown soils at the top of the slopes were overgrown by a thermophilous variant of fresh meadows (*Arrhenatherion*) and xerothermic communities (*Festuco-Brometea* and *Trifolio-Geranietea*). In turn, abandoned stands were dominated by thermophilic scrub from the class *Rhamno-Prunetea*. Management was an essential factor influencing the species richness. Mowed and grazed meadows were characterised by a substantially higher number of species. It was observed that the thermophilous meadow stands located on south-facing slopes exhibited the highest species richness. The lowest species diversity was found in the rush communities and abandoned meadows covering the moist and wet soils of the river valleys.

Wolters S.

Oral presentation

Postglacial changes in European landscape diversity

Special session: Long-term perspectives on vegetation change

Steffen Wolters [1,*], Willem O. van der Knaap [2], Jacqueline F.N. van Leeuwen [2], Simon Brewer [3] & Thomas Giesecke [4]

[1]Lower Saxony Institute for Historical Coastal Research, Wilhelmshaven, Germany; [2]Institute of Plant Sciences, University of Bern, Bern, Switzerland; [3]Department of Geography, University of Utah, Salt Lake City, UT, USA; [4]Department of Palynology and Climate Dynamics, Georg-August-University Göttingen, Göttingen, Germany

* Presenting author: wolters@nihk.de

The collection of pollen diagrams in the European Pollen Database (EPD) makes it possible to study changes in vegetation structure through time and space. However, due to the multiplicity of contributing authors the nomenclature of pollen types is complex as it includes many synonyms as well as identifications to different morphological and hence taxonomic levels. Both hamper the comparisons of pollen type diversity and richness between pollen diagrams. To overcome this problem we reviewed the nomenclature of pollen types in the EPD by identifying synonyms and amalgamating them. Moreover we constructed a hierarchical system of the pollen types on the basis of pollen morphology rather than phylogenetic relatedness of the parent plants. Using this harmonized database we compute diversity as the number of pollen types in a sample of ten using rarefaction analysis. This measure has been shown to best reflect landscape diversity. Our reconstructions show how the Lateglacial and early Holocene spread of forests as well as the spread of agriculture and medieval deforestation determined patterns of landscape diversity throughout Europe. We evaluate the effect of different levels of pollen-morphological hierarchy on these patterns. For a selection of pollen diagrams with advanced pollen-morphological differentiation and therefore higher taxonomic resolution we compute a suite of indicators including pollen type richness and evenness through time and evaluate the importance of Postglacial spread of plants versus the introductions of species with agriculture for different European regions.

Woods K.D.

Oral presentation

Retrospective permanent-plot data offer deeper understanding of late-successional forest dynamics

Special session: Global change and vegetation dynamics: the use of historical data sets

Kerry D. Woods

Natural Sciences, Bennington College, Bennington, VT, USA

kwoods@bennington.edu

Understanding of late-successional forests has been constrained by availability of data of appropriate time-scale and resolution; ideas about old-growth forest dynamics are generally based on indirect evidence from space-for-time substitution or historical and paleoecological data of low spatio-temporal resolution. While these models make predictions about community assembly and dynamics and ecosystem function, few have been rigorously tested against direct measurements over appropriate time scales. Forest management and conservation priorities incorporate poorly tested assumptions about “natural” forest dynamics. Realization of the need for high-resolution, long-term data has led recently to establishment of permanent plot networks in forests around the world. However, it will be decades before sufficient data are accumulated for rigorous analysis of demographic properties, compositional dynamics, and ecosystem functioning, and “baseline” conditions for newly initiated studies, even in old-growth forests, are already influenced by ongoing climate change.

Wulf M.

Oral presentation

How well can proportion of main land cover-types in NE Germany be explained with natural and anthropogenic factors for the last 250 years?

Monika Wulf *, Ute Jahn & Kristin Meier

Institute of Land Use Systems, ZALF, Müncheberg, Germany

* Presenting author: mwulf@zalf.de

Four landscape windows located in north-eastern Germany, each of 10 × 10 km size, have been investigated in land cover on maps from about 1780, 1890 and 2010. Two windows are characterized by low and high turnover of changes in the main land cover-types arable fields, grasslands and forests, respectively. Several data on natural and anthropogenic factors, e.g. soil types and land cover of settlements, have been compiled for all three periods at the level of old manors and communes (11–21 for each window), respectively. Since usually more than one model fits well to the data, we applied model averaging to find the best fit explaining the proportion of the main land cover types in each period. Averaged models mostly explained c. 60% of variance if fixed and random factors were considered (conditional R^2 GLMM according to Nakagawa & Schielzeth 2013). Both, natural and anthropogenic conditions play an important role, but varied between periods and land cover-types. Since all models for 1780 show lowest marginal R^2 values (concerning only fixed factors; ranging from 5.3% to 20.7%) we assumed, that fixed factors are less suitable to explain proportion of land cover-types in the earliest period, but "landscape window" as random factor (conditional R^2 values from 53.5% to 78.2%) is quite useful. In accordance with this result the response of all land cover-types to at least one fixed factor depends upon the level of turnover (low or high). The importance of the turnover level in models decreases with time, and remain relevant only for forest cover in 2010. In this context, we looked closer on changes in forest vegetation and their main drivers over the last 250 years. In all, but one window, the proportion of coniferous stands has decreased from 1890 to 2010, mainly accompanied by an increase of deciduous and/or mixed stands.

Yamashina C.

Poster B-22

The effect of animal seed dispersal on the development of characteristic woody plant assemblages on termite mounds in a semi-arid area in Namibia

Session: Plant community assembly: niche-based vs. neutral processes and the role of species pools

Chisato Yamashina

Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan

yamashinachisato@gmail.com

Mound-building termites function as ecological engineers in tropical savanna landscapes. Large termite mounds support a greater diversity of plants than off-mound areas. The availability of resources and disturbance regimes had been suggested as the factors to induce distinct vegetation on termite mounds. Plant recruitment limitation, however, can result from seed dispersal and post-dispersal (establishment) limitation. Hence, in addition to the post-dispersal limitation factors, dispersal limitation should be evaluated to understand the whole process of distinct plant assemblages on termite mounds. The objective of this study was to clarify the establishment process of woody plants on termite mounds, especially focusing on the earlier process. It is hypothesized that animal seed dispersal would contribute the process. In this study, firstly it was examined; (1) whether the species composition of woody plants on relatively new termite mounds reflect that of surrounding vegetation or not? Then, if question (1) is not, to examine the possibility that animal seed dispersal contribute the establishment of distinct woody plant assemblages on termite mounds, I investigated (2) frugivores feed on the pioneer species on termite mounds, and (3) animal dropping density and their contents on termite mounds without trees. Since the direct measurement of the seed rain on cone-shaped mounds was difficult, the number of animal droppings and their contents were surveyed on and off the mounds to estimate possibility of animal seed dispersal on termite mounds. *Salvadora perica* was the most frequent species and appeared on a half of the active mounds, followed by *Capparis tomentosa*. The fruits of these 2 species of woody plants were fed by several kinds of avian species. The dropping density of both avian and mammalian species was higher on active mounds than off-mound area, and the droppings found on termite mounds included the seeds of fleshy fruit bearing trees. Birds may perch preferentially and hence provide the higher density of their droppings on cone (active) mounds, result in higher seed deposition and contribute the establishment of typical tree species.

Yan Y.

Poster J-35 (young scientist)

The impact of future climate change on the distribution patterns of vascular plants on the Qinghai-Tibetan Plateau

Session: Patterns of vegetation change across landscapes

Yujing Yan * & Zhiyao Tang

Department of Ecology, College of Urban and Environmental Sciences, Peking University, Beijing, China

* Presenting author: yanyujing@pku.edu.cn

There is evidence that plants shift their distribution range as a response to climate change, which may greatly impact the function of local or even global ecosystems. However, few studies have discussed the species vulnerability on a regional basis. As a place sensitive to climate change and unique for its rich biodiversity, the Qinghai-Tibetan Plateau has experienced rapid temperature increases along with changes in precipitation during last decades. In this study, we assessed the effects of future climate change on the diversity and distribution of vascular plants on the Qinghai-Tibetan Plateau. To do this, we collected distribution range from specimen records and local floras for 2000 species (~25% of overall vascular plant species in this area) endemic to China and widely distributed in the plateau and constrained to specific habitats on the plateau. We projected distribution of these species at year 2050 and 2070 based on niche models. We further evaluated the threatened status for these species by year 2050 and 2070 based on the International Union for Conservation of Nature and Natural Resources Red List criteria. The results showed major changes in biodiversity in the future and provided insights for biodiversity conservation management under climate change.

Zajac M.

Poster P-35 (young scientist)

Semi-natural mesic grasslands of the Ukrainian Carpathians

Session: Vegetation survey: towards the broad-scale synthesis of local vegetation classifications

Milan Zajac [1,*], Liubov Borsukevych [2], Mário Duchoň [3], Tomáš Figura [4], Roman Kish [5], Anna Kuzemko [6], Janka Smatanová [7], Iveta Škodová [1], Peter Turis [8], Ingrid Turisová [9], Eva Uhliarová [10], Karol Ujházy [11] & Monika Janišová [1]

[1]Institute of Botany, Slovak Academy of Sciences, Bratislava, Slovakia; [2]Botanical Garden of Ivan Franco National University, Lviv, Ukraine; [3]Department of Botany and Zoology, Masaryk University, Brno, Czech Republic; [4]Department of Experimental Plant Biology, Faculty of Science, Charles University in Prague, Prague, Czech Republic; [5]Faculty of Biology, Uzgorod National University, Uzgorod, Ukraine [6]National Dendrological Park Sofiyvka, National Academy of Science of Ukraine, Uman, Ukraine; [7]Administration of Landscape protected area Strážovské vrchy Mts., Považská Bystrica, Slovakia; [8]Administration of National Park Nízke Tatry, Banská Bystrica, Slovakia; [9]Department of the Enviroment, Faculty of Natural Sciences, Matej Bel University Banska Bystrica, Banská Bystrica, Slovakia; [10]Department of Biology, Faculty of Natural Sciences, Matej Bel University Banska Bystrica, Banská Bystrica; [11]Department of Phytology, Technical University in Zvolen, Zvolen, Slovakia

* Presenting author: milan.zajac1986@gmail.com

The Ukrainian part of the Carpathian Mts belongs to the phytosociologically under-investigated regions of Eastern Europe. A few local studies focussing on grassland vegetation are moreover based on the eco-phytocenotic (dominance) approach and can hardly be used in recent supranational analyses and surveys. Based on our own phytosociological material recorded following the principles of the Zürich-Montpellier school we prepared the first large-scale syntaxonomical overview of mesic semi-natural grassland communities in the Ukrainian Carpathians. Our aim was to distinquish the main grassland types and to classify them according to the traditional classification used in most European countries. Altogether, 312 phytosociological relevés were recorded during 2010–2014 on 16 m^2 plots. TWINSPAN and supervised K-means clustering were used to distiguish the associations, which were later tested for overlaps in the ordination space by the detrended correspondence analysis. In the study area, ten associations were distinguished (*Alchemillo-Arrhenatheretum elatioris*, *Poo-Trisetetum flavescentis*, *Anthoxantho odorati-Agrostietum tenuis*, *Lolio perennis-Cynosuretum cristati*, *Campanulo abietinae-Nardetum strictae*, *Antennario dioicae-Nardetum strictae*, *Betonico officinalis-Agrostietum tenuis*, *Campanulo rotundifoliae-Dianthetum deltoidis*, *Nardo strictae-Festucetum rupicolae* and *Polygalo vulgaris-Nardetum strictae*) belonging to four alliances (*Arrhenatherion elatioris*, *Cynosurion cristati*, *Violion caninae* and *Nardo strictae-Agrostion tenuis*). The delimited syntaxa were discussed with respect to their distribution in the Carpathians and Europe. We hope this study will contribute to unification of the phytosociological classification in Europe.

Acknowledgements: The research was supported by the projects VEGA 2/0099/13 and VEGA 2/0027/15.

Zegrar A.

Poster M-04

Biological diversity and forest mapping using remote sensing in a semi arid area in the north-west of Algeria

Special session: Remote sensing for vegetation science

Ahmed Zegrar

Department of Observing the Earth, Centre of Spaces Techniques, Arzew, Algeria

z_ahmed65@yahoo.fr

The forests in Algeria have a fairly large ecological diversity with different bioclimatic zones from arid to wet. These floors have a direct impact on forest ecosystems and determine the floristic composition of these forests and their regeneration. This ecological diversity of forests due to its constitution plays an important role in natural regeneration from natural calamities (fire, wind phenomenon, logging). The conservation of biodiversity and the sustainable development of forest ecosystems are becoming increasingly important. These ecosystems are unique to the biological wealth of forests, inland waters, agricultural lands and humid lands. Research in ecology has advanced knowledge about the functioning of forest ecosystems and the impact of human activities (fires, logging, deforestation and land clearing). Man needs a better measure the extent of the changes it makes to its environment. Not only can it improve its practices accordingly, but it is becoming increasingly conscious of the need – and to some extent, its ability – to repair damaged areas. In this study, the use of remote sensing images from the satellites ALSAT-1 and Landsat TM at different times allowed us to classify forest formations in the semi-arid region of Tlemcen, in north-western Algeria. Data from images on several dates have been used and subjected to specific treatments, such as geometric correction and classifications. Supervised classification by the method of maximum likelihood was used to identify key training areas for study. Indices NDVI, MSAVI2 and Index greenness IV were used to characterize forest formations and determined the changes. This treatment has created a detailed thematic analysis of forest ecosystems and provided a vegetation map of the study area. We also used a Geographic Information System (GIS) for mapping management.

Zelený D.

Oral presentation

Comparing incomparable: explained variation in species composition is not comparable among datasets due to undersampling

David Zelený *, Ching-Feng Li, Dominik Zukal, Markéta Chudomelová, Helena Prokešová & Hana Sekerková

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: zeleny.david@gmail.com

Undersampling, or sample incompleteness, is a property of dataset reflecting the relationship between size of community species pool and number of individuals recorded in individual samples. Imagine sampling two different plant communities, one with low and another with high species pool. If the sampling effort is standardized by the same sample area in both communities, and the average number of plant individuals per area is comparable, then the sample of the species poor community is likely to record higher proportion of the species pool than the sample of the species rich community. Consequently, samples of species rich community will be more undersampled (incomplete) than samples of the poor community. Differences in the level of undersampling between datasets have undesirable consequences not only for comparisons of species richness, but also for comparisons of beta diversity and variation in species composition explained by environmental or spatial variables among datasets. Namely, undersampling increases the overall dataset beta diversity, and decreases the ability of environmental or spatial variables to explain it (e.g. by constrained ordination analysis). Here, we illustrate this effect using the real vegetation data collected specifically for this purpose. We selected six localities with vegetation types of contrasting size of species pool and density of individuals per sampled area, and at each of them we sampled 12 vegetation plots composed of four nested subplots of different area. From each locality we therefore obtained four datasets, differing by the level of undersampling (differences in plot area), while keeping constant the other factors like number of samples, their spatial distribution and environmental heterogeneity. As we expected, differences in variation explained by environment clearly show that the level of undersampling matters. The main message of our study is a warning: variation explained by environmental or spatial variables is not comparable among datasets differing by a level of undersampling, even if the sampling effort is standardized by plot area or number of individuals and explained variation is adjusted for number of samples and number of explanatory variables (adjusted R^2). Numerical solutions to this problem exist, but they have limited applicability. The main recommendation here is to avoid comparisons of explained variation in species composition among datasets unless the level of undersampling is comparable.

Zhang W.

Poster O-17 (young scientist)

Altitudinal patterns illustrate the invasion mechanisms of alien plants in temperate mountain forests of northern China

Session: Community invasibility: plant invasions as broad-scale biogeographical experiments

Wenxin Zhang [1,2,*], Da Yin [1,2], Dizhou Huang [1,2], Ning Du [1,2], Jian Liu [3], Weihua Guo [1,2] & Renqing Wang [1,2]

[1]Institute of Ecology and Biodiversity, School of Life Sciences, Shandong University, Shandong, China; [2]Shandong Provincial Engineering and Technology Research Center for Vegetation Ecology, Shandong University, Shandong, China; [3]Institute of Environmental Research, Shandong University, Shandong, China

* Presenting author: zhangwenxin_508@163.com

Altitudinal patterns of species richness and their underlying mechanisms have long been a hot topic. However, compared to native species, there has been relatively little research on altitudinal richness patterns of alien species. This study aims to explore altitudinal richness patterns of alien species and explain the invasion mechanisms of alien species in mountain forests. Sixty-three quadrats of 20 × 30 m were systematically set up along an elevation gradient in two mountain regions which have different climate features in Shandong Province, China. We examined the variation in alien and native plant richness and composition along an altitudinal gradient to explore the invasion mechanisms of alien species in mountain forests and analyzed the relationship between alien species richness and environment factors (disturbance, slope, aspect and canopy density) on both mountains. In contrast to native plants, which presented two different richness patterns along an elevation gradient on Mount Tai and Mount Lao, alien species richness presented a consistent decreasing tendency with increasing elevation, suggesting that mechanisms driving native and alien species richness may be different. Although native plants had many specialists at high altitudes and presented an obvious change of chorological groups along the elevation gradient, most alien species distributed in high altitude areas also occurred at lower elevations and did not reflect apparent species replacement between low and high elevations. All findings indicated that the invasion process in mountain forests is dominated by alien species that are introduced at low altitude, successively filtered out by worsening climatic conditions and decreasing propagule pressure along an elevation gradient, and a subset of this community spreads upward to high altitude areas. A Pearson correlation analysis showed plots with higher exotic species richness generally experienced stronger human disturbance. Therefore, alien plant monitoring efforts in mountain forests should put more focus on low-elevation areas, which are subjected to relatively more anthropogenic interference, to prevent alien species further spread to the new habitats at higher elevations.

Zimmermann Z.

Poster C-18

Effects of rooted and shoot sampling schemes on species richness and species-area curves

Session: Patterns and drivers of alpha and beta diversity in plant communities

Zita Zimmermann [1,*], Gábor Szabó [1], Sándor Bartha [1], Giandiego Campetella [2], Behlül Güler [3], Anke Jentsch [4], Jürgen Kreyling [5], Camilla Wellstein [6] & Jürgen Dengler [7]

[1]Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót, Hungary; [2]School of Biosciences and Veterinary Medicine, University of Camerino, Camerino, Italy; [3]Department of Biology, Celal Bayar University, Manisa, Turkey; [4]Disturbance Ecology, Bayreuth Center for Ecology and Environmental Research (BayCEER), University of Bayreuth, Bayreuth, Germany; [5]University of Greifswald, Experimental Plant Ecology, Greifswald, Germany; [6]Faculty of Science and Technology, Free University of Bozen, Bozen; Italy; [7]Plant Ecology, Bayreuth Center for Ecology and Environmental Research (BayCEER), University of Bayreuth, Bayreuth, Germany

* Presenting author: zimmermann.zita@okologia.mta.hu

Background and aims: There are two different approaches to record presences of species in a plot: shoot and rooted presence. Although it was demonstrated theoretically that the different recording schemes will lead to differences in richness counts and different shapes of species-area relationships (SARs), this aspect is not generally acknowledged in ecology. The aims of our study are to quantify how big the differences of rooted vs. shoot sampling in vascular plant species richness counts are at different spatial scales and to analyse how these two sampling approaches influence the shape of SARs.

Material and methods: We used the plots of the BiodivERsA project SIGNAL in semi-natural grasslands of six Eurasian countries. In each study site we established six blocks of 2.80 × 0.40 m, subdivided into 448 microquadrats of 25 cm. We recorded the vascular plant species composition in each of these microquadrats also with rooted and shoot sampling scheme. We calculated species richness values for ten different sampling unit sizes. To describe the rate of difference between the species richness obtained by the different sampling methods linear mixed-effect models were used. For detecting differences between rooted and shoot presence methods SAR models were applied based on species richness values.

Main results and interpretations: The effect of the different sampling scheme on species richness was scale-dependent, however the effect size varied between countries. Species richness recorded with shoot presence method was higher in every scale in the case of all sites, nevertheless the amount of relative differences became smaller with increasing plot size on every site. On the basis of our results we can confirm the statement that in case of comparing SARs from different studies it is essential to know which sampling scheme was used since if the method is uncertain, the comparison will not be responsible.

Acknowledgements: This work was carried out within the project SIGNAL, which is mainly funded by the ERA-Net BiodivERsA (*http://www.biodiversa.org*), with the national funders Belgian Science Policy Office (belspo), German Federal Ministry of Education and Research (BMBF), Bulgarian Science Found and Ministère de l'Écologie, du Développement durable et de l'Énergie (France) as part of the 2011–2012 BiodivERsA call for research proposals. The research stay of Z. Z. and Sz. G. in Bayreuth was made possible through a grant of the Bayerische Forschungsstiftung to J. D.

Zukal D.

Poster with lightning talk C-19 (young scientist)

Species richness of vegetation types: fair comparison using standardization to sample completeness rather than sample area

Session: Patterns and drivers of alpha and beta diversity in plant communities

Dominik Zukal * & David Zelený

Department of Botany and Zoology, Masaryk University, Brno, Czech Republic

* Presenting author: dominikzukal@gmail.com

For several decades, species richness has been one of the most popular diversity measures. However, its usage as a tool for comparison of richness between different communities might not always be appropriate. Traditional approach (i.e. comparison of equal-sized plots) may provide biased species richness values for communities differing by the level of undersampling. When comparing two communities differing in the size of species pool, a sample of given area may be large enough to fully characterize the less diverse community, but too small to sufficiently characterize the more diverse one. The problem of undersampling of such a community may be caused by limited number of individuals occurring in the area of interest, so a lot of species will simply not be captured by the sample of given size. As Chao & Jost (2012) suggested, instead of samples standardized by size, it is more reasonable to compare samples standardized by their coverage (a measure of sample completeness). We studied understory of six forest plant communities, with an aim to compare diversity of herb layer using different ways of sample standardization: (1) by area (i.e. equaly large vegetation plots), (2) by number of individuals, and (3) by sample coverage (a measure indicating the proportion of the total number of individuals in a community belonging to the species represented in the sample). With the intention of comparing usefulness of different standardizations, the six communities were selected with respect to differences in their alpha diversity, size of species pool and presumed density of plant individuals. For each of them, two types of data were recorded: (a) vegetation plots of nested design (with subplots of 4 m^2, 25 m^2, 100 m^2 and 400 m^2) recorded at 12 randomly selected locations, and (b) numbers of species and plant individuals in 100 subsamples of 0.04 m^2 (placed evenly at the 100 m^2 plot) recorded for 5 out of 12 plots mentioned above. For all three types of sample standardization, samples were rarefied to the same area, number of individuals and sample coverage, and species richness of each community was compared. Communities differ in their relative richness when using different types of sample standardization. Compared to less diverse communities, our results confirm our expectation that for fair comparison of species richness among vegetation types standardized by sample coverage, communities with larger species pool should be sampled by larger-sized plots.

Zupo T.

Poster A-20 (young scientist)

Is fire affecting legume germination? The effect of fire temperature and post-fire conditions in different fire prone ecosystems

Session: Plant traits: towards an understanding of the functional diversity of plant communities

Talita Zupo [1,*], M. Jaime Baeza [2] & Alessandra Fidelis [1]

[1]Departamento de Botânica, Instituto de Biociências, Universidade Estadual Paulista, Rio Claro, SP, Brazil; [2]Fundación Centro de Estudios Ambientales del Mediterraneo, Valencia, Spain

* Presenting author: talita.zupo@gmail.com

Fire stimulated germination has been reported for many species in fire-prone ecosystems. Post-fire germination may be triggered by different mechanisms, e.g. heat shocks, temperature fluctuations and smoke. Both heat shocks and temperature fluctuations have been reported to break physical dormancy in hard-coated species and stimulate germination. The aim of our study was to evaluate whether high temperatures (direct effect of fire) and/or the daily fluctuation of soil temperature (indirect effect of fire) would affect the germination of three *Fabaceae* species, *Mimosa leiocephala* and *Bauhinia* sp. (Cerrado species), and *Ulex parviflorus* (Mediterranean Basin species). Seeds of all species were submitted to four treatments (25 seeds × 4 samples × 4 treatments × 3 temporal replications = 1200 seeds/species): Fire (F), where seeds were placed inside an incubator at a temperature of 80 °C simulating fire temperatures at 1 cm belowground; Temperature fluctuations (TF), to simulate the daily temperature fluctuation that occurs after fire, seeds were exposed to daily cycles of alternating temperatures (15 °C to 50 °C) during 30 days in an alternating temperature incubator; Fire + Temperature fluctuations (F+TF), where both treatments were combined; and Control (C), where seeds were not exposed to any of the treatments mentioned above. Seeds of the two Cerrado species showed opposite germination patterns. Seeds of *Bauhinia* sp. showed high germination percentages (> 80%) in all treatments, suggesting that seeds from this species are water permeable. This species showed a lower germination percentage in treatments where fluctuating temperatures were involved: 87 ± 3.2% and 88.8 ± 4.9% germination in F+TF and TF treatments, respectively, and 99.2 ± 1.4% in F treatment ($p = 0.005$ and $p = 0.012$, respectively) and 98.8 ± 1.2% in the control ($p = 0.006$ and $p = 0.015$). These results might mean that seeds from this species recognize high temperature amplitudes as an unfavorable environmental condition. Seeds of *Mimosa leiocephala* showed low germination rates (≤ 35%) in all treatments and they showed no differences in germination percentages between treatments ($p > 0.05$). On the other hand, germination percentage of seeds of the Mediterranean species *Ulex parviflorus* was enhanced with all treatments, suggesting that both fire and temperature fluctuations are effective in breaking seed dormancy and stimulating germination in this species.

Author index

JUICE software for vegetation classification and analysis

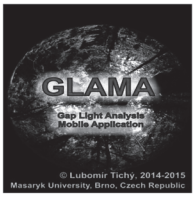
Do you need a fast unification of species nomenclature? Do you wish to create a table which can be easily analysed or classified using JUICE or various computer programs?

Download this program from:

http://www.sci.muni.cz/botany/juice

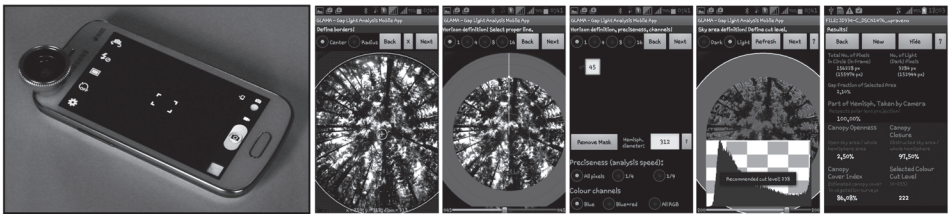
The software is free of charge. It supports many published scientific tools and data exports to various programs. JUICE is frequently used both for professional analysis of community data and for education.

GLAMA Gap Light Analysis Mobile Application



'Gap Light Analysis Mobile App' (GLAMA) is a program which calculates Canopy cover index to precise inaccurate estimation of forest canopy cover in the field. It is freely accessible from the Google Play website. It can be used for analysing hemispherical, wide-angle and standard photographs (with known angle of lens view). The photographs may be analysed either directly from a smartphone/tablet camera or as JPEG files on a computer with Android operation system or Android simulator. The analysis of a photograph takes only a few seconds. See more details at:

http://www.sci.muni.cz/botany/GLAMA



ISBN 978-80-210-7860-4

muni PRESS