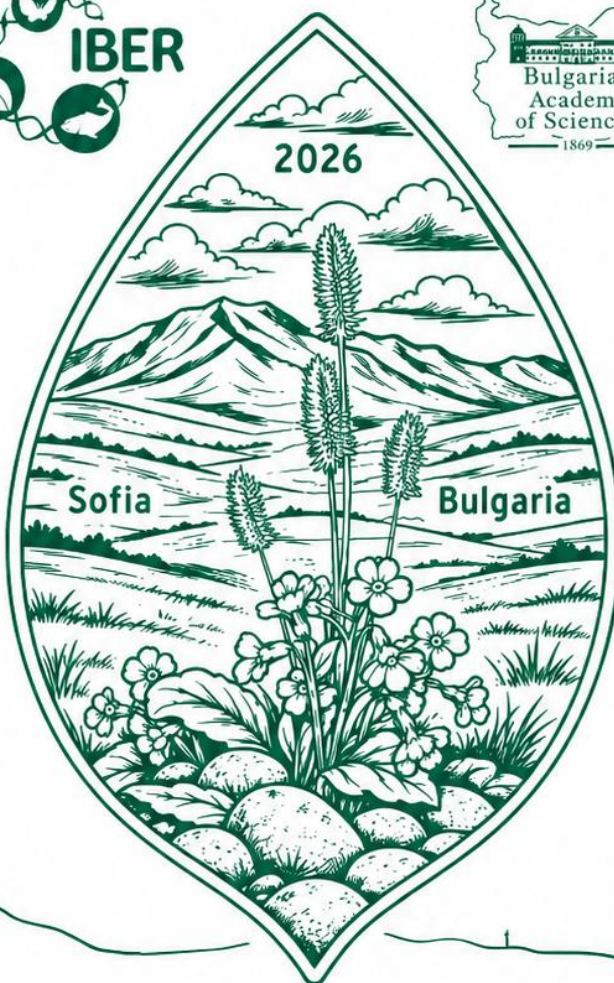




21st Eurasian Grassland Conference
Sofia Bulgaria

Book of Abstracts

*“Connecting science and conservation
for grassland sustainability”*

Welcome

Dear colleagues and friends,

On behalf of the Organising Committee, we are delighted to welcome you to the 21st Eurasian Grassland Conference in Sofia, Bulgaria, under the theme “Connecting science and conservation for grassland sustainability.”

The Eurasian Grassland Conferences, organised by the Eurasian Dry Grassland Group (EDGG), bring together researchers, conservationists, and practitioners working to understand, protect, and restore grassland ecosystems. We are pleased to continue this tradition by providing a platform for sharing knowledge, strengthening collaborations, and developing new ideas for the future of grasslands.

Grasslands are among the most diverse and valuable ecosystems worldwide, supporting exceptional biodiversity and providing important ecosystem services. At the same time, they face increasing pressures from land-use change, climate change, and biodiversity loss. This conference highlights the importance of connecting scientific research with effective conservation actions to ensure their long-term sustainability.

We are honoured to host this meeting in Sofia, a city surrounded by landscapes representing Bulgaria’s rich natural heritage. Alongside the scientific sessions, we look forward to the mid-conference excursion to Vitosha Mountain, offering participants an opportunity to explore local grassland habitats and experience the region’s unique biodiversity.

We sincerely thank all the keynote speakers, session chairs, authors, participants, volunteers, sponsors, and supporting organisations whose contributions have made this conference possible. We are grateful for the organisations, whose continued commitment of the EDGG community and everyone working towards advancing grassland science and conservation.

We wish you an inspiring and productive conference, filled with stimulating discussions, new connections, and memorable experiences.

Welcome to Sofia and the 21st Eurasian Grassland Conference!

The Organising Committee



Organising Committee

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Discover Sofia

Discover Sofia is the official tourism platform of the Sofia Tourism Administration, part of Sofia Municipality. It promotes Sofia as a year-round destination, highlighting the city's rich cultural heritage, natural attractions, events, and visitor services for both Bulgarian and international audiences. Through its tourism initiatives and partnerships, the organisation supports the development and promotion of Sofia as an attractive destination for business and leisure travel.

As a partner of the 21st Eurasian Grassland Conference, Discover Sofia contributes to the conference by providing a guided tour of Sofia for participants and by supplying promotional and informational materials for the conference registration packages. We gratefully acknowledge their support in helping us showcase the city and enrich our guests' experience during their stay.

20 July — Oral Presentations

Session 1: Patterns, Classification, and Biogeography of Palearctic Grasslands

Ecological scaling laws in Palaeartic grasslands

PLENARY PRESENTATION

Iwona Dembicz

Abstract

Scaling laws are universal in ecology. Although species-area relationships (SARs) were first described more than a century ago and are probably the most widely studied scaling law in ecology, there are many other similar interconnected phenomena. In my talk, I will use the term 'scale' to refer to spatial grain size and spatial extent. In any ecological research, it is crucial to account for spatial scale, as this may impact biodiversity metrics, diversity-environment relationships or any other community characteristic. Taking a scale into account can help make the most of ecological data and lead to accurate conclusions, which would otherwise be biased. Furthermore, incorporating multiple scales into vegetation sampling can provide insight into beta diversity, another measure of biodiversity linking alpha and gamma diversity. I will demonstrate that the Eurasian grasslands are an excellent subject for research on the importance of scale in ecological studies by presenting a variety of regional scaling-law studies involving EDGG nested plots. I will also present studies on beta diversity and island biogeography which used the z-value - the scaling exponent in the power-law SAR.

Drivers of multi-facet plant diversity across spatial scales in Ukrainian grasslands

ORAL PRESENTATION

Dariia Borovyk*, Oksana Buzhdygan, Selina Baldauf, Anna Kuzemko, Denys Vynokurov, Britta Tietjen & sScaleGrassDiv Working Group contributors

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Abstract

Understanding the mechanisms that shape biodiversity across spatial scales is essential for predicting ecosystem responses to environmental change and for designing effective conservation and restoration strategies. Although numerous studies have examined taxonomic diversity patterns in grasslands, much less is known about whether the drivers of phylogenetic and functional diversity operate similarly across spatial scales.

We analysed 174 nested plot series from grassland plant communities covering a broad environmental gradient across Ukraine. For each community, we quantified taxonomic, phylogenetic, and functional diversity across seven nested plot sizes ranging from 0.0001 to 100 m². Using Bayesian diversity–area models, we extracted two complementary components for each biodiversity facet: local diversity (α -diversity, represented by the intercept) and species turnover across space (β -diversity, represented by the slope). We then related these components to environmental conditions, management characteristics, and community structure using mixed-effects models.

Our preliminary results show that the importance of biodiversity drivers depends both on spatial scale and on the biodiversity facet considered. Environmental variables explained substantial variation in phylogenetic and functional diversity, whereas management and community structure showed stronger effects on taxonomic diversity. Drivers of α -diversity often differed from drivers of β -diversity, indicating that factors promoting local diversity do not necessarily increase spatial turnover. Furthermore, phylogenetic and functional diversity responded differently to several predictors, suggesting that taxonomic diversity alone provides an incomplete picture of biodiversity assembly processes. These findings highlight the scale-dependent and facet-specific nature of grassland biodiversity drivers.

Factors determining the occurrence of *Alchemilla* species on Finnish and Bulgarian Meadows

ORAL PRESENTATION

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Abstract

Meadows and many species associated with meadows, like many *Alchemilla* species, are threatened. It is thus important to know more about the ecology of these species in order to redirect the ecological processes to mitigate the current threats. I studied the factors affecting the coverage and species composition of *Alchemilla* in 6-17 1m² quadrats on 14 Finnish meadows. I also measured the height surrounding vegetation and defined the meadow types, and estimated ground structure and moisture, possible eutrophication, exposure and shadiness for each quadrat. I then compared these results to the results from Bulgarian meadows collected by Anna Gavrilova. There were differences in data collection and comparison was therefore conducted using conclusions instead of straight data analysis, and comparison was limited to Series Vulgares, in which there were more species in common. In Finnish meadows, the meadow type, moss occurrence, and the height and number of species of surrounding vegetation affected the coverage of *Alchemilla*. As the cover of Series Vulgares species decreased with higher number of other species, the effect was opposite in Bulgarian meadows. The study species which occurred in Bulgaria and Finland on Series Vulgares were *Alchemilla micans* and *Alchemilla monticola*. In Finnish meadows, both competition with other species and general light-deficiency decreases occurrence of *Alchemilla*. The differences between Finnish and Bulgarian meadows may be linked to the fact that in Finland, ecosystems are younger than in Bulgaria and many species are also on the edge of the distribution area. Studying apomictic species also needs careful consideration on species concept as taxonomy is not straightforward.

Session 2: Grasslands of the Balkan Peninsula

Grassland syntaxonomy and ecological patterns in the Central Balkans

PLENARY PRESENTATION

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Keywords: Grasslands; Syntaxonomy; Phytosociology; Central Balkans; Festuco–Brometea; Elyno-Seslerietea.

Abstract

The Central Balkans represent one of the most diverse regions for grassland vegetation in Europe due to the interaction of Mediterranean, sub-Mediterranean, continental and alpine biogeographical influences, combined with pronounced geological and altitudinal heterogeneity. This complexity has resulted in exceptional floristic diversity and the coexistence of numerous grassland vegetation types ranging from lowland xerothermic communities to alpine calcareous grasslands.

This presentation provides a synthesis of the current knowledge on the syntaxonomy of grasslands in North Macedonia, Kosovo and Serbia within the framework of the EuroVegChecklist (Mucina et al., 2016), complemented by recent phytosociological studies from the region. Special attention will be given to the diversity and ecological differentiation of the Festuco–Brometea and Elyno-Seslerietea classes, which represent the dominant dry and alpine grassland vegetation of the Central Balkans. Their floristic composition, diagnostic species, ecological gradients, altitudinal distribution and syntaxonomic relationships will be discussed together with recent revisions and newly described syntaxa.

The presentation will also highlight the correspondence between phytosociological units, EUNIS habitat types and Annex I habitat types of the EU Habitats Directive, emphasizing their importance for biodiversity conservation, habitat mapping and ecological restoration. Particular attention will be paid to Balkan endemic-rich grasslands and the role of recent vegetation-ecological research in improving the harmonization of national vegetation classifications with the European syntaxonomic framework.

By integrating classical phytosociological knowledge with recent numerical analyses and vegetation databases, this overview aims to provide an updated synthesis of grassland diversity in the Central Balkans and to contribute to a better understanding of their ecological patterns and conservation significance within the European vegetation context.

High-rank syntaxa of the non-forest vegetation on the territory of the Plovdiv and Rhodopean foothills geobotanical regions

ORAL PRESENTATION

Kiril Vassilev, Beloslava Genova*, Momchil Nazarov, Nikolay Velez, Gana Gecheva, Stoyan Georgiev, Constantin Mardari

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Abstract

The present study aimed to investigate the syntaxonomic diversity, structure, and ecological characteristics of non-forest vegetation within the Plovdiv and Rhodopean Foothills geobotanical regions of Bulgaria.

A total of 3,930 relevés were collected in the study area, mainly during the period 2020–2025. Vegetation sampling followed the Braun-Blanquet approach, and environmental variables such as elevation, slope, exposition, and soil depth were recorded for each plot. Most relevés were sampled on plots of 16 m², with slight variations in plot size for ruderal and chasmophytic vegetation types. The collected data were digitised using TURBOVEG and incorporated into the Balkan Vegetation Database. Subsequently, the dataset, together with 115 additional relevés obtained from published sources, was analysed using the JUICE software package.

The non-forest vegetation of the study area comprises 22 vegetation classes (*Artemisietea vulgaris*, *Bidentetea*, *Crypsietea aculeatae*, *Cymbalario-Parietarietea diffusae*, *Digitario sanguinalis-Eragrostietea minoris*, *Epilobietea angustifolii*, *Festuco-Brometea*, *Festuco-Puccinellietea*, *Helianthemetea guttati*, *Isoeto-Nanojuncetea*, *Juncetea maritimi*, *Koelerio-Corynephorsetea canescentis*, *Molinio-Arrhenatheretea*, *Mulgedio-Aconitetea*, *Oryzetea sativae*, *Papaveretea rhoeadis*, *Phragmito-Magnocaricetea*, *Polygono-Poetea annuae*, *Sedo-Scleranthetea*, *Sisymbrietea*, *Stipo-Trachynietea distachyae*, and *Trifolio-Geranietea sanguinei*), as well as 32 orders and 46 alliances. The most widespread vegetation classes were *Papaveretea rhoeadis*, *Sisymbrietea*, *Phragmito-Magnocaricetea*, *Festuco-Brometea*, *Digitario sanguinalis-Eragrostietea minoris*, *Polygono-Poetea annuae*, *Epilobietea angustifolii*, *Artemisietea vulgaris*, *Bidentetea*, *Helianthemetea guttati*, and *Molinio-Arrhenatheretea*.

Session 3: Animals in Palaearctic Grasslands

Distribution and conservation of reptiles in steppe, semi-arid and high-mountain pastures in Serbia and North Macedonia

PLENARY PRESENTATION

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Abstract

Habitats of steppe, semi-arid and high-mountain pastures are widely distributed in both Serbia and North Macedonia. Several reptile species are characteristic for habitats of steppe, semi-arid and high-mountain pastures. Six species (*Testudo graeca*, *Ablepharus kitaibelii*, *Lacerta agilis*, *Podarcis tauricus*, *Dolichophis caspius*, *Vipera ursinii*) can be found in both countries while an additional two are only present in North Macedonia (*Xerotyphlops vermicularis*, *Eryx jaculus*). Few are considered threatened according to the respective national IUCN assessments. Populations of the steppe and semi-arid reptiles are threatened by alterations and degradation of their habitats, through conversions of steppe fragments into arable land, plantations and industrial zones. They are also affected by afforestation, livestock grazing, and changes of the use of non-agricultural land, urbanization, and development of tourism/transportation infrastructure. Frequent fires in the areas inhabited by these species, resulting from negligence, intentional burning of stubble or grass or wildfires can jeopardize individuals either indirectly or directly. On the other hand, overgrowth of alpine grasslands (because of abandonment of traditional farming practices) is a threat to the species that inhabit high-mountain pastures. They can also be affected by global climate change, in particular, because of the impact of temperature change on its prey populations of orthopterans.

Using typical pollinators in monitoring of NATURA 2000 habitats

ORAL PRESENTATION

Ana Nahirnić-Beshkova, Lorenzo Marini, Jurrien R. Van Deijk & Stoyan Beshkov

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Abstract

According to the Habitats Directive (92/43/EEC), Member States shall report conservation status of the natural habitats and species (Article 17). Typical species are selected as good indicators of favourable condition of habitats. Insects play a crucial role in pollinating flowering plants, of which the most important are wild bees, hoverflies, butterflies and moths. In 2025 the European Parliament and the Council established the EU Pollinator Monitoring Scheme (EUPoMS), representing a science-based method for monitoring pollinator diversity and pollinator populations. The above-mentioned pollinator assemblage represents target groups of the PollHab project, which aims to identify typical pollinators for each Annex I habitat type. The criteria of the PollHab project for the selection of typical pollinators are: 1) species which occur regularly at a high constancy (i.e. are 'characteristic') in a habitat type or at least in a major subtype or variant of a habitat type; 2) species must be good indicators of favourable habitat quality, e.g. by indicating the presence of a wider group of species with specific habitat requirements, including species sensitive to changes in the condition of the habitat ('early warning indicator species'); 3) species which can be monitored relatively easily by non-destructive and/or inexpensive means should be favoured. The highest number of typical pollinators was proposed for dry grasslands because they hold rich biodiversity and are one of the best researched habitat types in terms of pollinators.

Losers or winners? An impact of small-scale steppe fire on ground-dwelling arthropods

ORAL PRESENTATION

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Abstract

Fire and grazing play key roles in the dynamics and evolution of dry grasslands, but the effects of fire on steppe arthropod communities remain poorly understood. Increasing frequency and severity of uncontrolled fires may destabilize steppe communities, and arthropods are of particular importance given the unprecedented decline of biodiversity. Over 7,000 individuals of 217 species in the orders Araneae (spiders), Coleoptera (beetles), and Hemiptera (true bugs) were collected in burned and unburned steppe plots on chernozem and clayey slopes of a steppe gully, part of a typical wood-and-steppe landscape in Northeastern Ukraine. This case study can therefore serve as a model for researching post-fire arthropod recovery. The total number of arthropods was negatively affected by fire, although taxonomic richness remained stable. However, the composition of arthropod assemblages changed significantly, depending on the taxon and ecological traits. Zoophagous insects were more abundant on burned plots than on unburned ones, whereas phytophagous insects were less abundant. Spider assemblage composition differed by site conditions (chernozem vs. clayey slope) and, to a lesser extent, by fire. The most diverse spider assemblage inhabited the chernozem slope after fire. True bugs were more diverse and abundant in the unburned steppe and preferred the undisturbed chernozem slope. Beetle assemblages were least abundant on this slope due to the avoidance of xerophilous species. In terms of species richness, beetle responses to fire were asymmetrical, with the highest observed richness on the burned chernozem slope and the lowest on the clayey slope. Of all the arthropod species collected in the gully, only three declined dramatically following the fire, while five benefited from it. No species disappeared from either slope after the fire, nor did any species colonize post-fire sites exclusively. Although some species preferred combinations of slope type and fire condition, most were found to be resilient to burning. Prescribed burning may therefore be recommended as a conservation management tool in European steppes. However, a comprehensive, multi-taxon study of the steppe biota is needed, including identification of vulnerable and beneficial species, as well as the creation of refuges for those species and assemblages that should be protected.

Rare Grassland Pollinators: A Species Action Plan for Teasel Plant-Specialised Bees

ORAL PRESENTATION

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Abstract

Across Europe, species-rich grasslands support a remarkable diversity of wild bees – the most important pollinator group for both wild plants and crops. Among them, a group of highly specialised wild bees depends almost exclusively on teasel plants (Dipsacoideae, including *Scabiosa*, *Knautia* and *Cephalaria*). These bees play a critical role in maintaining teasel-rich grasslands, habitats of high ecological value that also contribute to Europe's natural heritage and landscape diversity. In turn, the grasslands provide essential nectar and pollen not only for specialised bees, but also for a wide range of other pollinators and flower-visiting insects. The conservation of teasel plant-rich grasslands therefore supports entire pollinator communities, and the ecosystems and agricultural systems that depend on them.

Launched in 2023 under the European Commission's EU Pollinators Initiative, the Teasel-plant specialised bees in Europe – Conservation Action Plan 2023–2030 aims to strengthen the protection of some of Europe's most threatened pollinators. This Action Plan is one of three developed by the International Union for Conservation of Nature (IUCN), in collaboration with the IUCN Species Survival Commission, the Invertebrate Conservation Committee, the SSC Wild Bee Specialist Group and Buglife. Together the three Action Plans form a coordinated, science-based European response to halt pollinator decline across diverse ecosystems.

The 'teasel bees' Action Plan focuses on six key wild bee species that serve as umbrella species for the conservation of teasel-rich grassland communities, which are increasingly threatened, setting out a comprehensive framework to improve the conservation status of teasel plant-specialised bees through priority actions related to the research, governance and management of the bees and their habitat. It represents a crucial step towards safeguarding teasel bees and conserving Europe's species-rich grasslands. This presentation will showcase the progress made thus far on the implementation of the Action Plan, and the outstanding knowledge gaps to be filled if these important pollinators are to be safeguarded across Europe.

Poster Session 1

Biodiversity and ecosystem service monitoring in urban grasslands: the “Blühender Campus” project in Berlin, Germany

POSTER PRESENTATION

Dariia Borovyk*, Oksana Buzhdygan, Sophie Lokatis, Anja Proske, Rebecca Rongstock, Ana Maria Zambrano Cardona, Charlott Isis Guttek, Britta Tietjen

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Abstract

The Blühender Campus (Blooming Campus) initiative at Freie Universität Berlin promotes biodiversity by transforming intensively managed urban lawns into species-rich green spaces. Since 2019, the project has applied reduced mowing regimes alongside biodiversity-friendly and educational measures. In 2024, we initiated a biodiversity monitoring project within this initiative to assess how reduced mowing affects biodiversity and key ecosystem functions. One important aspect is that students are directly integrated into the project through bachelor's and master's projects and teaching.

The monitoring focuses on plant diversity, selected faunal groups, and ecosystem functions, e.g., greenhouse gas emissions, herbivory, pathogen-infection rates, predation rates, and decomposition. Permanent plots at two spatial scales (1 m² and 10 m²) were established at 20 localities and are resampled repeatedly. Phenological sampling of plant communities throughout the growing season is a core element of the monitoring design, allowing us to capture seasonal variability and relate patterns in biodiversity and ecosystem functioning to vegetation dynamics. Zoological sampling and biotic interaction experiments enable the exploration of cross-trophic responses to vegetation change.

First results showed that management effects are not fully captured by simple response metrics such as species richness alone, but rather become clearer when species composition and seasonal dynamics are considered. Our findings suggest that a mosaic of mowing regimes, combined where appropriate with the sowing of native species, can promote diverse, functionally differentiated urban grasslands and support ecosystem services. In addition to establishing a long-term ecological dataset for campus-scale biodiversity research and linking students to their campus, the project contributes to evidence-based management of urban spaces in Berlin and comparable cities and to the scaling up of similar biodiversity-oriented initiatives.

Vegetation assembly on the dried Aral Sea bed follows multiple pathways rather than a single successional route

POSTER PRESENTATION

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Abstract

The dried Aral Sea bed (Aralkum) is one of the largest newly exposed dryland areas in Central Asia. A central question in this system is whether plant communities follow a single successional route or form distinct vegetation states associated with different assembly pathways. We addressed this question using 577 vegetation relevés collected across the exposed seabed in Uzbekistan and Kazakhstan.

Species composition was analyzed using modified TWINSpan, NMDS, and DCA. We compared vegetation structure among groups using species richness, life-form composition, total cover, and within-group similarity. We also examined phylogenetic structure using Faith's phylogenetic diversity and SES.MPD.

The analysis identified eight recurrent vegetation clusters that differed clearly in floristic composition, structural organization, and internal homogeneity. Ordination supported the separation of these groups in compositional space. Annual halophytic communities formed the most isolated and structurally simplified vegetation type. In contrast, woody halophytic, psammophytic, and inland desert communities formed separate but internally differentiated groups. Phylogenetic structure also varied among clusters, with stronger clustering in halophytic states than in the other vegetation types.

These results show that vegetation on the dried Aral Sea bed is not arranged along a single linear successional sequence. Instead, the Aralkum supports several alternative vegetation states linked to parallel pathways of community assembly. This pattern helps explain the spatial organization of vegetation on the exposed Aral Sea bed and suggests that vegetation development in this system is better understood as a set of multiple pathways rather than a single trajectory.

Evolutionary history of feathergrasses mirrors climate-driven upslope and downslope shifts of the Central Asian steppes and their vulnerability to future climate change

POSTER PRESENTATION

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Abstract

Stipa species (feathergrasses) are dominant components of Eurasian steppe communities, serving as an example for elucidating the evolution of this biome. The ancestor of the genus originated during the Miocene; however, the greatest diversification occurred during Pleistocene climatic fluctuations, representing modern elements of the steppe biome. We used comparative phylogeography to identify concordant patterns reflecting the history of climate-driven upslope and downslope migration in the Central Asian steppes. Using genome-wide DArT-seq genotyping, we explored the phylogeny, genetic differentiation, demographic history, and adaptive evolution of the selected *Stipa* species with montane-lowland distribution.

Demographic modeling suggests a shared evolutionary history among the studied species, driven primarily by Pleistocene climatic fluctuations that led to range shifts (both horizontal and vertical). Colonization of habitats at different altitudes occurred at least twice during the evolution of these groups, likely due to successive waves of upslope and downslope migration associated with Pleistocene climate oscillations. This resulted in the development of a complex, spatial genetic structure and the emergence of distinct local climate-adapted lineages. Genomic and ecological data indicate region-dependent intraspecific vulnerability to climate change. The 'mountain' groups of populations will primarily respond to projected climate change by narrowing their ranges (moving to higher elevations). A significant loss of suitable habitat is especially noticeable on the southern range limits. Lowland populations of steppe species experiencing a considerable reduction in niche suitability show a higher degree of preadaptation to the future climate. On the contrary, populations from mountainous regions of the western Tian Shan and Pamir-Alai exhibited greater mismatch in genotype-climate associations between current and potential future climates, suggesting they face the highest risk of maladaptation.

Unraveling the evolutionary history of dominant species in steppe communities and their intraspecific variation is crucial for understanding how future climate change will affect the steppe biome and its grassland communities.

Research was funded by the National Science Centre, Poland, under projects 2020/39/D/NZ8/02307 and 2023/51/B/NZ8/01179.

Phylogenomic insights into the origin and diversification of Eurasian feathergrass steppe ecosystems

ORAL PRESENTATION

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Abstract

Understanding the evolutionary trajectory of the genus *Stipa* (feather grasses) is essential for reconstructing the historical origin of the Eurasian steppe biome. Integrating recent phylogenomic data and molecular clock analyses reveals that *Stipa* s.str. is a relatively young taxon, whose radiation was closely synchronized with the formation of modern steppe ecosystems. Molecular evidence indicates that *Stipa* diverged from its common ancestor during the Miocene, approximately 19–26 Ma. Phylogenetic reconstructions identify a basal divergence separating the genus into two evolutionary lineages: the Himalayan clade split from the Central Asian mountain-lowland clade about 14–16 Ma. The Himalayan clade, comprising cold-adapted, high-altitude species such as *S. purpurea*, *S. aliena*, *S. capillacea*, and *S. basiplumosa*, evolved tracking the early uplift stages of the Qinghai-Tibetan Plateau (QTP). Conversely, the Central Asian mountain-lowland clade underwent rapid radiation, diversifying ca. 3 Ma into a few species-rich lineages/sections: *Stipa* (e.g., *S. pulcherrima*, *S. borysthena*, *S. pennata*), *Leiostipa* (e.g., *S. capillata*, *S. grandis*, *S. krylovii*), *Barbatae* (e.g., *S. holosericea*, *S. ehrenbergiana*, *S. arabica*), and *Smirnovia* (e.g., *S. caucasica*, *S. longiplumosa*, *S. magnifica*). This evolutionary path reflects distinct adaptive strategies to heterogeneous environments, driven by the intensification of Asian aridification and the expansion of open habitats. These processes resulted from the synergistic effects of the QTP uplift and the retreat of the Paratethys Sea. The colonization of diverse ecological niches led to the emergence of three fundamental steppe types: high-altitude cold steppes, dominated by the *Regelia* and *Pseudoptilagrostis* sections; desert steppes, characterized by xeric-adapted species of sections *Barbatae*, *Smirnovia*, and *Leiostipa*; and typical and meadow-like steppes, defined by the dominance of species from sections *Stipa* and *Leiostipa*. Molecular dating further suggests that the contemporary feathergrass-steppe is a recent Neogene phenomenon. During the Miocene (ca. 12 Ma), Eurasian *Stipa* species diverged into distinct clades. One lineage comprises the arid South-West Asian steppes (sect. *Barbatae*) and a specific Central Asian group (*S. breviflora*, *S. bungeana*, *S. przewalskyi*) which, despite their current taxonomic assignment to different sections, form a single genetic clade. The remaining species, primarily within sections *Stipa*, *Smirnovia*, and *Leiostipa*, diverged between 3 and 1 Ma. Their origin is closely linked to the climate cooling of the late Pliocene, and glacial-interglacial cycles of the Pleistocene. Biogeographically, *Leiostipa* representatives are distributed in Siberia and Eastern Central Asia (classes *Cleistogenetea squarrosae* and *Ajanio-Cleistogenetea songoricae*), members of the section *Smirnovia* dominate the lowlands and mountains of Middle Asia (class *Artemisio-Stipetea drobovii*), while the nominal section *Stipa* extends from Middle Asia through the Caucasus and the Pannonian Basin to Western Europe (class *Festuco-Brometea*). This rapid, though relatively recent, radiation provided the biological basis for the enormous diversity of modern feathergrass-dominated vegetation of the Eurasian steppe biome.

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Floristic, ecological characteristics and distribution of forest fringe and related tall-herb rich thermophilous vegetation in Bulgaria and Romania

POSTER PRESENTATION

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Abstract

Introduction: The tall herb-rich grassland and forest fringe vegetation thrives in sunny edges of deciduous forests, clearings, roadsides, and abandoned grasslands and fields bordering woodlands. These plant communities can be found in areas that have been influenced by grazing, fire, or other disturbances that prevent the establishment of dense forests.

Aim: This study is focused on the distribution patterns and characteristics of forest fringe vegetation across Bulgaria and Romania. It emphasises the following aspects: 1) the syntaxonomical diversity of forest fringe vegetation in Romania and Bulgaria and its diagnostic species; 2) the environmental preferences of these communities, and 3) the main ecological factors influencing their floristic composition.

Methods: Vegetation classification was performed on a dataset of 351 relevés. The analyzed dataset was subjected to hierarchical agglomerative clustering using the β -flexible algorithm ($\beta = -0.25$), and Bray-Curtis dissimilarity. Vegetation-environment relationship was assessed using Detrended Correspondence Analysis on square root-transformed percentage cover data, with detrending by segments and down-weighting of rare species. The strength of the effect of each environmental variable on the floristic composition was quantified using Canonical Correspondence Analysis with forward selection and a Monte Carlo test.

Results: The saum vegetation studied was assigned to two vegetation classes comprising thermophilous forest fringe and tall-herb vegetation (Trifolio-Geranietea) and vegetation on disturbed forest sites or forest clearings (Epilobietea angustifolii). The plant communities identified presented distinct floristic composition with well-defined diagnostic species, which allowed us to assign them to seven phytosociological associations. Festuco pseudodalmaticae-Geranietum sanguinei ass. nova was proposed.

Terricolous Lichens of Rare Petrophytic Grasslands of the Ivano-Frankivsk Oblast (Ukraine)

POSTER PRESENTATION

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Abstract

Petrophytic steppe habitats of Pokuttia belong to habitat type E1.2 (Perennial calcareous grasslands and basic steppes) and are exceptionally rare within the Ivano-Frankivsk Oblast of Ukraine, being exclusively confined to the Dnister River Valley. Developing at altitudes of 240–310 m a.s.l. on gypsum and chalk limestone outcrops, these unique and highly vulnerable ecosystems are characterized by high species diversity of both vascular plants and cryptogams, including numerous species of national conservation concern. During the 2024–2025 vegetative seasons, we investigated the species composition of the terricolous lichen component across plant communities typical for this habitat type, including *Adonido vernalis*–*Stipetum tirsae*, *Ranunculo zapalowiczii*–*Helictotrichonetum desertori*, *Poetum versicoloris*, and *Teucrio pannonicum*–*Caricetum humilis*.

Our comprehensive analysis of the collected materials enabled us to assess species diversity, perform a detailed taxonomic characterization, and evaluate key ecological features of the studied lichen component. Within the investigated biota, typical epigeic species are represented mainly by the genus *Cladonia* (*C. foliacea*, *C. fimbriata*, *C. furcata*, *C. pyxidata*, *C. rangiformis*, *C. rei*, etc.), while these habitats also host true indicator species highly specific to E1.2 ecosystems, including *Catapyrenium squamulosum*, *Endocarpon pusillum*, *Gyalolechia bracteata*, and *Thalloidima sedifolium*. Notably, our surveys yielded conservation-significant records, including the first record of *Squamarina lentigera* for Western Ukraine, alongside several newly found populations of *Psora decipiens*, both of which hold a vulnerable status in the Red Data Book of Ukraine. However, this typical steppe complex of lichen species is highly threatened by secondary succession and shrub encroachment triggered by recent land-use abandonment. We conclude that there is an urgent need to develop and implement effective management measures, highlighting the critical importance of preserving and restoring these unique petrophytic grasslands of Pokuttia and their associated cryptogamic diversity.

Urban lawn–grassland mosaics along a local disturbance gradient: a teaching-based case study from the campus of Taras Shevchenko National University of Kyiv

POSTER PRESENTATION

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Abstract

Urban grassland vegetation is an ecologically relevant component of green infrastructure, yet its small-scale compositional differentiation remains insufficiently documented in Ukrainian cities. This study addresses the following question: can nested-plot sampling combined with basic vegetation analyses detect fine-scale spatial differentiation of urban grassland mosaics on a university campus shaped by trampling, shading and routine management?

We analysed urban grasslands on the campus of Taras Shevchenko National University of Kyiv using vegetation records collected by Ecology and Biology students during practical classes in Phytocoenology and Flora and Vegetation of Ukraine, subsequently revised as a unified dataset. Sampling followed the EDGG multi-scale approach to vegetation diversity assessment using nested plots (Dengler et al. 2016, 2021). The study is based on 10 sampling locations representing a locally defined gradient of disturbance exposure and shading, from open roadside sites affected by trampling to more distant and partly shaded sites near buildings and protective tree belts. At each location, nested plots of 0.1, 1 and 10 m² were sampled, yielding 30 vegetation records. The studied communities represent anthropogenic urban grassland mosaics composed of sown grasses and spontaneously established ruderal and mesic herbaceous species under a broadly similar mowing regime.

Analyses included species richness, Shannon diversity and ordination-based assessment of compositional differentiation, used to compare vegetation structure among position classes and to test whether small-scale differences in species composition can be detected within the campus. Preliminary analyses suggest that compositional and diversity differences are detectable between position classes and that the nested-plot design is effective for capturing fine-scale heterogeneity in urban grassland mosaics. Additional sampling during further practical classes is expected to expand spatial coverage across the campus and provide a broader basis for interpreting the observed patterns. Expected changes in campus management, including possible reduction of mowing, may provide an opportunity for future monitoring of vegetation change under reduced management and to build an evidence base for assessing the potential for developing low-maintenance, more diverse urban grasslands.

Topological vegetation differentiation of the Dniester Canyon (Ukraine)

POSTER PRESENTATION

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Keywords: symphytosociology, topological differentiation of habitats, vegetation

Abstract

Study area: Dniester Canyon (Ukraine).

Materials and methods: An algorithm for describing and evaluating the ecological and topological structure of habitats of the Dniester Canyon is suggested. As a main unit for these purposes, we used the catena level, which shows the distribution of habitats in the landscape. For the typification of selected territorial units, we used the sigma-syntaxa approach (Rivas-Martínez, 2005). For their identification we used a dataset of 622 relevés of different vegetation types from the Dniester Canyon. For the statistical analysis we used the R programming language and Past. Ecological evaluation was carried out using the phytoindication methodology (Didukh 2011).

Results: The habitat diversity of the Dniester Canyon is mainly characterized by forests of the Carpino-Fagetea sylvaticae class. The remnants of thermophilic and acidophilic forests of the Quercetea pubescentis class are unique to this region. The steppe vegetation of the Festuco-Brometea class shows the highest phytosociological diversity. The dominants of such communities are often rare species, such as *Stipa capillata*, *S. pennata*, *S. pulcherrima*, *Sesleria heufleriana*, *Chamaecytisus podolicus*, etc. The chasmophytic vegetation is confined to the outcrops of carbonate rocks of the canyon and is classified into the classes Sedo-Scleranthetea, Asplenetia trichomanis, and Verrucarietea nigrescentis. Floodplain forests and shrubs, forest fringe vegetation, meadows, and aquatic communities have a limited distribution within the canyon. The complexity of the structure of the habitats in the Dniester Canyon is explained primarily by the variety of natural conditions (orographic, geomorphological, geological, edaphic, and climatic).

The ecological and topological structure of the habitats of the Dniester Canyon is presented by 16 sigma-syntaxa: one sigma-class, two sigma-orders, and 12 sigma-associations. The analysis at the level of sigma-syntaxa displays the diversity of the study region and shows the integrity of the environmental conditions despite the highly fragmented natural habitat system.

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Phytosociological diversity of high-altitude grasslands within the class *Juncetea trifidi* Hadač 1946 in Southeastern Carpathians

POSTER PRESENTATION

Constantin Mardari*, Kiril Vassilev, Nikolay Velev, Ciprian Bîrsan & Cătălin Tănase

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Abstract

The class *Juncetea trifidi* Hadač 1946 includes both primary and secondary high-altitude grasslands on nutrient-poor soils. These grasslands are represented by communities of short grasses adapted to low temperatures and conditioned by the wind regime and edaphic factors.

This study was focused on the floristic composition of certain high-altitude grasslands in the Romanian Carpathians, and on the diagnostic species which differentiate the communities from each other. Also, the environmental preferences and the main ecological factors shaping their floristic composition were investigated.

The vegetation dataset was analyzed using hierarchical agglomerative clustering methods in order to identify the main vegetation groups, while direct and indirect ordination methods were used to identify the main factors affecting the floristic composition.

The numerical analysis highlighted well-defined communities dominated by *Carex curvula*, *Juncus trifidus*, *Poa media*, *Festuca ovina* subsp. *supina*, and *Nardus stricta*, largely corresponding to associations described in syntaxonomical literature (based on diagnostic species). At lower hierarchical levels, new syntaxa (sub-associations) were identified. Their floristic composition was mainly influenced by soil characteristics, bedrock type and elevation.

Dry rocky grasslands as a main driver of a hotspot of butterflies and moths (Lepidoptera) diversity: case study NATURA 2000 area Dragoman

POSTER PRESENTATION

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Abstract

Dragoman BG0000322 Natura 2000 Protected Area covers 21,357 ha and includes Chepan Ridge, a karst plateau with dolines, and marshes in the foothills. The main vegetational cover is grasslands. The most conspicuous relief is Chepan Ridge, part of the Stara Planina Mts: a limestone ridge stretching east-west with a highest point of 1,206 m. Due to its east-west orientation, the northern and southern slopes show notable differences in vegetation and butterfly and moth (Lepidoptera) diversity. Southern slopes with dry rocky grasslands hold the highest butterfly and moth richness in this zone and also in the wider area.

Dragoman NATURA 2000 Protected Area hosts eight species from Annex II of the EEC Habitats Directive 92/43, including *Lycaena dispar*, *Euphydryas aurinia*, *Eriogaster catax*, *Euplagia quadripunctaria*, *Paracossulus thrips*, *Lygnioptera fumidaria*, *Polyommatus eroides* and *Chondrosoma fiduciaria*, more than any other NATURA 2000 Protected Area in Bulgaria. Moreover, two additional species are expected. Among the recorded conservation-relevant taxa are *Euphydryas maturna*, *Phengaris (Maculinea) nausithous*, *Coenonympha oedippus*, *Arytrura musculus*, *Colias myrmidone*, *Dioszeghyana schmidtii*, *Erannis (Desertobia) ankeraria*, *Gortyna borelii lunata*, *Leptidea morsei*, *Nymphalis l-album*, and *Pseudophilotes bavius*.

Altogether, there are more than 50 butterfly and moth species of conservation concern. So far, ca. 750 species of butterflies and moths have been found in this area. Many xero-thermophilous and xero-montane species occur there, and a significant number of species reach their distributional limits in this area. Several species are relicts with very disjunct distributions.

The two most important habitat types for this outstanding richness of butterflies and moths are 62A0 Eastern sub-Mediterranean dry grasslands (*Scorzoneratalia villosae*), followed by 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites). Other very important habitats are 6110 *Rupicolous calcareous or basophilic grasslands of the *Alyso-Sedion albi* and 40A0 *Subcontinental peri-Pannonic scrub.

What makes this area a hotspot of Lepidoptera richness and diversity is not only the presence of the above-mentioned habitats but that they occur close together and form mosaics over large areas within this NATURA 2000 area. *Artemisia alba* Turra, one of the edifiers of dry rocky grasslands, turned out to be one of the most important plants, as it is the only host plant for several rare moth species.

Diversity of macromycetes species in the xerophilous and meso-xerophilous grasslands from North-Eastern Romania

POSTER PRESENTATION

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Abstract

Xerophilous grasslands are of major importance for biodiversity, and at small scales, some of these habitat types include some of the most species-rich communities in the world. Most xerophilous grassland communities in Europe are semi-natural, with evolution influenced by environmental conditions and traditional land use. Grasslands play a crucial role in supporting biodiversity, as they are home to numerous threatened plants, animals and fungal species. The current study was carried out over the last three years and brings new data on the fungal species diversity of the dry grassland ecosystems from Northeastern Romania.

The majority of identified fungal species were basidiomycetes and ascomycetes. Species classified in Tricholomataceae, Agaricaceae and Lycoperdaceae were more frequent. During spring, typical meadow/pasture fungal species were identified in semi-arid grasslands, such as *Calocybe gambosa* (St. George's mushroom), or specimens of the rare species *Morchella stepicola* (blistered morel). Frequent in meadows were some species of the genus *Agaricus*, some of which are edible, such as *Agaricus campestris* (white field mushroom), along with toxic species such as *Agaricus xanthodermus*. The less frequent species *Agaricus fissuratus* was also identified. Also more frequent were species of the genus *Lycoperdon*, *Bovista plumbea* (tumbleball), as well as some of impressive size such as *Calvatia gigantea* (the giant puffball). A species frequently found in meadow habitats was *Marasmius oreades* (the fairy ring mushroom).

During field investigations, rare fungal species included in the Red List of macromycetes species in Romania were also identified: *Clathrus ruber*, a rare species, and *Picipes rhizophilus*, identified in dry grasslands dominated by *Stipa* sp., among others. Research on grassland diversity suggested that a particular type of long-term land use favors a particular fungal composition (e.g. intensive grazing increases the number of coprophilous fungal species). The pressure generated by anthropogenic activities, degradation and habitat loss, intensive agriculture, pesticide pollution, and uncontrolled fires are the main threats affecting the diversity of both macromycetes and plant species in grasslands.

Land use-driven habitat heterogeneity shapes grasshopper (Orthoptera) and bee (Hymenoptera: Apiformes) assemblages in dry grasslands of southeastern Bulgaria

POSTER PRESENTATION

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Abstract

Dry grasslands of southeastern Bulgaria form complex habitat mosaics shaped by long-term grazing, agricultural transformation, shrub encroachment and land abandonment. Many of these habitats are included within the Natura 2000 network, where effective biodiversity monitoring is essential for evaluating habitat condition and supporting adaptive management. Understanding how biodiversity responds to land use-driven habitat heterogeneity is therefore critical for the long-term conservation of dry grassland ecosystems.

We studied how grasshopper and bee assemblages respond to land-use-driven habitat heterogeneity in the Sakar region (SE Bulgaria). We sampled 25 plots during three-year seasonal transect counts (grasshoppers) and flight interception trap exposure (bees), covering a gradient of land use and habitat types including semi-natural dry grasslands, shrub-grassland mosaics, secondary grasslands, agroforestry systems/woodland edges and agriculturally transformed habitats. Habitat classification and land-use characterization followed the LUCAS framework, complemented by on-field vegetation assessments.

Semi-natural and structurally complex habitats consistently supported higher diversity than agricultural sites. Differences in alpha diversity among land-use categories were not statistically significant for either group (Kruskal–Wallis: grasshoppers $p = 0.14$; bees $p > 0.2$). In contrast, pairwise Bray–Curtis dissimilarity among sites was high (0.31–1.00), indicating substantial community composition heterogeneity across the landscape. Neither orthopteran nor bee richness showed a significant relationship with plant species richness, suggesting that plant diversity alone is a poor predictor of insect diversity in structurally heterogeneous grasslands.

Our results show that both orthopteran and bee assemblages can serve as effective indicators for monitoring habitat quality, structural heterogeneity and management impacts in southeastern European grasslands. In landscapes such as Sakar, where biodiversity patterns are strongly shaped by land-use history and management intensity, grasshopper and bee assemblages provide valuable tools for assessing conservation status and guiding sustainable grassland management.

This study is part of EU Horizon Europe grant 101081964 BioMonitor4CAP.

Syntaxonomic diversity of alpine and subalpine calcareous grasslands in the Sharri Mountains (Kosovo)

POSTER PRESENTATION

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Abstract

Alpine and subalpine calcareous grasslands of the Balkans, belonging to the class Elyno-Seslerietea, are floristically rich but remain insufficiently studied in parts of the Sharri Mountains. This study aimed to classify the (sub)alpine grasslands of Mt. Luboten (Kosovo) within the syntaxonomic framework of the central and southern Balkans, reassess previously reported communities, and describe newly recognised vegetation units.

During 2017–2019, 110 phytosociological relevés were recorded using the Braun–Blanquet approach, stored in TURBOVEG, and analysed in JUICE. A regional dataset of 274 relevés, combining new and published data, was classified by hierarchical clustering and evaluated using synoptic tables. Diagnostic taxa were identified using ϕ -fidelity with Fisher's exact test ($p < 0.05$), while DCA ordination, unweighted mean Pignatti indicator values, life forms, and chorological groups were used for ecological interpretation. Six vegetation clusters were distinguished on Mt. Luboten. One association was confirmed and nomenclaturally corrected as *Caricetum sempervirentis-kitaibelianae* Rajevski 1974 nom. invers. et corr. within *Anthyllido-Seslerion klasterskyi*. The remaining five clusters belonged to *Seslerion nitidae*, including three new associations (*Festuco-Bryoerythrophyllietum recurvirostrae*, *Helianthemo nummularii-Festucetum pancicianae*, *Poo badensis-Cerastietum cerastioidis*) and two new subassociations within *Helianthemo grandiflori-Festucetum adamovicii*, whose name was also corrected.

Mt. Luboten harbours distinct limestone grasslands dominated by Balkan and high-mountain elements, including several previously unrecognised syntaxa. These results refine the Balkan framework of Elyno-Seslerietea and highlight the high conservation value of these alpine and subalpine calcareous grasslands.

Session 4: Innovative Methods, Experimental Approaches, and Open Science in Grassland Research

Vanishing agrobiodiversity and the growing importance of small grassland fragments: the potential of Eurasian burial mounds in EU-level conservation and restoration policies

PLENARY PRESENTATION

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Abstract

Agricultural intensification has profoundly transformed European landscapes, causing severe biodiversity loss and degradation of ecosystem services. In such landscapes, remnants of natural habitats often persist in small landscape features embedded within agricultural parcels. Among these, ancient burial mounds represent one of the most widespread yet overlooked landscape features across Europe. Steppic burial mounds, the so-called 'kurgans', which are one of the most widespread millennia-old manmade landscape features in Eurasia, are integral elements of many Central and Eastern European agricultural landscapes. Besides being important sites of historical heritage, they provide important refuges for grassland biodiversity and biocultural values within intensively transformed agricultural regions.

As suggested by results of regional-level surveys in Hungary, Bulgaria, and Ukraine, their ecological importance is supported by long-term habitat continuity, reduced soil disturbance, pronounced environmental heterogeneity, and cultural protection associated with their historical and spiritual significance. Kurgans preserve species-rich dry grasslands, support numerous red-listed taxa, contribute to ecological connectivity, and provide multiple ecosystem services disproportionate to their small spatial extent. Importantly, their biodiversity value is tightly interconnected with cultural heritage, local stewardship, and landscape identity, making them characteristic elements of Europe's biocultural infrastructure.

Kurgans align closely with several major European policy frameworks, including the EU Biodiversity Strategy for 2030, the Nature Restoration Regulation, Green Infrastructure strategies, and the European Landscape Convention. Their conservation and restoration may provide particularly feasible and cost-effective opportunities for increasing biodiversity, ecological connectivity, and ecosystem multifunctionality within agricultural landscapes where opportunities for large-scale restoration are limited. We propose that future European conservation and restoration strategies should explicitly integrate burial mounds through coordinated mapping, legal protection, agri-environmental schemes, restoration programmes, monitoring systems, and cross-sectoral cooperation among biodiversity conservation, cultural heritage, agricultural, and local stakeholders. By jointly supporting biodiversity conservation, ecological restoration, and cultural heritage preservation, burial mounds may become important components of socially embedded landscape-scale restoration across Europe.

cocktailr: fast and reproducible Cocktail clustering for vegetation classification

ORAL PRESENTATION

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Abstract

The Cocktail method is a valuable approach for vegetation classification because it identifies hierarchically structured groups of co-occurring species and translates them into explicit membership rules. However, its broader application to large vegetation datasets has been limited by computational and methodological constraints. We present cocktailr, a new open-source R package that implements Cocktail clustering in a fast, reproducible and transparent way. The package uses efficient sparse-matrix operations and deterministic tie handling, making it suitable for large datasets. In addition to constructing the Cocktail hierarchy, cocktailr provides tools for selecting strong clusters, exploring species-cluster relationships through ϕ profiles, comparing clusters based on plot co-membership, and assigning relevés to vegetation units using alternative scoring strategies based on species presence, cover and ϕ -weighted information. We demonstrate the workflow on regional grassland datasets from Europe, showing how the package can support formalized vegetation classification and reproducible relevé assignment. cocktailr thus bridges the gap between diagnostic species-group detection and practical classification workflows and provides a flexible framework for vegetation classification in R.

Co-designing Results-Based Grassland Conservation with Landowners: Management Choices and Monitoring Insights from Latvia

ORAL PRESENTATION

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Abstract

The results-based pilot programme Blooming Meadows supports the involvement of private landowners in the creation of biologically valuable grasslands in Latvia. From 2023 to 2026, 65 grassland managers participating in the LIFE-IP LatViaNature project are contributing to perennial grassland management, grassland biodiversity monitoring, training activities, and the development of approaches for more effective landowner engagement. Although nature conservation programmes are primarily designed by biodiversity experts, the achievement of conservation goals depends largely on grassland managers. Therefore, effective grassland conservation programmes should involve landowners at all stages of their development and consider landowners' motivation and practical capacity to implement the desired conservation measures. To examine landowners' perspectives on management activities aimed at improving conservation outcomes and, consequently, increasing the level of financial support under a results-based approach, we analysed the grassland management activities selected solely by landowners between 2023 and 2025. The management activities most frequently proposed by landowners targeted the reduction of invasive and expansive species, primarily through local manual mowing, repeated mowing, and grazing, as well as grassland surface levelling, reduction of plant litter by harrowing, enhancement of plant species diversity, and removal of secondary trees and shrubs. To examine landowners' opinions on programme design, including monitoring methodology, training, and advisory support, we conducted two surveys and organised workshops for programme participants. Landowners expressed a preference for participating in plant species monitoring rather than in the assessment of overall grassland structural elements (e.g. shrubs, plant litter, sward and pasture structure), while also acknowledging that grassland structure more accurately reflects overall grassland condition. During the workshops on plant species monitoring, landowners suggested combining systematically selected sampling plots with a small number of plots of their own choosing to better capture within-field heterogeneity. Analysis of survey data on other aspects of landowners' participation in the Blooming Meadows programme is currently in progress and will be presented at the conference.

At the forefront of FAIR publishing for biodiversity and conservation research

ORAL PRESENTATION

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Keywords: biodiversity, scholarly publishing, open access

Abstract

Biodiversity and sustainability research is gaining momentum as a result of increasing international and interdisciplinary collaboration, elaborate technology, and an environmental crisis that calls for immediate action. Across the Palearctic realm, grassland ecosystems, including species-rich semi-natural grasslands and Eurasian steppes that provide numerous ecosystem services to one of the most highly urbanised and intensively managed regions globally, are among the most threatened habitats.

Thereby, bridging scientific knowledge and conservation practice is critical for ensuring the sustainability and restoration of these landscapes.

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Local-scale increase masks landscape-scale loss of species richness in managed Pannonian grasslands

ORAL PRESENTATION

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Abstract

Context: While biodiversity decline is undebated on the global level, landscape-scale trends are poorly known and local assemblages even show stable species richness, accompanied by pronounced turnover. The landscape-scale consequences of local-scale species turnover likely depend on whether species replacement is random or biased towards more frequent species in the metacommunity, but this potential bias is insufficiently studied.

Objectives: Here, we use grassland ecosystems of a Central European national park to simultaneously analyse time-series of local-scale species richness and landscape-scale species incidence to better understand how trends are linked at these two scales.

Methods: From 2013 to 2024 we sampled 120 plots per year and used regression methods to quantify changes in the number of species per assemblage, the incidence of species across assemblages and the relationship between initial incidence of species and incidence trends. To explore possible drivers of change, we further evaluated trends of community means of environmental indicator values.

Results: We found that local species richness has increased within the study period, from 18 species per plot in 2013 to 21 species in 2024, while the overall number of species sampled per year stayed the same. In contrast, when looking at individual species trends we found an average decline of species' incidence in the region. While a small pool of already common species became more frequent, the majority of species became rarer, leading to a pronounced homogenization of plant communities on the sampled sites. Indicator-value analysis showed that the species turnover was mainly influenced by desiccation of grasslands, significantly biasing incidence changes towards species that prefer drier conditions.

Conclusions: We conclude that in typical Central European grassland ecosystems, anthropogenic drivers decrease landscape-scale rather than local-scale biodiversity, because they tend to homogenize environmental conditions. The resulting species turnover can stabilize local species richness but depletes the metacommunity, thereby posing future risks to regional biodiversity.

Global change in European grasslands: insights from local to continental studies

PLENARY PRESENTATION

Jürgen Dengler

Abstract

Grasslands hold a major part of Europe's native plant diversity – despite the majority being secondary (zoo-anthropogenic). A majority of the grassland types in Europe is now considered threatened, having suffered a severe reduction in area and quality. While there is a general idea of the ongoing changes, many aspects are inconclusive, particularly regarding the relative importance of drivers of grassland diversity loss and composition change. In this talk, I shed light on these developments, using regional resurveys of historic vegetation plots, combined analyses of multiple resurvey datasets across larger territories and analyses of plot data from the European Vegetation Archive (EVA) across multiple decades. These methods have different pros and cons, while together they can provide a comprehensive picture of grassland change in Europe across space and time. Resampling the oldest broad-scale grassland dataset, SquareFoot from Switzerland, originally sampled around 1900, we found that all components of vascular plant diversity (alpha, beta, gamma, taxonomic, phylogenetic and functional) had significantly declined 120 years later, with the decline strongest at low elevations. During this long period, the communities shifted towards compositions indicating eutrophication and higher land use as well as slightly warmer conditions. Systematic monitoring data of Swiss grasslands since 2001, by contrast, showed a moderate increase in species richness and a decrease in mean nutrient values, while thermophilisation continued, but again at a lower rate than expected. Analysing vegetation-plot data from EVA from the entire continent across the past six decades revealed a strong and general trend of eutrophication and slight trends towards more shady and more moist communities, all indicating that grasslands nowadays are denser and contain more biomass than sixty years ago. Taken together, the main drivers of grassland diversity and composition change across Europe seem to be eutrophication and intensification and, to a far lesser degree, thermophilisation, while neophyte invasions were largely irrelevant. However, it is important to gain a spatially and temporally resolved picture, as regional trends might deviate, e.g. in regions with predominant land-use extensification/abandonment. Detailed studies of the 21st century showed that not all is constantly worsening: environmental measures, such as the reduction of nitrogen oxides as well as agri-environmental schemes, can indeed turn formerly negative biodiversity trends around.

Climate and management changes drive semi-natural grassland community assembly over twenty years

ORAL PRESENTATION

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Abstract

Semi-natural grasslands are among the most biodiverse ecosystems in Europe, yet their conservation state has steadily declined over the past decades. This is particularly evident in mountain areas, where management shifts are reported as the main driver of marked changes in vegetation structure and composition. Nevertheless, the extent and pathways through which climate change is involved in these processes are still largely unknown. To assess the role of climate and management changes in mountain semi-natural grasslands, we resurveyed 49 vegetation plots in the semi-natural grassland habitat 6210(*) in central Italy over a twenty-year period (2003–2023) and retrieved climate and grazing management data over the same period. We aim to: (i) assess semi-natural grassland changes in community assembly and environmental conditions over the last twenty years; (ii) disentangle the effects of climatic and management drivers on the observed changes; (iii) assess species responses to climatic and management drivers of community change. Changes in species composition, also accounting for diagnostic species, were assessed using non-parametric tests. Compositional shifts and beta-diversity turnover were quantified using Bray-Curtis and Jaccard dissimilarity measures. Plot-scale climate data – derived from geographically weighted regression (GWR) downscaling – and remotely sensed management variables were incorporated in a PERMANOVA to identify the role and interactions of different drivers in shaping semi-natural grassland biodiversity. Generalized linear latent variable models (GLLVMs) were used to identify species indicative of relevant ecosystem changes. We found a deterioration of species composition and decline in habitat conservation state, mostly driven by climatic warming and increasing aridity, while changes in management had a diverse range of effects. We also found some species to respond mainly to changes in climate and management conditions, making them potential indicators for habitat monitoring. Our findings support the definition of evidence-based conservation and restoration strategies in line with European policies, aiming to mitigate climate-driven biodiversity loss and maintain the ecological functions of semi-natural grasslands.

Monitoring the spatial structure of mountain meadow habitats to support diversity conservation in the context of recreational infrastructure development

ORAL PRESENTATION

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Abstract

Mountain ecosystems of the Ukrainian Carpathians are facing increasing pressure as a result of the relocation of economic activity caused by warfare in Ukraine, as well as the expansion of recreational infrastructure. The aim of this study was to create a basic information framework for monitoring high-mountain grassland habitats within the area of the implementation of the GORO Mountain Resort construction project (Lviv Region, Stryi District, v. Volosyanka). The investor is interested in the project's "environmental friendliness."

The study included an inventory of the floristic and coenotic diversity of high-mountain grasslands (1000–1250 m a.s.l.), an analysis of habitat diversity, and modelling of their spatial distribution. The species composition of the flora, including rare species, as well as the diversity of grassland habitats, were identified and mapped. The study was based on florological, phytocoenological, ecological, and population methods with GIS modelling. Field surveys were conducted in 2025, and previously collected materials were used.

Within the study area, six habitat types listed in Resolution 4 of the T-PVS were recorded: E1.71 (*Nardus stricta* swards), E2.2 (Low and medium altitude hay meadows), E2.3 (Mountain hay meadows), E3.4 (Moist or wet eutrophic and mesotrophic grassland), E5.4 (Moist or wet tall-herb and fern fringes and meadows), and E5.5 (Subalpine moist or wet tall-herb and fern stands). The study area comprises 427 species of vascular plants (267 genera, 69 families) and 109 bryophyte species (72 genera, 43 families). Overall, 16 vascular plant species listed in the Red Data Book of Ukraine (2009, 2021) were found, 12 of them associated with these habitats. One species, *Campanula serrata*, is included in Resolution 6 of the T-PVS. In addition, 12 regionally protected species for Lviv Region were recorded, including 8 associated with grasslands. The study area contains 18 invasive species, some of which pose threats, particularly in view of the area's prospective recreational use. The results made it possible to develop cartographic models of the spatial distribution of rare grassland components, particularly habitats and species. These data provide the information basis for long-term monitoring of grassland habitat phytodiversity and are already being used to refine the project's spatial planning, including compensatory conservation measures. They also form the basis for further monitoring planned for at least the next five years and support project monitoring.

This study was funded by LLC "SLAVSKI", the company responsible for implementing the "GORO MOUNTAIN RESORT" project.

Impact of military actions on the steppe ecosystems of Ukraine

ORAL PRESENTATION

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Abstract

Steppes are among the most transformed ecosystems in Europe, primarily due to large-scale conversion into arable land during the 19th and 20th centuries. Currently, the main driver of their decline is shrub encroachment resulting from the abandonment of traditional land-use practices. However, since 2014, the primary threat to Ukrainian steppe ecosystems has been the military aggression of the Russian Federation. As major hostilities occur within the steppe zone, nearly all of Ukraine's steppe nature reserves, with one exception, are now under temporary occupation. These impacts are diverse and complex, necessitating a systematic classification to improve the planning and prioritization of restoration efforts for damaged habitats. This study utilizes the List of Pressures and Threats used for reporting under Article 17 of the Habitats Directive as a framework for typifying these impacts. We identified pressures directly or indirectly linked to military activities and analyzed their effects on steppe habitats. Impact magnitude was assessed using a 3-point scale, ranging from 1 (weak) to 3 (strong), with cumulative scores calculated for each pressure and habitat type.

The findings indicate that steppe ecosystems are subject to 14 distinct types of military-related impacts. The most severe include: PE01 (Roads, paths, railroads, and related infrastructure), specifically from heavy military vehicle movement; PF01 (Conversion from other land uses to built-up areas), primarily due to the construction of fortifications; PH04 (Vandalism or arson incl. human-introduced wild fire), representing widespread fires caused by shelling; and PK06 (Non-chemical mixed source pollution), notably through optical fibre contamination.

Importantly, several critical impacts – such as vegetation and soil damage from explosions, as well as disturbances from landmining and demining – are not covered by the existing classification, which was designed for peacetime. These results serve as a basis for developing methods to address ecosystem damage, enabling both a comprehensive assessment and the effective prioritization of resources for steppe habitat restoration.

Complementary ecosystem engineering by shrubs and wild boars structures above- and belowground vegetation in abandoned temperate grasslands

ORAL PRESENTATION

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Abstract

Fine-scale environmental heterogeneity is a key driver of plant community assembly and biodiversity in semi-natural grasslands. Following abandonment, this heterogeneity often declines, yet shrub encroachment and soil disturbance by large mammals may reintroduce spatial variability and influence plant regeneration processes. We investigated how shrub patches and wild boar rooting generate microsite heterogeneity and thereby shape plant community composition and soil seed bank characteristics in abandoned dry calcareous grasslands near Budapest, Hungary. We compared four microsite types: undisturbed control grasslands (matrix), shrub patches, rooting edges, and rooting centres. Compared to grasslands, shrubs created shaded, cool, litter-rich microsites that supported plant species with lower light and higher moisture requirements. Rooting patches were warmer, more exposed to light, and supported warm-adapted, light-demanding species. Rooting centres supported the highest number of weeds and invasive alien species, but also rare weeds, while control grasslands harboured the most grassland-related species. Regeneration processes had contrasting trajectories in microsites created by the two ecosystem engineers because of differences in propagule availability and the properties of establishment gaps. The seed bank of each microsite contained several ruderal and weedy species and therefore had limited potential for grassland regeneration. Rooting centres had the lowest and the rooting edges the highest seed density and vegetation-seed bank similarity, suggesting favourable establishment conditions linked to soil redistribution. Our study shows that shrub encroachment and wild boar rooting jointly structure fine-scale vegetation patterns in abandoned grasslands. Although each disturbance entails conservation trade-offs, their coexistence can enhance microsite heterogeneity and support diverse plant assemblages.

Integrating dry grasslands into woody crops: opportunities for large-scale grassland restoration in Mediterranean agroecosystems

ORAL PRESENTATION

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Abstract

Traditional Mediterranean agroecosystems, especially rain-fed woody crops, are undergoing renewed expansion driven by economic shifts and greater resilience to climate variability compared to annual crops. Under nutrient-poor and semi-arid environments, these systems can provide favourable conditions for the rapid establishment of semi-natural grassland plant communities, especially when combined with mowing or extensive grazing regimes. Concurrently, European restoration policies call for large-scale habitat recovery, raising the need to identify compatible land-use strategies that reconcile socio-economic development and conservation goals. Within the Horizon Europe project MONALISA, we assess the potential for integrating dry grassland recovery within agroecosystems in the Alta Murgia Natura 2000 site, in southern Italy. The site, one of six case studies of the project, is characterised by a typical Mediterranean agro-pastoral landscape dominated by semi-natural dry grasslands, including habitats of community interest (EU habitat codes 62A0 and 6220*). Based on the current distribution of EU protected habitats and land-use categories, we adopt an interdisciplinary approach both to assess the role of traditional olive and almond groves in preserving grassland vegetation, and to uncover the main challenges in adopting nature-based solutions to preserve this protected habitat. Vegetation surveys carried out to identify plant community patterns and dynamics across different land-use types, including managed and abandoned permanent crops, and typical calcareous grasslands. We also performed spatial analyses to model the potential expansion of dry grasslands in the protected area and surrounding territory, and to quantify the role of agricultural landscapes in enhancing habitat connectivity. Finally, we investigated stakeholder knowledge, perceptions and societal awareness through in-depth interviews with farmers and an online survey of citizens. Our findings reveal that extensively managed and abandoned woody crops currently host more than 20% of protected semi-natural grassland habitats occurring in the Natura 2000 site. Plant community structure and composition of extensively managed almond groves, in particular, did not differ from typical calcareous grasslands. These sites also featured very high cover of grassland specialist species, including the protected grass species *Stipa austroitalica*. Based on the current landscape configuration, the integration of grassland understorey within woody crops was expected to largely increase habitat availability, in turn exponentially strengthening habitat connectivity for grassland specialist species even beyond the protected area. Our results suggest that the widespread presence of extensively managed permanent crops across Mediterranean regions can represent a substantial and underutilized opportunity for dry grassland restoration. Practical constraints remain, including farmers' engagement, citizens' awareness, and the current scarcity of grazing livestock necessary for sustainable understorey management. Addressing these challenges could allow the restoration of semi-natural ecosystems in agricultural landscapes to be fully realized.

Protection and Conservation of Grasslands in the Carpathians: Spatial Extent, Management Practices, and Current Challenges

ORAL PRESENTATION

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Abstract

Grasslands, including meadows and pastures, are recognized as some of the most biodiverse habitats in Europe. At the same time, they constitute semi-natural ecosystems whose existence and high conservation value are closely dependent on the maintenance of appropriate management regimes. Anthropogenic disturbances, such as low-intensity mowing or grazing, play a crucial role in preserving their species richness (Pazur et al., 2024). Both the abandonment of traditional management practices, such as mowing and grazing, and their intensification contribute to habitat degradation, trigger secondary succession, and reduce biodiversity (Dengler et al. 2014; Janišová et al. 2025).

In the context of the Carpathians, characterized by a high proportion of protected areas (covering more than 62% of the region) and a diverse land-use structure, important questions arise regarding the extent of grasslands within the existing nature conservation system and the measures undertaken for their protection and management. The aim of this study is to assess the degree to which grasslands in the Carpathians are covered by legal protection, to identify the forms of protection and areas dedicated to the conservation of these habitats, and to analyze conservation measures implemented within different protection frameworks, including management practices that support the maintenance of their high ecological value. To improve the accuracy of grassland identification, we integrate different types of spatial and land-cover datasets (Liu et al., 2025; Opravil et al., 2026) to develop a reliable grassland mask for the study area. Special attention will be given to the role of protected areas, including national parks, nature reserves, and Natura 2000 sites, in grassland conservation, with particular emphasis on the analysis of conservation practices, management strategies, and the challenges of maintaining these habitats under ongoing socio-economic changes and increasing environmental pressures.

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Out-of-production sites designated on ancient burial mounds provide safe-haven for rare weeds in agricultural landscapes

POSTER PRESENTATION

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Abstract

Rare weeds are disturbance-tolerant plant species that enhance agrobiodiversity and related ecosystem services without adversely affecting agricultural production. However, agricultural intensification has caused severe declines of rare weeds across Europe, highlighting the need for targeted conservation measures addressing their specific ecological requirements. We aimed to explore the potential of out-of-production sites designated on ancient burial mounds (kurgans) for maintaining rare weed populations associated with arable lands, old fields, and grasslands. During an extensive field survey, we collected vegetation and environmental data from 216 kurgans that were surrounded by agricultural landscapes in Hungary. The surveyed kurgans were covered by spontaneously recovering old fields and semi-natural grasslands. We assessed the effects of site- and landscape-level factors (i.e., geographic position, landscape transformation, habitat area, environmental heterogeneity, soil properties, vegetation age, and vegetation attributes) on the occurrence and species richness of rare weeds. We recorded 38 rare weeds, including 15 red-listed and two protected species. Rare weeds occurred at 50.9% of the study sites, indicating that out-of-production sites can provide important refuges for rare weeds associated with croplands, old fields, and grasslands. Environmental heterogeneity was the most important factor promoting rare weed occurrence, particularly for grassland-associated rare weeds. Poisson models revealed that the total richness of rare weed species decreased towards northern sites. The richness of arable rare weeds was higher in sites with high soil CaCO_3 content, whereas high soil phosphorus content negatively affected grassland rare weed richness. Sites with more diverse vegetation supported higher richness of old-field and grassland rare weeds. Our results suggest that land sparing through the maintenance of out-of-production sites, together with the promotion of environmental heterogeneity and establishment gaps, can substantially contribute to the conservation of rare weeds in agricultural landscapes.

Common habitat preferences of endangered grassland species as a mirror of lost pristine grassland environments

POSTER PRESENTATION

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Abstract

Semi-natural grasslands have long served as habitats for diverse flora and fauna; however, in recent years, their rapid decline and environmental degradation have become serious concerns. Accompanying the global loss and deterioration of semi-natural grasslands due to land-use change, a large number of plant species have experienced marked population declines and are now facing extinction (threatened species), while other species show no notable decline (least-concern species). Based on this context, we hypothesized that many threatened species share similar environmental preferences and therefore respond similarly to widespread grassland environmental changes. This study was conducted across seven burn-managed grasslands and aimed to address two research questions: 1) Do grassland threatened species have similar distribution patterns? and 2) Do threatened species share similar environmental preferences that differ from those of least-concern species?

Following the standardized EDGG sampling methodology, a total of 266 plots of 10 m² were established. All vascular plant species within each plot were recorded, and vegetation height and soil properties (rock and stone cover, soil depth, soil pH, and plant-available phosphorus, exchangeable potassium, and total extractable nitrogen contents) were measured. The Red List Index (RLI) was calculated for each plant species to quantify its degree of threat. A joint species distribution model incorporating only spatial autocorrelation and interspecific covariance (JSDM without environmental variables) was first applied to examine multi-species co-occurrence patterns. Subsequently, a JSDM incorporating environmental variables (E-JSDM) was conducted, and the estimated partial regression coefficients for each environmental variable were used to cluster species by their environmental preferences (E-clusters).

The JSDM results revealed that threatened species share similar distribution patterns. The E-JSDM analysis showed that species with higher RLI values tended to have smaller partial regression coefficients for vegetation height and larger coefficients for soil pH, indicating that more highly threatened species preferred environments with lower vegetation height and higher soil pH. All national red list species belonged to the same E-cluster and were shown to share similar environmental preferences, thereby supporting our hypothesis. Among least-concern species, environmental preferences were diverse; contrary to our prediction, some shared preferences with threatened species. However, E-clusters composed exclusively of least-concern species exhibited environmental preferences distinct from those of threatened species. These findings suggest that having environmental preferences suited to conditions unfavorable for threatened species may be a key factor enabling least-concern species to avoid rapid population declines.

High-density grass seeding limits regeneration in a loess meadow steppic grassland: A 13-year annual timeline of post-restoration community assembly

POSTER PRESENTATION

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Abstract

Pannonian loess meadow steppes have largely disappeared due to drastic conversion to croplands, and most remaining fragments are small or severely degraded. Consequently, the restoration of this habitat type has become a conservation priority. We studied the community assembly of a loess old-field in Southeast Hungary following seeding treatments. The regionally dominant native grass species, *Festuca valesiaca*, was sown at high density in 2011, supplemented by additional seeding of 14 characteristic forb species. The old-field was directly adjacent to one of the largest well-preserved ancient loess meadow steppes in Hungary ('Tompapusztai-löszgyep'), characterized by high perennial forb cover, and serving as both propagule source and reference for the study. We compared vegetation development in the sown site with a neighbouring, spontaneously recovering, same-aged old-field and the reference ancient grassland. Vegetation was surveyed annually for 13 consecutive years (2013–2025) in the recovery sites and for seven (2019–2025) in the ancient grassland. The sown grass became dominant four years after seeding, and its cover soon exceeded levels recorded in the ancient grassland. Species composition initially progressed rapidly in the sown site, but slowed considerably by year six after sowing, showing only limited further recovery. In contrast, spontaneous succession advanced steadily toward the target state throughout, and although weed cover remained higher for longer, non-sown forbs established more successfully in the spontaneous site. Together, these results highlight contrasting short- and long-term restoration trajectories and the importance of long-term monitoring for evaluating restoration outcomes.

On the verge of change: low occurrence of alien species in endemic-rich grasslands of the mountains of Central Asia — a global biodiversity hotspot

POSTER PRESENTATION

Arkadiusz Nowak, Ewelina Klichowska, Sebastian Świerszcz, Sylwia Nowak, Marcin Nobis

Abstract

Vegetation of Middle and Central Asia encompasses a wide spectrum of grassland types shaped by long-term climatic gradients, disturbance regimes, and biogeographical history. We analysed 5,650 relevés (including 2,095 from grasslands) representing 35 vegetation classes (including 8 from grasslands) and assessed differences in richness and cover of alien species, endemic taxa, and ruderal plants to show the current threats of alien species encroachment into endemic-rich vegetation of the region. Particular attention was given to Irano-Turanian subalpine forb steppes (alien richness 0.1, cover 0.5%; endemic richness 4.2, cover 18.7%; ruderal richness 0.6, cover 2.3%), mountain steppes of semi-arid to subhumid areas, dry thermophilous montane steppes, high-altitude desert steppes, thermophilous secondary grasslands, high-altitude halophytic vegetation, alpine mesic grasslands and alpine-subnival tundra.

The examined grassland and alpine vegetation types were generally characterised by very low alien species richness and cover, indicating the very early beginning of alien species encroachment. The effect is vegetation type specific, with the lowest invasion levels observed in high-altitude and climatically extreme habitats (e.g. Ajanio-Clejstogenetia, Kobresietea, DRA), as well as in semi-natural steppes (Artemisio-Stipetia, Clejstogenetia squarrosae), reflecting strong environmental filtering and limited anthropogenic disturbance.

In contrast, higher levels of ruderalisation and alien occurrence were associated with disturbed vegetation types such as therophyte-rich dwarf-herb vegetation of trampled habitats, and to a lesser extent also with pseudosteppe vegetation (secondary perennial Irano-Turanian grasslands). In the latter case, the elevated share of alien species is likely linked to lower altitudes and long-term intensive grazing, which facilitate disturbance-tolerant taxa and species introductions, and is further intensified by recent climate change.

Endemic species richness was highest in several montane and alpine grassland types (e.g. mesic tall-forb vegetation, alpine grasslands, and montane steppes), suggesting long-term ecological continuity and diversification. This pattern may be related not only to habitat heterogeneity in mountainous environments but also to intensified evolutionary processes driven by the uplift of major mountain systems such as the Pamir and Himalayas, which promoted speciation and endemism.

Overall, the results indicate that Middle Asian grassland and alpine vegetation remain largely intact, with low invasion pressure and a substantial contribution of endemic taxa. These ecosystems represent important refugia of biodiversity and should be prioritised for conservation under increasing anthropogenic and climatic pressures.

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Both intensification and abandonment of paddy terraces degrade native pollination services through distinct network generalization

POSTER PRESENTATION

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Abstract

Land intensification and abandonment are major drivers of biodiversity loss in agricultural landscapes, yet how these changes affect ecosystem services through species interaction networks remains poorly understood. Here, we examined plant-pollinator interactions across 19 paddy meadows (meadows around paddy terraces) of three types of paddy land-use: traditional, intensified (i.e., consolidated), and abandoned. We compared plant and pollinator diversity, plant-pollinator network structure, and pollination success of native and exotic plants, classifying plants by life history and origin (native perennial, native annual, and exotic) and pollinators by taxonomic group (bees, syrphid flies, other flies, and butterflies) among the three land-use types.

Both intensification (i.e., consolidation) and abandonment reduced native plant diversity, while exotic plant diversity increased under intensification. Pollinator diversity — particularly bees and syrphid flies — declined significantly in intensified meadows, and all pollinator groups were severely reduced in abandoned meadows. Compared to traditional meadows, pollination services for native perennials declined through network generalization in both intensified and abandoned meadows, whereas exotic plants received higher pollination services. Notably, the mode of generalization differed between land-use types, reflecting distinct mechanisms of diversity loss.

These findings demonstrate that both paddy intensification and abandonment degrade native pollination services through different modes of network generalization. We advocate for the re-introduction of traditional extensive management practices and the removal of exotic plants to restore biodiversity and pollination ecosystem services in paddy terrace landscapes.

Morphological variability of *Festuca* taxa in the central dry grassland area of the Carpathian Basin

POSTER PRESENTATION

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Abstract

Festuca vaginata is the dominant species in all geographical units in the open sandy area of the Carpathian Basin as far as the Romanian Plain. Moving towards the middle part of the basin, the number of species increases. On its northern edge, *Festuca javorkae* occurs as an endemic species. In the southern half of the basin and in the central part, the also-endemic *Festuca wagnerii* can be found. *Festuca pseudovaginata* is another endemic in the middle part. The question is whether this is only due to anthropogenic influence or whether there is some other, calamitous connection. We also carried out investigations to analyze the forested steppe zone of the central area and to analyze the occurring taxa, and we also evaluated climatic data. *Festuca* species were examined on leaf cross-sections based on 24 characteristics of the inflorescence and leaf anatomy. In addition, the micromorphological characteristics of the leaves were compared by stereomicroscopy, scanning electron microscopy, energy dispersive X-ray spectroscopy measurements and phytolith analysis to establish the taxonomic application of epidermal micromorphological characters. We also discovered the presence of a new species (*Festuca tomanii*). After deforestation and scrubbing, the bare soil patches exposed to anthropogenic influences gave the opportunity for new vegetation to develop. In addition, the more extreme climatic and extremely dry and hot conditions that have developed in the central part of the basin mean that the vegetation is exposed to greater stress, requiring better adaptation to environmental factors and, at the same time, giving a greater richness in the proportion of endemic species.

This work was supported by OTKA K-147342 and the Research Excellence Programme of the Hungarian University of Agriculture and Life Sciences.

Dry grasslands should be prioritized for conservation based on the principle 'Save the weakest first'

POSTER PRESENTATION

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Abstract

Ukraine, which ranks first in Europe and second worldwide in the percentage of arable land, could rapidly lose a significant share of its natural areas. Meanwhile, their biodiversity remains understudied. Given the influence of adjacent agrocoenoses and interactions among habitats, it is necessary to clarify which habitats are now most vulnerable to prioritize their protection. We aimed to identify current threats and the most endangered habitats in the Eastern Ukrainian Forest Steppe and to assess the diversity of vascular plants and spiders, as well as steppe marmot populations, as model objects for grassland monitoring.

Our research was conducted in the northeast of the Kharkiv Region. We outlined the contours of all areas we considered representative natural/seminatural sites of the typical landscape of Northeastern Ukraine on satellite imagery, and distinguished 20 figures of different sizes and shapes; their area was only 11.5% of the total area studied, with dry grasslands and chalk outcrops covering one third of the natural sites. Plant and spider diversity data were collected from 2012 to 2021 in gullies with various dry grassland vegetation, isolated within the agrolandscape. Marmot settlements have been monitored since 1990. We analysed 76 plant biodiversity plots and a collection of 158 spider species and discovered that both groups exhibited high diversity, including typical steppe species. Marmot abundance, in contrast, decreased dramatically and rapidly following pasture abandonment. Since the early 1990s, we have observed shifts in the vulnerability hierarchy of natural habitats, resulting from changes in land use and legislation. These changes have made grasslands more vulnerable than forests due to increased ploughing. The absence of large herbivores has left them defenseless against encroachment by trees and shrubs, exacerbated by the spread of invasive species forming forest shelterbelts. Uncontrolled burning, afforestation, placement of solar panels, and other developments worsen the situation. Furthermore, the region has experienced hostilities since 2022, the impact of which on natural habitats remains to be evaluated.

An additional threat to small grassland habitats is the disproportionately long length of their borders. This enhances the effect of pesticides and herbicides used in agricultural fields and the enlargement of the marginal strip with poor transitional vegetation. If the terrain allows, additional ploughing of the outskirts happens annually. There is also a negative effect of soil movement from fields to adjacent steppe pockets on the slopes. Grassland habitats surrounded by forest shelterbelts are most vulnerable to tree and shrub invasion.

All natural habitats should be protected. However, the vulnerability hierarchy allows us to focus restoration efforts on the principle of saving the weakest first.

Providing favorable conditions for the restoration and eutrophication of wetlands for the cultivation of rare species of mosses and lichens in the context of climate change

POSTER PRESENTATION

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Abstract

Finland boasts a rich diversity of bryophytes thanks to its extensive forests, bogs, and rocky landscapes. Rare moss species are often associated with ancient forests and limestone rocks. These include *Takakia lepidozoides* — one of the most primitive and rare mosses in the world, found in the arctic regions of Lapland. In eastern Central Finland, a high diversity of mosses has been found on rocky surfaces, many of which require specific conditions. Rare species of *Sphagnum* are found in oligotrophic and mesotrophic bogs.

Taxonomic expertise on mosses and lichens in Finland is at a very high level, thanks to a strong botanical tradition and the study of northern flora. Key institutions include the Finnish Museum of Natural History (Luomus) at the University of Helsinki, which houses extensive herbarium collections and conducts molecular genetic studies to clarify the taxonomic status of specimens; the universities of Helsinki and Oulu, where specialists conduct fieldwork and taxonomic analysis of lichen and bryoflora; and the Finnish Environment Institute (SYKE, Oulu), which monitors species, including rare and endangered mosses and lichens. Epiphytic and terrestrial lichens have been studied in detail in Finland, with particular attention paid to species sensitive to environmental change.

For a long time, Finland drained its mires to increase forest productivity and facilitate logging, funneling water from numerous drainage channels into rivers and lakes. While this practice significantly increased forest productivity, it also increased the removal of suspended matter and soluble nutrients from the soil. Today it is clear that mires in some of these areas need to be restored, returning a natural filter to forest landscapes that will protect water bodies. 54% of Finnish mires require protection, and another 20% require ongoing monitoring.

Finland plays a key role in mire restoration, as very few mires remain in other EU countries. Mires are typically restored to their natural state by flooding the area, a process that typically takes a decade; however, the initial flooding increases emissions of harmful substances into the atmosphere. This paper proposes an environmentally friendly biopolymer composite water treatment system to mitigate eutrophication and a new method to create favorable conditions for wetland restoration while reducing environmental impact.

Climate driven niche dynamics of hybridizing *Stipa* species in Central Asia

POSTER PRESENTATION

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Abstract

Central Asia represents one of the major grassland regions of the world and is simultaneously recognized as a hotspot of ongoing climate change. Shifts in habitat suitability may reshape species distributions and increase contact among taxa, potentially influencing hybridization dynamics in grassland ecosystems. In this study, we investigated niche dynamics and hybridization patterns in four hybridizing *Stipa* species from Central Asia, with particular focus on *S. richteriana* and its related taxa. We combined species distribution models, climatic niche analyses, and genomic data to evaluate present and future distributional changes. Occurrence records and bioclimatic variables from WorldClim were used to reconstruct current and future habitat suitability under SSP245 and SSP585 scenarios for 2041-2060 and 2081-2100. Niche overlap over time was assessed using PCA-env analysis and Schoener's D metrics. In parallel, genomic structure inferred from DArTseq SNP data and fastStructure analyses was used to evaluate hybridization among selected parental species. Our results revealed substantial future changes in habitat suitability across the studied taxa, including northward and northeastward centroid shifts and pronounced range changes under future climate scenarios. Niche overlap between hybridizing species generally increased through time, particularly toward the end of the century under SSP585. The highest overlap was observed between *S. richteriana* and *S. sareptana*. Spatial projections indicated expanding zones of climatic contact among several taxa, suggesting increased opportunities for future hybridization. Genomic analysis supported ongoing admixture among the investigated species and confirmed the presence of hybrid lineages associated with overlapping ecological niches. These findings suggest that climate-driven niche dynamics may substantially reshape species interactions and hybridization patterns in Central Asian grasslands. Increasing climatic overlap among *Stipa* may contribute to future contact zones, reflecting the importance of integrating ecological and genomic approaches in understanding grassland responses to climate change.

This research was supported by the National Science Centre, Poland, projects 2020/39/D/NZ8/02307 and 2023/51/B/NZ8/01179. Conference participation was supported by the Visibility & Mobility Module, Jagiellonian University.

Tackling the unknown. Studying and conserving fungi in sand dunes

PLENARY PRESENTATION

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Abstract

Sand dunes are xeric habitats of immense conservation and economic importance. Due to their natural scarcity in Europe, they are the subject of rigorous studies of various aspects of their biodiversity and functions. Fungi, an important and highly diverse group that play a crucial role in ecosystem functioning, are not well studied in xeric habitats, and sand dunes in particular, especially in South-eastern Europe. Fungi are also a highly neglected group in terms of conservation efforts due to their cryptic lifestyle, irregular occurrence and difficulties with taxonomic identification, making monitoring particularly challenging.

In this presentation we focus on the current state of research regarding fungal diversity of sand dunes. We provide an overview of the literature focusing on this neglected group in Europe, highlighting the scarcity of studies while demonstrating rich and exclusive fungal diversity. We also outline the current state of monitoring efforts in the south-eastern part of the continent, where dedicated studies are appallingly lacking. The high potential for revealing undocumented fungal diversity in sand dunes is illustrated by our own surveys carried out across different dune habitats in Bulgaria, in particular white, grey and wooded dunes on the Black Sea coast as well as inland peri-Danubian dunes. Our surveys combine two approaches: classical above-ground survey based on the production of basidiomata, and shotgun metagenome sequencing of selected plant roots from sand dune habitats.

The results from both approaches show high and exclusive diversity of fungi in sabulicolous habitats. The above-ground survey helped reveal higher diversity of basidiomycetes, while the shotgun sequencing pinpointed the prevalence of ascomycetes as well as distinct fungal communities associated with the sampled grasses, pine tree and moss species. Little-known species of fungi were documented and a number of novelties for the Balkan Peninsula were revealed. ITS amplicon sequencing of selected specimens, collected during above-ground surveys, also revealed the presence of potentially undescribed species. All these outcomes confirm that dunes are neglected but promising habitats for future studies on fungal diversity. We also discuss the needs of conservation of sand dune fungi and their possible application in defining different habitat types.

From grassland to shrubland: bryophytes as sentinels of woody encroachment in sub-Mediterranean calcareous grasslands

ORAL PRESENTATION

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Abstract

Woody plant encroachment (WPE) is driving a global contraction of open grassland habitats, yet its impacts on bryophyte communities remain underexplored. In this study, we compare bryophyte richness, composition and functional diversity between grassland and shrubland, identify environmental drivers of bryophyte richness and species occurrence, and examine cross-taxon relationships between vascular plants and bryophytes across WPE levels. The study was conducted in sub-Mediterranean calcareous grasslands in the northern Iberian Peninsula, comparing open grassland with closed shrubland. Bryophyte richness tended to decline in shrubland, whereas total bryophyte cover was broadly similar between WPE levels. Community reassembly involved a marked functional turnover: open grasslands were dominated by small, acrocarpic, turf-forming colonists, while shrublands were characterised by larger pleurocarpic perennials forming mats or wefts. Functional richness remained generally stable, indicating replacement of strategies rather than a net loss of functional space, with some site-level variability. Environmental responses were largely species-specific, but several tendencies emerged. Woody cover and litter had negative effects on bryophyte richness and several grassland-typical species, whereas bare ground had positive effects. Annual precipitation increased the probability of occurrence of some taxa, and calcium availability and higher C/N ratios were positively associated with total richness and calcicolous species. Bryophyte and vascular plant composition were correlated, suggesting congruent responses to the grassland-shrubland transition. Indicator species analysis identified *Trichostomum crispulum* as diagnostic of grasslands and *Pseudoscleropodium purum* of shrublands. Overall, WPE promotes taxonomic and functional turnover in bryophyte assemblages, potentially imperilling open-habitat specialists. Incorporating bryophytes into WPE assessments may improve early detection of structural transformation.

Relationships between biomass and species richness in abandoned sand mines

ORAL PRESENTATION

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Abstract

Abandoned sand mines differ from their surrounding habitats in several environmental parameters, as they are younger and generally more abiotically stressed ecosystems. These differences influence their flora, vegetation, and the biotic interactions among species inhabiting them. Previous studies have demonstrated the important role of abandoned sand mines in the conservation of rare and protected species. However, biotic interactions and biomass-species richness relationships have rarely been investigated in these habitats.

In our study, we examined biomass characteristics and biomass-species richness relationships in abandoned sand mines, which may also provide insight into underlying biotic interactions. We hypothesized that biomass-species richness relationships are weaker in abandoned sand mines than in control grasslands.

Control sites showed higher species richness as well as higher living and total phytomass values compared to sand mines, while no significant difference was found in litter mass. At the control sites, living and total phytomass were negatively related to species richness, whereas no such relationship was detected for litter mass. In abandoned sand mines, no relationship was found between living or total phytomass and species richness. However, litter mass showed a negative relationship with species richness.

Our results suggest that competition is an important driver of community assembly in the control habitats, whereas this effect is not detectable in abandoned sand mines, likely because these habitats are highly stressed, open, and generally characterized by pioneer vegetation.

Successional dynamics of clonal growth in two perennial forb species: a 14-year tracking of individual colonies

ORAL PRESENTATION

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Abstract

Plant clonal growth patterns strongly influence succession dynamics, yet how clonal expansion changes over succession remains poorly documented. We studied the clonal expansion of two forb species with different clonal growth organs, the stoloniferous *Fragaria viridis* and the rhizomatous *Teucrium chamaedrys*, in a spontaneously recovering loess old-field in Southeast Hungary. The field was abandoned in 2009 following intensive agricultural use. We tracked each established colony ($n=10$ for both species) individually in four large permanent plots of 1000 m² over 14 years (2012–2025), measuring the maximum colony diameter (distance between furthest rooting daughter ramets) and estimating cover annually. Both species were abundant in the neighbouring ancient Pannonian loess meadow steppe, making their successful expansion an important target for recovery. In early-establishing *Fragaria* colonies, clonal expansion declined strongly ten years after abandonment, with mean growth rate declining from 198.3 to 15.3 cm/year. By year 16, early colonies reached 986.7 cm in diameter and 26.0 m² cover on average, whereas late colonizers remained small throughout. In contrast, early *Teucrium* colonies expanded at a largely steady rate of 42.3 cm/year throughout spontaneous succession, reaching 430.7 cm diameter and 8.5 m² cover by the end. Establishment timing significantly influenced final colony size in both species, yet in *Teucrium*, expansion remained near-linear regardless of colonization time. Our results suggest that clonal growth is linked to successional time, likely driven by increasing mid-successional competition, with responses being strongly species-dependent. Such dynamics may play an important role in community assembly during grassland succession, with implications for restoration practices, though further studies across multiple species are needed.

Assessments of the soil seed bank in the Kyzylkum Desert rangelands along distance gradients from watering wells

ORAL PRESENTATION

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Abstract

Livestock grazing covers over 70% of terrestrial land and often alters vegetation composition under high grazing pressure. While many studies have examined grazing effects on vegetation dynamics, observational research has largely focused on aboveground communities and overlooked the effects of grazing on soil seed banks. Seed banks help maintain plant community stability and resilience to environmental change, and they may offer strong potential for restoration in sandy grasslands. Our study assesses the effect of grazing pressure on soil seed bank dynamics and vegetation composition at various distances from watering wells (0m, 500m, 1000m, 2000m) with various ages and status (functioning vs abandoned wells) in the southern part of the Kyzylkum Desert in Uzbekistan. Grazing is a significant land use in this area, where rangelands make up around 57% of the total land area, 78% of which is dryland. Investigations were conducted at 20 watering wells, starting with the zone nearest to the watering well and moving outwards over a distance of 2,000 metres, encompassing four grazing zones. Each zone comprised six 5 × 5 m vegetation plots within two transects, where vegetation assessments were carried out and soil samples were taken. A total of 480 soil samples were collected at a depth of 10 cm using a soil auger within the 480 vegetation plots. These samples were then transported to the university greenhouse, where germination experiments were set up. The number of seedlings was recorded and the species were identified.

The results showed that watering wells in arid rangelands act as focal points of ecological transformation. The multivariate analysis confirms a significant 'biosphere' effect, where vegetation communities undergo distinct structural shifts based on the distance from the water source (PERMANOVA, $p=0.001$). The most severe degradation and loss of species diversity are concentrated in the immediate vicinity of the wells, primarily driven by intense grazing pressure and livestock trampling. However, a clear recovery trend in vegetation cover and species composition was observed as the distance increased toward the outer zone. Furthermore, the age of the watering wells and their status (active vs. abandoned) play a crucial role in successional dynamics; older, abandoned wells show a gradual return to more stable, natural plant communities. The soil seed bank can partially support vegetation recovery, especially for target grasses and sedges, while the dominant target species, *Artemisia diffusa*, had only a minimal seed bank even in the least degraded zones. Poisonous weeds, such as *Peganum harmala*, had a dense seed bank that represents a threat for long-term degradation. These findings suggest that rangeland management interventions should limit grazing intensity near wells and consider time since abandonment to support recovery and promote the long-term resilience of desert ecosystems.

Geoecological Characterization of Grassland Soils in the Gouraya National Park (Northern Algeria): Implications for Biodiversity Conservation

ORAL PRESENTATION

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Keywords: Grassland Ecosystems; Soil Geology; Gouraya National Park; Mediterranean Environment; Soil Erosion; Biodiversity Conservation; Pedology; Northern Algeria

Abstract

The Gouraya National Park, located in northeastern Algeria along the Mediterranean coast, represents an important ecological zone characterized by mountainous landscapes, diverse vegetation, and fragile grassland ecosystems. The interaction between geological formations, soil properties, and climatic conditions contributes significantly to the ecological functioning of these habitats. However, increasing environmental pressures, including soil erosion, urban expansion, and climatic variability, threaten the sustainability of these ecosystems. This study aims to investigate the geoecological characteristics of grassland soils within Gouraya National Park and to evaluate the influence of geological substrates on soil development and vegetation dynamics.

Field observations and preliminary soil analyses were conducted in selected grassland areas distributed across different topographic and geological settings within the park. The study focused on the characterization of soil texture, pH, organic matter content, moisture retention capacity, and mineral composition. Geological observations were also performed to identify dominant lithological formations and their relationship with soil stability and vegetation cover.

Preliminary findings suggest that calcareous and rocky substrates strongly influence soil depth and nutrient availability. Shallow soils located on steep slopes show higher susceptibility to erosion and lower vegetation density, while deeper soils in more stable areas support richer grassland communities. The results highlight the critical role of geology and topography in shaping ecosystem resilience and biodiversity patterns within Mediterranean grasslands.

This research contributes to improving scientific knowledge on soil–vegetation interactions in protected Mediterranean ecosystems and may support future conservation and sustainable land management strategies in Northern Algeria.

From Suppression to Diversity: How *Rhinanthus* Parasitism Reshapes Grassland Structure and Enhances Ecological and Agricultural Value

ORAL PRESENTATION

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Abstract

The traditionally managed grasslands of the Carpathian Mountains are renowned hotspots of fine-scale species diversity. While traditional agricultural practices have largely disappeared across most of Europe following the Industrial Revolution, they have persisted locally in the Carpathian Mountains and are still maintained today. Within this landscape, several species of the hemiparasitic angiosperm genus *Rhinanthus* present an ecological paradox: while typically known to decrease yields by suppressing grasses, they remain a stable and valued component of these grasslands, traditionally serving as a phenological indicator for the right time of mowing.

We investigated whether this appreciation for *Rhinanthus* stems from its facilitation of other high-value species, specifically nitrogen-fixing legumes. Using an extensive dataset of vegetation plots across the Carpathian Mountains, integrated with soil data, management history, and CHELSA climatic variables, we analysed the co-occurrence patterns of hemiparasites and legumes. To investigate the mechanisms behind these patterns, we established a mesocosm experiment using simplified communities of grasses, legumes, and hemiparasites.

Our results demonstrate co-occurrence between specific hemiparasite and legume species. This might be driven by a differential recovery response of the two functional groups, which we revealed in our mesocosm experiment: while legumes recover quickly from *Rhinanthus* suppression after the first hay harvest, grasses exhibit a "legacy effect," failing to recover equally well. These findings have implications for diverse farming systems: although *Rhinanthus* may slightly reduce total biomass yield, it enhances forage quality by increasing legume abundance and prevents grass dominance, thereby maintaining high species diversity over the long term.

The role of grasslands in the conservation of Insect Biodiversity

ORAL PRESENTATION

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Abstract

Insect diversity is declining globally, primarily as a consequence of global warming and anthropogenic change. Insects are known to play a key role in the provision of numerous essential ecosystem services, of which pollination is the most well-known. Previous research on grassland ecosystems has shown that semi-natural grasslands play a major role in the sequestration and storage of carbon, for instance. Primary production by vascular plants is the source of large amounts of carbon and nutrients, such as nitrogen compounds. Much of this carbon and nitrogen passes through several trophic levels before being sequestered and stored below ground or recycled. Animals from large herbivores down to phytophagous insects consume plant material, and detritivorous organisms, such as dung beetles, facilitate the breakdown of dung and sequestration of its components. In this presentation, I will present a summary of functions involving insect taxa in different types of grassland ecosystems and factors affecting their diversity.

Ecosystem Services of the grasslands of Velež Mountain (Bosnia and Herzegovina) identified through the use of medicinal plants

ORAL PRESENTATION

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Keywords: mountain grasslands, medicinal plants, ecosystem services, biodiversity conservation, floristic diversity, traditional knowledge, Velež Mountain

Abstract

Mountain grasslands of Mt. Velež represent valuable biodiversity hotspots and provide numerous ecosystem services recognized by local communities through the use of medicinal and useful plants. The investigated grasslands are traditionally used by local communities for collecting medicinal and edible plants, reflecting long-standing interactions between people and nature. Such resources represent provisioning ecosystem services, providing direct benefits for human well-being and local livelihoods. The research was conducted in the grassland associations *Alchemillo-Scabiosetum silenifoliae*, *Salvio bertolonii-Saturejetum subspicatae* and *Seslerietum robustae*, which develop on limestone substrates and are traditionally used for grazing and plant collection. A total of 201 medicinal plant species belonging to 60 families and 150 genera were recorded. The most species-rich families were Lamiaceae, Compositae, Rosaceae, and Apiaceae. The association *Salvio bertolonii-Saturejetum subspicatae* contained the highest richness of medicinal plants, accounting for almost 60% of all medicinal species recorded on the mountain. The studied communities exhibited high floristic diversity, with Shannon-Weaver index values ranging from 2.64 to 2.98. Hemicryptophytes dominated the life-form spectrum (43.07%), while sub-Mediterranean floral elements were the most represented. Frequently used species included *Teucrium chamaedrys*, *Achillea millefolium*, *Hypericum perforatum*, *Thymus serpyllum*, *Salvia officinalis*, and *Juniperus communis*. Local communities most frequently use medicinal plants as herbal teas, juices, and food, predominantly for the treatment of digestive and respiratory system disorders. Several species of conservation concern were also identified, including taxa classified as Critically Endangered, Near Threatened, and Least Concern. The results highlight the importance of Mt. Velež grasslands as reservoirs of medicinal plant diversity and demonstrate their significant contribution to provisioning ecosystem services in this area of Bosnia and Herzegovina. The findings provide a scientific basis for biodiversity conservation, sustainable resource management, and the development of local initiatives based on the sustainable use of natural resources.

Climate-driven habitat loss of a moisture-dependent alpine grass *Ptilagrostis malyschevii* in Central Asian mountains

POSTER

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Abstract

The 'escalator to extinction' describes the phenomenon of alpine species shifting their ranges upslope in response to climate warming. It is considered one of the greatest threats to biodiversity at high altitudes. As vegetation zones move upwards, the progressively narrowing mountain summits offer increasingly less area, leaving high alpine species with nowhere to go. We analysed this phenomenon using *Ptilagrostis malyschevii* as an example, a grass found exclusively in wet alpine meadows and moist grasslands of the Tian Shan and Pamir-Alai mountain ranges in the Central Asian biodiversity hotspot. Using ecological niche modelling across two emission scenarios (SSP2-4.5 and SSP5-8.5), we projected the future distribution of this species over two time frames (2061-2080 and 2081-2100). Our models show that the ecological niche of *P. malyschevii* is primarily constrained by precipitation-related variables, making the species sensitive not only to warming but, more importantly, to the hydrological consequences of glacier retreat and reduced meltwater availability. This dual thermal and hydrological pressure accelerates the escalator effect. A comparison between the 1960-1990 and current conditions already reveals a subtle but measurable contraction of suitable habitat, indicating that this process is not merely a future threat but is already in motion. Future projections indicate a 50% decline in habitat area under intermediate-emission scenarios and as much as 66% under high-emission scenarios by 2100. Given the island-like distribution of suitable alpine habitats across isolated mountain ranges, horizontal range shifts are often not possible. Consequently, populations of mountain species become "trapped" on the summits. We believe that, given the high dependence of *P. malyschevii* on moisture, it may be an indicator of the hydrological stability of high-altitude wet meadows in Tian Shan. The predicted decline in the suitable area for this species, and what this means for the whole community, highlights the urgent need to monitor and protect moisture-dependent alpine grasslands within the highly biodiverse mountain regions of Central Asia.

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The Effects of Urban Land Use on Taxonomic Plant Diversity in Ankara's Urban Ecosystem (Türkiye)

POSTER

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Abstract

Urbanisation is recognised as one of the primary causes of grassland habitat loss in the Palearctic. As cities continue to expand, remaining green spaces in cities become increasingly fragmented, transformed and affected by diverse land-use types, management regimes, and disturbance levels. These changes can strongly affect spontaneous plant communities, and yet urban biodiversity patterns remain understudied in several species-rich regions, including the Irano-Anatolian biodiversity hotspot.

Our objective in this study was to assess how urban land-use categories influence the taxonomic diversity and species composition of spontaneous plant communities in grassy habitats in Ankara, Türkiye. Plant surveys were conducted in 80 plots distributed across four major urban land-use categories: residential areas, commercial and municipal areas, urban parks, and vacant or abandoned lots. Explanatory variables related to management intensity, disturbance, and local environmental conditions were compiled through semi-structured interviews with residents or managers of green spaces, as well as the use of GIS-based tools. Preliminary findings indicated that vacant areas supported higher plant diversity compared to other land-use categories. They harboured several species of Anatolian dry grasslands and had higher species turnover. The community composition of the residential areas, although limited, depended on the management of the green spaces. In parks, commercial and municipal areas, a high intensity of management was associated with lower alpha and beta-level plant diversity. Therefore, it is crucial to conserve remnants of grasslands and vacant areas to support plant diversity in urban spaces. To support dry grassland species within the urban matrix, municipalities should abandon conventional, highly managed, aesthetically clean park design and instead plan to retain semi-natural grassland patches, decreasing management intensity via reduced mowing intensity and limited removal of spontaneous vegetation.

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The role of grassland communities in South-Eastern Ukraine as a source of trophic resources for pollinators

POSTER

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Abstract

This research evaluates the pollination potential of 22 grassland habitat types in the steppe zone of southeastern Ukraine, a region characterized by extreme land cultivation (81.2%) and ongoing military conflict. Based on an analysis of 1,802 relevés across seven regions (from Mykolaiv to Kharkiv), the study identified 1,330 plant species, of which 78.2% (1,040 species) are insect-pollinated. The highest species richness was recorded in meadow steppes (R1A), typical steppes (R1B), and anthropogenic habitats (V38), while the proportion of entomophilous species ranged from 40% in semi-deserts (R64) to 88% in forest fringes (R51). The taxonomic core of these floral resources is dominated by the Asteraceae, Fabaceae, and Lamiaceae families. From a conservation perspective, the study identified 74 rare species, 61 of which are insect-pollinated, including those protected under the Bern Convention and the Habitats Directive (e.g., *Crambe tataria*, *Pulsatilla patens*). Conversely, 43 alien species (neophytes) were documented, primarily concentrated in ruderal and transformed habitats. Phenological analysis revealed a pronounced unimodal flowering pattern peaking in June–July. The application of a phenological asymmetry index (AI) highlighted a functional gradient: natural steppes provide vital resources in early summer, whereas anthropogenic and saline habitats shift the flowering peak toward late summer. These findings emphasize the necessity of maintaining a landscape mosaic to ensure continuous resource availability for pollinator communities throughout the growing season. Ultimately, the results confirm the high conservation value of these grassland biotopes and their essential role as nectar and pollen sources within highly anthropogenized environments.

Preliminary structural analysis of the flora of the “Kovalivskyi Yar” landscape reserve, Kyiv Region, Ukraine

POSTER

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Abstract

Small remnants of steppe vegetation in Ukraine are of high conservation value under long-term agricultural conversion and Russian war-related impacts. This study presents an open-data-based preliminary structural analysis of the flora of the “Kovalivskyi Yar” landscape reserve, a ravine-slope protected area in south-western Kyiv Region where meadow-steppe fragments occur alongside wet grasslands and riparian habitats affected by grazing, local land-use impacts and adjacent landfill influence. GBIF occurrence records from a reserve-boundary polygon were spatially filtered in QGIS 3.34.1, cleaned and analysed in R, taxonomically harmonised using Euro+Med PlantBase, and supplemented with functional, ecological and coenotic species attributes from FloraVeg.EU. The analysis covered taxonomic composition, Raunkiaer life forms, life-cycle duration, diaspore-dispersal modes, Ellenberg-type indicators for light, moisture, pH and nutrients, continentality and its amplitude, alien status and rare taxa. The preliminary checklist comprises 341 species, 233 genera, 70 families and 34 orders. Eudicots dominate the taxonomic spectrum, with Asteraceae, Poaceae and Rosaceae as the leading families. Herbaceous plants prevail (86.2%). The Raunkiaer spectrum is dominated by hemicryptophytes (52.3%), whereas therophytes (17.9%) indicate disturbed or dynamic microhabitats. Perennials form the largest life-cycle group (68.0%), reflecting the persistence of semi-natural grassland and meadow communities. The diaspore-dispersal spectrum is dominated by local non-specific dispersal (36.6%) and anthropochory (29.2%), suggesting both local continuity and human-mediated propagule input. The native component prevails (89.5%), while alien taxa are mainly neophytes (10.1%) and only marginally archaeophytes (0.35%). Ecological indicators show a prevalence of hemicontinental (31.4%), basiphilous (63.7%), eutrophic (42.4%) and mesophytic (46.4%) species. Species of semi-open habitats (40.8%) and light-demanding open habitats (37.2%) confirm the open to semi-open vegetation character. Six nationally protected taxa highlight the reserve’s conservation relevance. Critically filtered, trait-enriched open biodiversity data thus provide a preliminary baseline for targeted field-based verification of this under-studied grassland fragment as a local steppe refuge.

Floristic Diversity of Grasslands on Bitovnja Mountain (Bosnia and Herzegovina)

POSTER

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Keywords: Mt. Bitovnja, floristic diversity, mountain grasslands, vegetation, syntaxonomy, biodiversity conservation, anthropogenic pressures

Abstract

Mt. Bitovnja is an important silicate mountain massif in Bosnia and Herzegovina, characterized by extensive mountain grasslands traditionally used for grazing and livestock farming. Due to its specific geomorphological features and long history of land use, the area represents a valuable center of biodiversity. However, the flora and vegetation of Mt. Bitovnja have not been comprehensively investigated so far, and the impacts of anthropogenic activities on its vegetation remain largely unknown. The aim of this study was to document the floristic diversity of the mountain and assess the ecological characteristics of its vegetation communities. Field investigations were conducted at elevations ranging from 300 to 1,650 m a.s.l., predominantly on northern and northwestern slopes. A total of 415 vascular plant species belonging to 67 families were recorded. The most species-rich families were Compositae (12.02%), Poaceae (9.13%), Leguminosae (7.93%), Rosaceae (7.93%), and Lamiaceae (5.53%). Eight vegetation types belonging to different syntaxonomic units were identified, including the associations *Hyperici-Vaccinietum myrtilli* and *Seslerio tenuifoliae-Arctostaphylletum uvae-ursi*, as well as communities of the alliances *Jasionion orbiculatae* and *Filipendulion*. All vegetation types exhibited relatively high species diversity, with Shannon–Weaver index values ranging from 2.01 to 2.90. The flora was dominated by Eurasian, North Mediterranean, and Eurasian-suboceanic floral elements, while hemicryptophytes represented the dominant life form (55.36%). Despite its high conservation value, the vegetation of Mt. Bitovnja is increasingly exposed to anthropogenic pressures, particularly resource overexploitation, intensive trampling associated with off-road vehicle use, and recurrent fires. The presented results provide the first comprehensive overview of the floristic diversity and vegetation of Mt. Bitovnja and represent an important basis for biodiversity conservation, sustainable management, and the development of measures aimed at mitigating ongoing anthropogenic impacts.

Ecological Restoration and Sustainable Management of the Akfadou Forest Ecosystem in Northern Algeria

POSTER

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Keywords: Mediterranean forest ecosystems; ecological restoration; biodiversity conservation; sustainable forest management; climate change; ecosystem resilience

Abstract

The Forêt d'Akfadou represents one of the most important forest ecosystems in northern Algeria and constitutes a major biodiversity hotspot within the Mediterranean region. Dominated primarily by cork oak (*Quercus suber*), Algerian oak (*Quercus canariensis*), and holm oak (*Quercus ilex*), this forest plays a fundamental role in biodiversity conservation, hydrological regulation, carbon storage, and soil protection. Despite its ecological significance, the Akfadou forest is increasingly exposed to multiple environmental pressures, including recurrent wildfires, unsustainable exploitation of forest resources, overgrazing, and climate change impacts. These disturbances accelerate ecosystem degradation, reduce habitat quality, and threaten several endemic and emblematic species, particularly the Barbary macaque. The growing vulnerability of Mediterranean forest ecosystems highlights the urgent need for sustainable management and ecological restoration strategies. This study examines the main ecological challenges affecting the Akfadou forest and explores the potential of restoration-based management approaches aimed at improving ecosystem resilience. Particular attention is given to reforestation with native species, soil rehabilitation, sustainable fire management, and biodiversity conservation measures. In addition, the study investigates the role of forest valorization through ecotourism, non-timber forest products, and scientific research as mechanisms for promoting sustainable local socio-economic development. The findings emphasize that the long-term preservation of the Akfadou forest requires an integrated management framework combining ecological restoration, sustainable resource valorization, and active involvement of local communities. Such an approach may significantly enhance the adaptive capacity and resilience of Mediterranean forest ecosystems under ongoing environmental and climatic changes.

Drivers of vascular plant diversity in cultural heritage sites: a case study of old cemeteries (southern Ukraine)

POSTER

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Abstract

Anthropogenic activities and intensive agricultural practices have decimated the natural steppe ecosystems of Ukraine, reducing their original 40% land cover to a mere 1–3% of isolated remnants. This study investigates the role of old cemeteries (established over 100 years ago) as biodiversity hotspots within the grass steppe zone of southern Ukraine. Despite their potential, the environmental drivers influencing their species richness and vegetation composition remain poorly understood.

We asked the following questions: (1) How high is the species richness of vascular plants in old cemeteries located in the grass steppe zone of southern Ukraine? (2) Do old cemeteries have a nature conservation value comparable to other steppe enclaves and cultural heritage sites of the studied zone? (3) Which factors are most important for species richness and species composition in old cemeteries? We analyzed total species richness and its specific ecological categories as dependent variables in simple regressions against seven environmental predictors: age of the old cemetery, area, distance to the closest steppe habitat, human footprint index, steppe cover in a 1 km² buffer, and mean annual precipitation. Across the studied old cemeteries in the grass steppe zone of southern Ukraine, we recorded a substantial presence of native (426 species, 62.2%), steppe (277 species, 40.4%), and non-synanthropic plants (253 species, 37.0%), indicating a high degree of floristic preservation. The results demonstrate that natural steppe flora is most effectively preserved in the older sections of cemeteries where anthropogenic pressure is minimal, or within abandoned sites that have transitioned out of active burial use. The presence of a high proportion of steppe-specific and non-synanthropic plants suggests that these cemeteries often maintain a conservation value comparable to, or exceeding, other steppe enclaves such as kurgans and ancient settlements. Results indicate that old cemeteries in southern Ukraine serve an essential function in the preservation of natural biodiversity. To ensure the long-term persistence of these endangered plant communities, protection strategies should focus on maintaining the integrity of older cemetery sections and managing the surrounding landscape to enhance connectivity with existing steppe fragments.

Grassland maintenance and various grassland restoration measures in Pannonian grasslands

POSTER

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Abstract

We analyzed the vegetation of differently restored and planted grasslands grazed by Hungarian grey cattle. The treatments were as follows: I: spontaneously grassed fallow land, II: hay mulch application, III: grass sowing after soil preparation, IV: grazing on abandoned alfalfa fields, V: fallow land reseeded in 1989. The sample areas have been grazed uniformly since 2012 using free grazing. Based on the results, the area that was reseeded in 1989 and left fallow since then, and the method of spreading hay, were the most successful. Directly sown grassland and abandoned alfalfa fields differed most from these grassland areas. The restoration of the area used as pasture was optimal during the period, as a result of two years of mowing followed by grazing. Spontaneous grassland fallow and, in particular, the hay mulch method proved to be the most successful from a nature conservation and grassland management perspective.

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Finally, we warmly thank all keynote speakers, session chairs, authors, reviewers, volunteers, sponsors, partner organisations, and participants. Your enthusiasm, expertise, and dedication have made this conference a valuable opportunity for scientific exchange, collaboration, and the advancement of grassland research and conservation.

We hope you have enjoyed your time in Sofia and wish you safe travels. We look forward to meeting you again at future EDGG events.

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