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PALAEARCTIC GRASSLANDS

Journal of the Eurasian Dry Grassland Group

Table of Contents

Palaearctic Grasslands
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Palaearctic Grasslands, formerly published under the names *Bulletin of the European Dry Grassland Group* (Issues 1–26) and *Bulletin of the Eurasian Dry Grassland Group* (Issues 27–36), is the journal of the Eurasian Dry Grassland Group (EDGG). It appears in four issues per year. *Palaearctic Grasslands* publishes news and announcements of EDGG, its projects, related organisations and its members. It also serves as an outlet for scientific articles and photo contributions.

Palaearctic Grasslands is freely available at http://edgg.org/publications/bulletin and new issues are announced to all EDGG members.

Submissions following the Author Guidelines are welcome by the deadlines of the four issues: 31 January, 30 April, 31 July and 31 October.

Scientific articles (Research Articles, Reviews, Forum Articles, Scientific Reports) should be submitted to the Receiving Editor Jürgen Dengler (dr.juergen.dengler@gmail.com) and will then undergo peer review, so publication in a certain issue cannot be guaranteed.

All other text contributions (News, Announcements, Short Contributions, Book Reviews, Glimpses of a Grassland…) should be submitted to Anna Kuzemko (anyameadow.ak@gmail.com) AND Idoia Biurrun (idoia.biurrun@ehu.es).

Photo contributions (photos for general illustrative purposes with captions; Photo Stories) should be submitted to Rocco Labadessa (rocco.labadessa@gmail.com).

Contributions to Photo Competitions should be submitted to Edy Fantinato (edy.fantinato@unive.it)

Contributions to the section **"Recent Publications of our Members"** should be sent to Iwona Dembicz (i.dembicz@gmail.com) and those for **"Forthcoming Events"** to Alla Aleksanyan (alla.alexanyan@gmail.com). Any member of EDGG who would like to see their book reviewed in *Palaearctic Grasslands* should communicate with our Book Review Editor Péter Török (molinia@gmail.com).

Palaearctic Grasslands is published by EDGG c/o Prof. Dr. Jürgen Dengler, Plant Ecology, BayCEER, University of Bayreuth, Universitätsstr. 30, 85447 Bayreuth, Germany.

Palaearctic Grasslands on ResearchGate, Google Scholar, vegsciblog.org

Editorial Board

On front cover page: National colors of Ukraine in sand dune communities near Pokrovka village, Ukraine. Photo: J. Dengler. Digital art: R. Labadessa.

Editorial

Dear readers,

This issue of *Palaearctic Grasslands* celebrates the wonderful 15th EDGG Field Workshop, conducted ad hoc in Southern Ukraine in May 2021 with a detailed Scientific Report. It was a very inspiring and joyful event. The same organisers were planning to announce the 16th EDGG Field Workshop in this issue, to be conducted in steppes of Ukraine along a broad latitudinal gradient, to which many EDGG members were looking forward.

While we were preparing this issue, the shocking reports of the completely unjustified invasion of Ukraine by the Russian army, under the command of President Putin, have reached us. According to our information, the territories studied during the 15th Field Workshop have largely been seized by Russian military.

We want to express our absolute condemnation of this violent incursion, in breach of international law, and the pain and suffering caused to the people of Ukraine. The EDGG has deep connections with Ukraine. We have a large number of Ukrainian members, and we conducted two Field Workshops (2010 and 2021), as well as the Eurasian Grassland Conference (2011) in Ukraine. We would like to express our support and compassion for our fellow EDGG Chair, Anna Kuzemko, who right now is experiencing the Russian aggression in Kyiv, and also with all our other friends and colleagues in Kherson, Odessa, Lviv and other Ukrainian cities and regions. We are deeply concerned about their security. As scientists, we know that good science can only exist in free countries. This said, we take relief in the fact that in this dark moment in European history, many Russian scientists are brave enough to raise their voice against the barbarity of their political leaders (https://trv-science.ru/2022/02/we-are-against-war/).

We have little possibility of providing concrete support to help Ukraine defend itself against this invasion, but we encourage our members to support the numerous charities that are collecting funds to help humanitarian causes and offering a safe place to students and scientists. We also want to take this opportunity to celebrate this country, its people and its nature with the wonderful cover photograph of this issue.

#StandWithUkraine

With best regards,

Alla Aleksanyan, Didem Ambarlı, Idoia Biurrun, Iwona Dembicz, Jürgen Dengler, Rocco Labadessa & Stephen Venn

National colors of Ukraine in sand dune communities near Pokrovka village, Ukraine.
Photo: J. Dengler. Digital art: R. Labadessa.

News

Call for photos in *Palaearctic Grasslands*

As usual, we are looking forward to your contributions to the Photo Story section, as well as your photographs for general illustrative purposes.

Submissions for the **Photo Story** section are always welcome. Photo Story is an open space where members can submit their own photo collection on a certain grassland-related topic of their choice. High-quality photos should be provided together with their captions (at least species names or landscape description), a brief text and possibly other graphical elements (like a map or a drawing). The selection of photos should fit within 4-15 (-20) pages and the contributors should propose a preliminary layout (in PDF or MS Word format), which will be finally typeset by Editors. As an example, you can look at the Photo Stories published in the previous issues.

As with scientific articles, Photo Stories undergo a review process with a focus on photo quality. There is no guarantee that they will be accepted without changes, and late submissions may be published in a subsequent issue.

We would also like to encourage you to contribute to **the Global Vegetation Project** with your vegetation photographs:

1) If your photos have already been published in *Palaearctic Grasslands*, you can submit them to the global map citing DOI of your article or of the whole issue (you can find all published issues here: https://edgg.org/publications/bulletin);
2) If you are submitting new vegetation photographs to *Palaearctic Grasslands*, either within an article, a photo story or for general illustrative purposes, you can provide each photo file with the following information (* = required fields): date (year/month/day); author's full name*; place name; latitude and longitude*; vegetation type; vegetation classification system; naturalness; dominant species list*; additional comments.

Please take a look at the project website (http://gveg.wyobiodiversity.org) for an overview of the global map and the data entry form.

If you want to contribute to Photo Stories, or if you simply want to help us with enriching this aspect of the journal, please submit your photos together with required information to Rocco (rocco.labadessa@gmail.com).

Deadline for photo submissions is **30 April 2022**.

Rocco Labadessa, Italy
rocco.labadessa@gmail.com

Call for Photo Competition "Asian Grasslands"

To celebrate the first Asian Grassland Conference, the overall theme of the new Photo Competition is **Asian Grasslands**. Asian grasslands are unique worldwide for their variety of habitats, species and land-use practices. The aim of this Photo Competition is to highlight this wealth of immense beauty and conservation value. Participants of the conference, as well as all EDGG members, are invited to send up to three high-quality photographs on any combination of the following topics:

- Asian grassland plants
- Asian grassland animals
- Asian grassland landscapes
- Humans and grasslands in Asia

The photos should be in high resolution (full-size JPEG or TIFF images, at least 300 dpi) and be accompanied by captions including a short title or description and information on the subject (species name, date, place name). The Photo Jury will select the best photographs. The three best shots in each category will be awarded with full space in the next issue of *Palaearctic Grasslands* and will be presented in the closing session of the conference. We reserve the right to also use non-winning photos for illustrative purposes in other parts of the issue. Published photos will be licensed under the CC BY-SA, and supporters of the conference can use them with proper credits. If you want to take part in the competition, please submit your photos together with required information to Edy Fantinato (edy.fantinato@unive.it) by **9 April 2022**.

Photo Jury: Edy Fantinato (Chair), Magdalena Firganek-Fulcher, Anna Kuzemko, Rocco Labadessa, Jim Martin, Alireza Naqinezhad, Jalil Noroozi, Salza Palpurina.

Edy Fantinato, Italy
edy.fantinato@unive.it

EDGG Event

Asian Grassland Conference (AGC)

New dates: 19-21 April 2022

Extended abstract submission deadline: 6 March 2022

Please register at: https://edgg.org/AGC

The Asian Grasslands Conference is a virtual event, with presentations on a diverse range of topics on the overall theme of Asian Grasslands. The programme includes three keynote lectures, regular oral presentations and a poster session supported by speed talks. Participation in the conference is free of charge, thanks to the generous support of the IAVS and the Inner Mongolia University. It will be coordinated via an online platform that will facilitate navigation through the presentations and diverse supplementary events. Due to the number of time zones crossed by the region of Asia, we are endeavouring to ensure that the schedule will be as convenient as possible to participants. The programme each day will take approximately 6 hours. The conference will start at 10:00 Istanbul Time and 15:00 Beijing Time and finish at 16:00 Istanbul Time and 21:00 Beijing Time. We will also make pre-recorded versions of the presentations available for one month after the conference, to ensure adequate opportunities for seeing the conference presentations.

Participants in the conference will have the opportunity of contributing to a number of Special Issues in the following international, peer-reviewed scientific journals: *Biodiversity and Conservation* (d/l 1.5.2022), *Vegetation Classification and Survey* (d/l 28.2.2022), *Hacquetia* (d/l 28.2.2022).

We very much hope to see a broad level of representation in the event, covering diverse research fields and also highlighting research from less well-known parts of the continent. You can find more information about the event, including instructions for registration, at https://edgg.org/AGC.

Extended abstract submission deadline 6 March 2022

***Stipa capillata* and *Stipa zalesskii* steppe, Altai Territory, Russia. Photo: I. Smelansky**

Keynote lectures

Prof. Norbert Hölzel, Institute of Landscape Ecology, University of Münster, Germany

Prof. Shuli Niu, Institute of Geography and Natural Resources, Chinese Academy of Sciences, Beijing, China

Prof. Jiang Zhigang, Institute of Zoology, Chinese Academy of Sciences, Beijing, China

Themes of the sessions

The themes aim to cover all aspects of research and conservation relevant to Asian natural and semi-natural grasslands. Presentations on all subjects of grassland research are welcome.

1. Biodiversity of grasslands
2. Ecology and taxonomy of plant and fungi species in grasslands
3. Ecology and taxonomy of grassland vertebrate species
4. Ecology and taxonomy of grassland invertebrate species
5. Grassland ecosystems under global change
6. Functional ecology of grasslands
7. Grassland conservation, management and restoration
8. Vegetation and habitat classification of grasslands
9. Remote-sensing, mapping and modelling of grasslands
10. Livelihoods and sustainability of pastoral communities
11. Open-subject session: For any contributions that do not suit the themes listed above.

Young Investigator Competition

Prizes will be awarded to young scientists for both oral presentations and posters.

Special events (remember to indicate your interest in special events upon registration!)

- Meet the Editors
- Workshop on the vegetation typologies in Asia and their crosswalks to/overlaps with phytosociological syntaxa.

There will also be an Initial Workshop on the foundation of IAVS Regional Section(s) in Asia immediately after the conference. See separate announcement on pp. 23-24.

Further information is available at EDGG website or from the Organizing Committee:

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Frank Yonghong Li, lifyhong@126.com

Stephen Venn, stephen.venn@helsinki.fi

Jianshuang Wu, wujianshuang@caas.cn

Yak grazing on alpine meadow. Photo: J. Wu.

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EDGG Event

EGC 2022
17th Eurasian Grassland Conference
"Grassland dynamics and conservation in a changing world"
Tolosa, Spain, 12-18 September 2022

First complete call

View of Tolosa. Photo: I. Salcedo.

The 17th Eurasian Grassland Conference focuses on global change as a major driver of grassland biodiversity and productivity. The conference aims to bring together and connect the latest research with practical management and policy, and thereby contribute to the sustainability of natural and semi-natural grasslands and the animals and plants that depend on them. As in previous years, we offer opportunities for the exchange of information during our standard talk and poster sessions, as well as the mid-conference excursion to the Aizkorri-Aratz Natural Park. In addition, we will offer a *Meet the Editors Workshop* and a *Workshop on Orthoptera*. Furthermore, we will host three inspiring keynote presentations.

This year's conference offers three keynote talks, two optional workshops and an optional post-conference excursion, in addition to the talk and poster sessions, mid-conference excursion and grassland party. On 12th September, participants will have the opportunity to participate in two workshops: i) *Meet the Editors* of high impact ecology and vegetation journals, ii) workshop on Orthoptera, led by Rocco Labadessa. We welcome Alfonso San Miguel, Monika Janišová and Frank Yonghong Li as our keynote speakers.

The mid-conference excursion will take us to Aizkorri-Aratz Natural Park, and a three-day optional post-conference excursion will take place mostly in Navarre (16–18th September). Below you will find the programme.

For more information, please visit the conference web site:
www.edgg.org/EGC2022

Programme

12th September	**Workshops, registration**
12:00-17:30	Introduction to Orthoptera (lunch in between, after the room session)
17:30-18:30	Meet the editors
18:30-20:00	Registration and welcome drink
13th September	**Talks and Poster Sessions I and II**
8:00-9:00	Registration
9:00-9:20	Opening ceremony
9:20-10:20	Keynote lecture by Alfonso San Miguel
10:20-13:30	Talks and posters, with coffee break at 11:05
13:30-15:00	Lunch in Zerkausia (see map)
15:00-16:00	Keynote lecture by Monika Janišová
16:00-19:00	Talks and posters, with coffer break at 17:00
19:00	Touristic tour
14th September	**Mid-Conference excursion, Grassland Party and Auction**
8:00	Departure of buses from Navarra bridge (see map)
19:00	Grassland Party in Arantzazu with Auction
21:00 to 22:00	Departure of buses from Arantzazu to Tolosa
21:30 to 22:45	Arrival at Tolosa
15th September	**Talks and Poster Sessions III and IV**
9:00-10:00	Keynote lecture by Frank Yonhong Li
10:00-13:30	Talks and posters, with coffee break at 11:00
13:30-15:00	Lunch in Zerkausia (see map)
15:00-17:45	Talks and posters, with coffee break at 16:45
17:45-19:00	General Assembly and Closing Ceremony
16-18th September	**Post-conference excursion (optional, max. 40 people)**
16 September, 8:00	Departure from Tolosa (Navarra bridge)
18 September, 20:00	Arrival at Bilbao

Sessions

Global change is a major threat of natural and semi-natural grasslands, which face important conservation challenges caused by land-use and climatic change. Palaearctic grasslands are among the most threatened in the world and include both natural grasslands (mainly alpine grasslands and steppes) and semi-natural grasslands used for animal husbandry. Due to several factors – land-use abandonment and intensification being the strongest – these grasslands have declined in extent, integrity and diversity. Their conservation is crucial, as Palaearctic grasslands account for almost 40% of the World's grasslands and exhibit global maxima for fine-grain plant diversity. The 17th EGC aims to improve our knowledge of the diversity and management of Palaearctic grasslands in the face of global change.

The conference intends to emphasize the following topics in focused sessions:

1. Succession and species turnover in abandoned grasslands

Ecological succession leads to shrub and tree encroachment of semi-natural grasslands after land-use abandonment. This session welcomes contributions dealing with the effects of land-use abandonment in any type of grassland, including studies reporting data from permanent plots, monitoring of species and habitats, remote sensing, etc.

2. Biodiversity of urban grasslands

Urban grasslands across the Palaearctic are becoming a last refuge for endangered flora, fauna, and grassland habitats, especially when the surrounding rural landscapes experience either forest encroachment after abandonment, or management intensification through fertilization, afforestation or conversion to croplands. Therefore, throughout the Palaearctic, the potential value of urban grassland patches for the conservation of grassland biodiversity is increasing. This session will highlight studies focused on factors associated with diversity in urban grasslands, their contribution to the quality of urban life, and their conservation management.

3. Above and belowground grassland diversity

In the Palaearctic Realm, a major part of the biodiversity within most trophic levels and taxonomic groups is found in grasslands. This session will host studies dealing with alpha and beta diversity, at the taxonomic, phylogenetic or functional levels, including studies of plants, animals, fungi and bacteria. Studies relating diversity patterns to variation in land use are especially welcome.

4. Grassland conservation and global change

This session will focus on historical changes and future prospects on grassland extent and quality in the context of land -use trends and climate change. We encourage studies that examine the drivers of land-use change, grassland restoration, qualitative and quantitative changes in grassland cover, and studies of the impacts of conservation and management policies in the real world.

5. Classification of Palaearctic grasslands and other open habitats

This session welcomes contributions on the classification and survey of grasslands and other open habitats (e.g. wetlands, saline, dunes, screes, scrub) in the Palaearctic.

6. Conservation genetics

This session invites presentations on the use of genetic data to advance conservation goals for grassland plants, fungi and animals of all kinds that use grassland habitats. Studies of species delimitation, metagenomics, and environmental DNA are also welcome. Genetic studies may address natural populations or data resulting from experimental manipulations, reintroductions, or facilitated migration and dispersal. Preliminary and baseline data from newly established genetic monitoring programs are especially welcome.

Special Issue

EDGG seeks to enhance the visibility of the research presented in the EGCs. Studies presented in the conference will be eligible to contribute to our regular special features in *Tuexenia* and *Hacquetia*.

Important dates

Registration opens: 1st April

Early Bird registration deadline – 30th April

Travel grant application deadline – 30th April

Post-conference excursion application – 30th April

Abstract submission deadline – 30th April

Communication of acceptance for post-conference excursion – 15th May

Acceptance of abstracts and type of presentation – 15th May

Travel grant allocation – 31st May

Late registration deadline – 15th June

Detailed program: 25th July

A reminder about the opening of registration will be sent to EDGG members end of March.

Venue

The conference will be held in Tolosa (Basque Country, Spain, ~20,000 inhabitants), a historic town in the province of Gipuzkoa, 25 km away from the province capital, San Sebastian (Donostia in Basque), a famous touristic location and only 20-30 min. away by train (https://en.wikipedia.org/wiki/Tolosa). In medieval times, Tolosa was an important checkpoint between the Kingdoms of Navarre and Castile, France and the Cantabrian harbors. Currently it hosts many important cultural events and a traditional market every Saturday.

The registration and conference sessions will be held in TOPIC, the Tolosa Puppets International Centre, in Tolosa city centre: Euskal Herria, 1.

View of Tolosa and the River Oria with the Navarra bridge. The white building to the left of the bridge is called Tinglado (Zerkausia), where we will have lunch on 8th and 10th September. The bus for the mid and post-conference excursions will depart from a bus stop on this side of the bridge. Photo: I. Salcedo

Venue of the EGC, TOPIC (Tolosa Puppets International Centre). On the left, TOPIC in the middle of Euskal Herria square (photo: http://bit.ly/2Fl3fgo); on the right, the conference hall (photo: http://bit.ly/37y4hlk).

Accommodation

Accommodation should be booked independently by each participant. In Tolosa, there are two hotels, two guesthouses, and several rural accommodations. Below we give details about them. Please take into account that beginning of September is High Season in the area, so prices are not cheap. As the availability of accommodation is rather limited, we recommend booking as soon as possible. There is also the possibility of renting private apartments on line. Prices given below include VAT. Breakfast is a continental breakfast.

Hotels:

Hotel Oria, a 5 min. walk from the conference venue. Prices: single room without breakfast: €69.60, with breakfast: €77.80; double room without breakfast: €88, with breakfast: €106. All prices VAT included. Free Wifi.

Hotel BideBide, adjacent to conference venue. Prices: double room €85 (€81 for individual use), triple room €95 (prices excluding breakfast, but with 20% discount if reservation is made via the hotel's webpage). All prices VAT included. Free Wifi.

Guesthouses:

Pensión Karmentxu, in the historical center. Prices: €35 single room, €60 double room. Bathrooms outside the rooms. Breakfast available, but not included. Free Wifi.

Pensión Oyarbide, in the historical center. Prices: €35 single room, €50 double room, both prices with en suite bathroom (€27 and €45 with only sink en suite, respectively). Possibility of additional bed. Free Wifi. No breakfast service, but many cafeterias in surroundings. Parking: €10.

Rural accommodations (https://www.nekatur.net/):

Korteta Nekazalturismoa. Rural accommodation at a distance of 1.5 km from the town centre. Only suitable for people with a car, as it is quite steep to get there (160 m higher than town center). Six double rooms available, with possibility of supplementary beds, total room for 18 people. Prices range from €25 to €50 per person, depending on single/ double room and season.

Teileri in Berrobi village. New building used as rural accommodation at 5 km distance from Tolosa. Only suitable for people with a car. Two apartments with parking. Each apartment with three double rooms, two complete bathrooms, kitchen, etc. Prices: Whole apartment: €155 per night, whole house (two apartments): €310 per night.

Arkaitza in Berrobi.

Akulebi in Villabona, Legarreta Auzoa. 4.5 km distance from Tolosa, 1.2 km from the railway station. Three double rooms with bathroom. Breakfast service available.

Urresti and Alustiza Rural houses, both in Villabona, Amasa. About a 7 km distance from Tolosa.

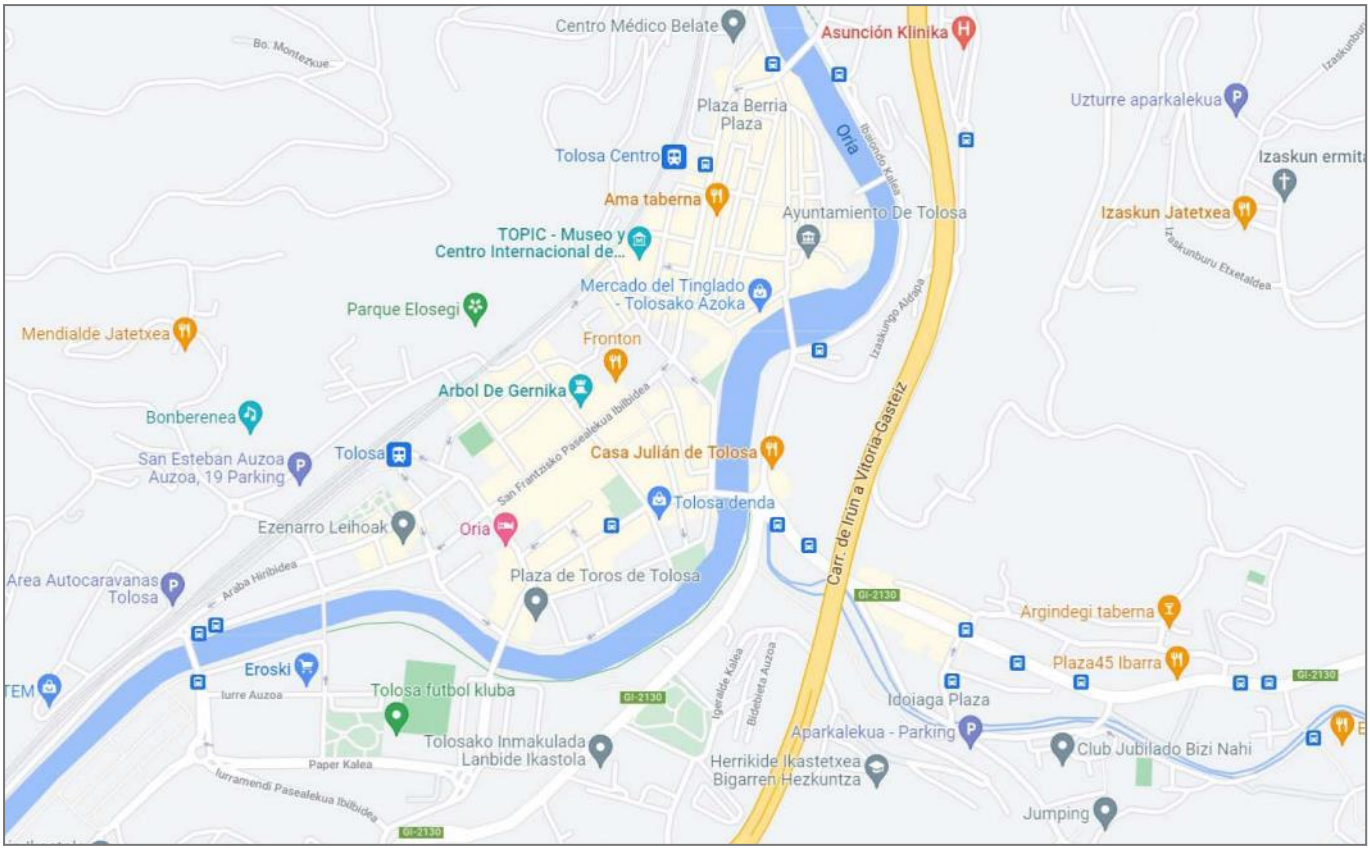


Fig. 3. Map of Tolosa showing the two railway stations: Tolosa Centro (Tolosa Erdia officially) and Tolosa (estación, geltokia), and the conference venue TOPIC (BideBide hotel is adjacent) (GoogleMaps). Mercado del Tinglado (zerkausia), by the river, is a covered market where we will have lunch during the conference. The bridge adjacent to the Tinglado is the Navarra bridge. The bus for the excursions will leave at the south side, indicated with a cross. All distances in Tolosa are very small, from hotel Oria to TOPIC 5 to 10 minutes walking distance.

Travelling to Tolosa

There are two international airports in the surroundings:

Biarritz airport, in the French Basque Country, with direct flights to several European cities, including Munich, London, Berlin, Geneva, etc. There are direct buses from the airport to the bus station in San Sebastian (only one intermediate stop in San Sebastian city), 45 min.

Bilbao airport , near Bilbao, with direct flights to many European cities. PESA company offers direct buses from the airport to San Sebastian bus station (€17.00, 1 hour and 8 min.). Timetables are not yet available, but the buses leave frequently (every hour).

There is also a regional airport, San Sebastian Airport, located at Hondarribia, on the border with France. This airport only operates with Air Nostrum, Iberia and Vueling, flying to Barcelona and Madrid.

If you are travelling from Madrid, there are buses from Madrid airport and Madrid bus station to Tolosa, with the ALSA company.

Visas

If you require an official invitation letter to attend the conference, please contact the Chair of the Organizing Committee, Idoia Biurrun, after registering (Department of Plant Biology and Ecology, University of the Basque Country (UPV/EHU) P.O. Box 644, 48080 Bilbao, Spain. Email: idoia.biurrun@ehu.eus). This letter will not represent any commitment on the part of the organizers to provide financial support for you; it is only for the purpose of obtaining your visa or other such purposes.

Keynote lectures

The 17th EGC is pleased to welcome three keynote speakers:

Diversity, management and conservation of natural and semi-natural grasslands in Spain

Alfonso San Miguel, Department of Natural Systems and Resources, Polytechnic University of Madrid, Madrid, Spain.

Spain is a country with an amazing diversity of natural and semi-natural grasslands. Most of them are included in old cultural landscapes and/or High nature value (HNV) farmland. That is why their conservation, and that of their associated biodiversity (flora, fauna, habitats of Community interest), requires suitable management. In his keynote lecture, Professor San Miguel will present an overview of the diversity of natural and semi-natural grasslands in Spain and their associated biodiversity, and also address their conservation status after changes in management during the last decades.

Alfonso San Miguel is full professor at the Department of Natural Systems and Resources, Polytechnic University of Madrid. He is a member of the Spanish Society of Pastures (President between 2010-2014) and the Spanish Society of Geobotany. He is also the Director of the National Parks Chair. His research topic is management and conservation of natural and semi-natural grasslands and rangelands and their associated biodiversity: flora and fauna. Some of his latest works deal with typology of natural and semi-natural grasslands in Spain, Types of Habitats of Community Interest and wild ungulate carrying capacity and management in Natural Protected Areas. ResearchGate profile.

Species-rich semi-natural grasslands of Europe – historical masterpieces of human-nature interaction

Monika Janišová, Institute of Botany, Slovak Academy of Sciences, Banská Bystrica, Slovakia

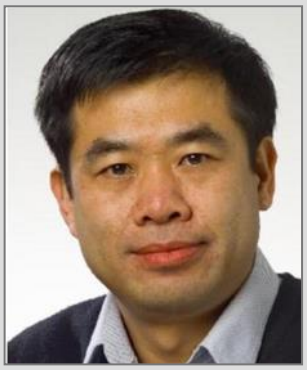
Examples of positive impact of humans on ecosystem biodiversity are rare. One of the phenomenal examples are species-rich secondary grasslands of Europe, which were formed as a consequence of low-intensity farming. Their maintenance is a main goal of current grassland conservation. Through several examples from the Carpathian Mountains, Dr. Janišová will try to demonstrate: i) the importance of a deep knowledge of local history and traditions, which lead to the formation of each particular grassland; ii) the risks associated with substitution of traditional grassland management practices by their modern analogies; iii) the irreplaceable role of domestic animals in grassland conservation. Additionally, she will highlight approaches inspired by our ancestors (based on traditional ecological knowledge) that could help to maintain or increase grassland diversity for our descendants.

Monika Janišová is a vegetation ecologist focusing mainly on grasslands, their classification, biodiversity, succession, management and conservation. She is also interested in biogeography and endemism, as well as population biology and conservation of rare plants. Recently, the main subject of her research includes traditional ecological knowledge, bio-cultural heritage and sustainable agriculture in the Carpathian Mountains (Central and Eastern Europe). ResearchGate profile.

Patterns, dynamics and conservation of the steppes of the Mongolian Plateau

Frank Yonghong Li, School of Ecology and Environment, Inner Mongolia University, Hohhot, China

In his keynote, Professor Yonghong Li will summarize the patterns and dynamics of the vast and continuous easternmost part of the Eurasian steppe, based on his field research experiences. He will discuss species diversity and vegetation dynamics in relation to climate and land-use changes, and present the status of, and challenges for, the conservation and sustainable management of these prestigious natural grasslands.



Frank Yonghong Li (PhD 1992, Montpellier) is professor and dean of the School of Ecology and Environment, Inner Mongolia University, China. His research career includes many years in the Institute of Botany of Chinese Academy of Sciences (Beijing) and New Zealand AgResearch- Grasslands Research Center (Palm. North). His current research covers biodiversity conservation, ecosystem processes and multifunctioning, and restoration and adaptive management of grassland ecosystems under climate and land-use change. ResearchGate profile.

Workshops

17th EGC offers two optional workshops: Meet the Editors and Introduction to Orthoptera.

Meet the Editors, facilitated by Didem Ambarlı

12th September, 17:30-18:30, with informal follow-up during the welcome drink.

We'd like to provide a platform for our participants to meet with editors of high impact journals on ecology, conservation and vegetation science and ask questions about the peer-review process and get tips on submitting a successful paper.

Introduction to Orthoptera, led by Rocco Labadessa

12th September, 12:00-17:30, with lunch break after indoor session

The workshop will provide key aspects on the taxonomy and ecology of grasshoppers, katydids and crickets. Through a brief course indoors and practical activities in the field, the workshop will familiarize participants with sampling and determination techniques, and also provide hints on the interpretation of orthopteran community and biodiversity data.

Excursions

17th EGC offers a mid-conference excursion to the Aizkorri-Aratz Natural Park on 14th September and a post-conference excursion in Navarre from 16-18th September.

Euchorthippus declivus. **Photos: R. Labadessa.**

Rocco Labadessa is an active EDGG member, working as freelance biologist for environmental studies and biodiversity conservation projects in southern Italy. His main research focus is plant and insect ecology and conservation, with specific studies on orthopteran ecology and biogeography, and their relationship with grassland structure and dynamics. ResearchGate profile.

Map showing the venue of the conference (Tolosa), destination of the mid-conference excursion (Aizkorri-Aratz) and main destinations of the post-conference excursion to Navarre (source: GoogleEarth). Airports are also indicated, as well as main cities in the surroundings.

Mid-conference excursion (14th September 2022)

We aim to show participants the biodiversity-rich grasslands of the Cantabrian valleys and mountains in the Basque Country. Two optional excursions are planned:

Excursion 1. Mountain walk to Aizkorri peak, led by Javier Loidi.

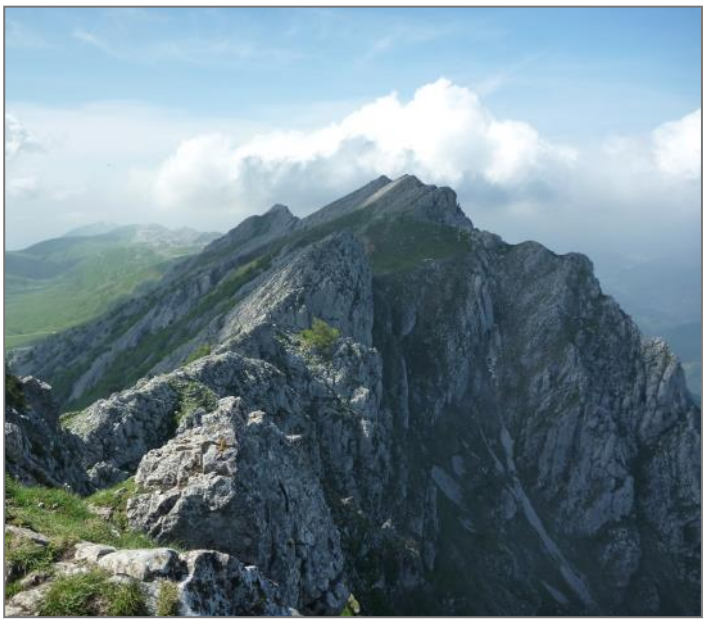
We will travel by bus to Otzaurte, where we will start a mountain hike to the top of Mount Aizkorri, and finish in Arantzazu. It will be a long hike, with approximately 1,000 m slope.

The highest peak in the Basque Country, Aitxuri (1,551 m a.s.l.) is located in this limestone mountain range, which limits the Cantabrian and Mediterranean basins. Basque legends place one of the houses of the goddess Mari, a personification of mother earth, and all the elements it contains, in these summits. In these mountains, we can find such treasures as the Tunnel of San Adrian, crossed by a medieval road, and the Arrikrutz cave, with galleries full of giant stalactites.

In 2006, the Aizkorri mountain range became the Aizkorri-Aratz Natural Park, of 19,400 ha. Several forest types are abundant in these mountains, mostly beech forests, but there is also space for semi-natural grasslands in many open areas that have been retained for extensive grazing, especially in Urbia and Oltza open fields, at approximately 1,000 m a.s.l, which have been used for the summer grazing of sheep since the Neolithic, as testified by several megalithic monuments. Nowadays also cattle and horses graze these fields, but the indigenous latxa sheep breed has been traditionally bred, mainly for its milk, which is used to make Idiazabal cheese. Shepherds join in small group of txabolas (small mountain houses) during the summer months. Besides shepherding, charcoal-making has also been a traditional activity in these mountains.

Many species of mammals, birds and amphibians inhabit these forests, pastures and cliffs: alpine newt (*Ichthyosaura alpestris*), Iberian frog (*Rana iberica*), Peregrine falcon (Falco *peregrinus*), Griffon vulture (*Gyps fulvus*), Egyptian vulture (*Neophron percnopterus*), Alpine chough (*Pyrrhocorax graculus*), Red-billed chough (*Pyrrhocorax pyrrhocorax*), European snow vole (*Chionomys nivalis*), European pine marten (*Martes martes*), European polecat (*Mustela putorius*), European wildcat (*Felis silvestris*) and several bat species.

On our way to the mountain summit, we will cross dry grasslands with *Helictotrichon cantabricum* and Sesleria *autumnalis* and basophilous thorny-cushion scrub with *Genista occidentalis*, secondary vegetation mostly of *Quercus pubescens* forests. We will go up to the Urbia fields, at 1,100 m a.s.l., through beech forests. In Urbia, grasslands of *Violion caninae* and heathlands of *Daboecion cantabricae* form the traditional pastoral landscape. Back on the steep limestone slopes towards the summit, rocky grasslands occur, with *Teucrium pyrenaicum, Carex caryophyllea, C. ornithopoda, Festuca rectifolia, Brachypodium rupestre, Acinos alpinus, Thymus praecox*, etc. At higher elevations, we will find subalpine dry grasslands with *Festuca gautieri* subsp. *scoparia* and *Agrostis schleicheri* (*Festucion scopariae*). Near the summit, limestone cliffs harbour rupicolous communities, with *Potentilla alchimilloides*, *Hornungia alpina* subsp. *auerswaldii*, *Dethawia splendens* and *Erinus alpinus* (*Sedo-Seslerion hispanicae*), as well as mesic chionophilous grasslands with *Sesleria caerulea* (*Primulion intricatae*).



Left: Aizkorri summit (photo: J. Loidi). Right: Urbia fields (photo: http://bit.ly/31ovWls).

Surroundings of Orendain, Aralar. Left: Larreta farm (photo: https://www.larretaesnekiak.com/); right: sheep herd with Txindoki mountain on the back (photo: http://bit.ly/39qD9Ws).

Excursion 2. Visit to farms, meadows and pastures in Aralar and Aizkorri mountain ranges, led by Idoia Biurrun.

Our first stop will be a short walk to enjoy morning fresh air in the northern foothills of the Aralar mountain range (Aralar Natural Park), near the villages of Abaltzisketa and Larraitz, under the impressive silhouette of Mount Txindoki. After this nice walk, we will visit the Larreta farm in the village of Orendain, at 5 min. distance by bus.

We will then move to Ataun, in the western foothills of the Aralar range, where we will learn about an old method of bringing the hay to the valley from the steep slopes in the hills, and also have a nice walk by a stream and adjacent meadows.

After our picnic in Ataun, we will travel to Arantzazu (45 min.), already in the Aizkorri-Aratz Natural Park. In Arantzazu, we will first hike for 2-3 hours to mountain grasslands above the village, and afterwards visit the Gomiztegi farm and shepherd school. They will show us their facilities, how they make the Idiazabal cheese with the milk of the Latxa sheep and perform a demonstration of Basque shepherd dogs working with sheep herds.

Both excursions will join at 19:00 for the Grassland Party nearby the Arantzazu sanctuary.

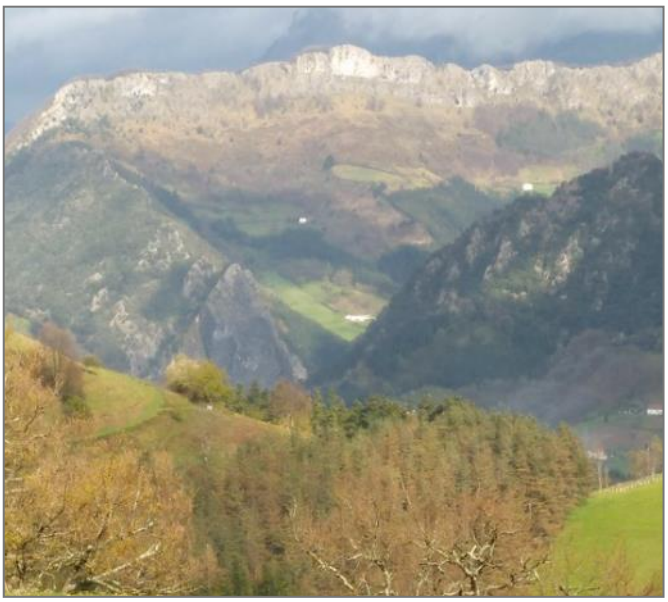
Post-conference excursion (16-18th September 2022)

(optional - maximum number of participants: 40)

The three-day post-conference excursion will take place mostly in Navarre, a highly diverse territory where three biogeographic regions meet: Atlantic, Alpine and Mediterranean. Natural vegetation in the Atlantic region, in the North, is formed by oak forests (mostly *Quercus robur*, but also *Q. pubescens* in the driest areas) in valleys and hills, and beech forests in the mountains. Grasslands are semi-natural grasslands, except for azonal grasslands in rocky areas. Meadows are mostly found in valleys, while in the mountains, acidophilous grasslands of *Violion caninae* (*Nardetea strictae*) and basophilous mexo-xeric and rocky grasslands of *Festuco -Brometea* prevail. Heathlands are one of the most typical landscape features, especially on siliceous bedrocks and leached soils.

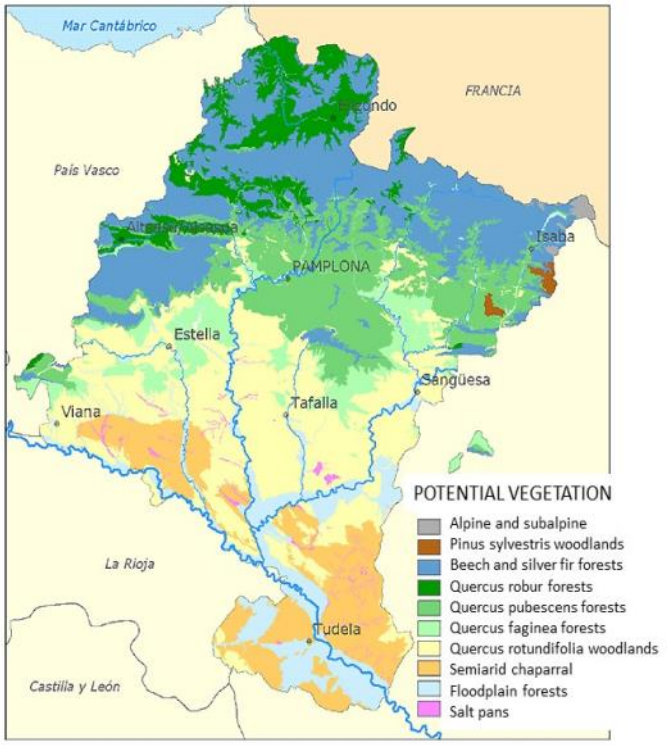
The Alpine region, in the northeast corner, is the Pyrenees, one of the most beautiful and impressive European mountain ranges. The Pyrenees form the border between Spain and France from the Mediterranean to the Atlantic, and in Navarre, they are represented by the Western Pyrenees, the most oceanic part of the range. Natural vegetation includes downy oak (*Quercus pubescens*) and silver fir-beech forests in the montane belt, *Pinus uncinata* forests in the subalpine belt and alpine grasslands above the timberline.

The Ebro River valley occupies the south of the region, with a typically Mediterranean climate, though we can still find differences from the upper part to the centre of the valley (the so-called Ebro depression). On the upper part, the cli-



Dome in Ataun (photo: http://bit.ly/2UK4K0P).

Gomiztegi farm and shepherd school (photo: http://www.oñatiturismo.eus/es/listings/gomiztegi-baserria/**).**



Map of potential vegetation of Navarre. Modified from the http://www.cfnavarra.es/agricultura/informacion_agraria/MapaCultivos/seriesvegetacion.html**.**

mate is still quite rainy, and natural vegetation corresponds to marcescent deciduous forests dominated by *Quercus faginea*, whereas evergreen *Quercus rotundifolia* becomes dominant on the rocky slopes. Secondary grasslands still belong to *Festuco-Brometea*, at least in the deepest soils, although there is a particular meso-xeric grassland where *Brachypodium phoenicoides* is dominant. Down the valley, the climate becomes drier and warmer, and the natural vegetation is dominated exclusively by evergreen sclerophyllous trees (*Quercus rotundifolia*). Secondary shrublands and grasslands are typically Mediterranean: garrigues, with *Rosmarinus officinalis* (*Ononido-Rosmarinetea*) and Mediterranean grasslands, where *Brachypodium retusum* is the dominant species (*Lygeo-Stipetea*: *Phlomido lychnitis-Brachypodion retusi*).

The driest area in Navarre is located in the southernmost corner, near the Ebro River. Here, the bioclimate is Mediterranean xeric, too dry even for the sclerophyllous forest, and thus the natural vegetation is an open woodland with *Pinus halepensis* and *Juniperus thurifera*, which is better represented towards the center of the Ebro depression (Monegros), in Zaragoza province. An exceptional grassland type can be found here on the clayey soils: the relict Mediterranean steppes, formed by *Lygeum spartum*, with Stipa *capillata* and *S. lagascae* (*Agropyro-Lygeion sparti*). *Lygeum spartum* also forms grasslands on the edges of inland salt-pans (*Limonion catalaunico-viciosoi*), in contact with halophilous scrub (*Suaedion brevifoliae*) and grasslands (*Puccinellion lagascanae*). Another outstanding feature of this semi-arid area is the abundance of nitrophilous steppic scrubs of the class *Pegano-Salsoletea*.

On the first day, we will travel directly to Jaizkibel, a small coastal mountain between San Sebastian and Hondarribia, a beautiful town on the border with France. Sandstone is the prevalent rock of this mountain, and thus heathlands cover almost all of the surface, maintained by repeated burning and extensive grazing. These coastal heathlands are very thermophilic, as frost is very rare this near to the ocean, and therefore the floristic composition is quite different to that of the mountain heaths. Small patches of mires are scattered in the heathland, with interesting communities belonging to the alliances *Anagallido-Juncion* and *Hyperico elodis-Sparganion*. After a walk in the heathland, we will have coffee and refreshments with an impressive panorama

Sheep herds are taken from the winter pastures in Bardenas Reales to the summer pastures in the Pyrenees along traditional paths (Cañadas Reales), nowadays most of them under roads. Sheeps arriving to Pyrenean valleys (left), climbing to the mountain (center), enjoying the subalpine grasslands. Photos: A. Berastegi.

of the estuary of the Bidasoa River, the natural border between Spain and France, with the towns of Hondarribia (Spanish Basque Country) and Hendaye (French Basque Country).

We will continue our journey by bus up the Bidasoa River and will enter Navarre a few kilometers from the sea. We will climb to the Belate mountain pass, in the interfluve of the Atlantic and Ebro basins. In Belate, we will stop to visit mountain acidophilous grasslands and heathlands, but we will especially focus on the Belate mire. This is one of the largest mires in the Basque mountains, although it has long suffered from drainage, eutrophication and overgrazing. During recent years, a restoration project has been initiated, and we will be able to see some of the permanent plots used for monitoring.

In the afternoon, we will continue our journey by bus southwards, and our next stop will be in the Urbasa mountain range. There, we will enjoy the mountain landscape, with basophilous beech forests and extensive grasslands. The location of this mountain, south of the Atlantic-

Fig. 13. Estuary of Bidasoa River, frontier between Spain (below) and France (above). Photo: I. Salcedo.

Fig. 15. Castil de Tierra, Bardenas Reales, with *Lygeum spartum* on the front. Photo: J. Loidi.

Mediterranean divide, creates a high diversity of vegetation, with temperate grasslands of *Festuco-Brometea* and *Nardetea* co-occurring with submediterranean grasslands with *Festuca hystrix, Helianthemum canum, Jurinea humilis*, etc. From Urbasa we will go down to the Mediterranean region, and travel to our accommodation in the historical town of Tafalla. Here, we are already in the Ebro valley. For those of you who never visited the Mediterranean Region, we will make a special toast during the dinner!!

On the second day, we will travel directly southwards to the Ebro depression, towards the driest area in Navarre, Bardenas Reales. In route, we will stop near the Aragón River in Mélida, a tributary of the Ebro Rover originating from the Western Pyrenees, where we will enjoy the panorama view and visit some halophilic and gypsophilic communities in Caparroso. The main stop during this journey will be in the impressive Bardenas Reales, a huge non-urbanized extension of eroded hills, plateaus, saltpans and canyons, in which there are soils clay, chalk and sandstone.

After a long stop in Bardenas, picnic included, we will resume our journey and travel northwards to the Pyrenees. We will make a last short stop in the Mediterranean Region, near the village of Lumbier (Iso mountain pass) and a photo

Fig. 14. Palace of the kings of Navarre near Tafalla. Photo: A. Berastegi.

stop at the panorama of the impressive canyon Foz de Arbaiun. In the evening, we will reach our accommodation in the village of Isaba. We will sleep at the Isaba hotel, but before going to bed, we will have the opportunity to walk around the village, which is full of life during summer weekends.

On the third day, we will go by bus to the mountain pass called Piedra de San Martín, on the border with France. From there we will hike through subalpine and alpine grasslands and dwarf shrublands with *Juniperus communis* subsp. *nana* and *Rhododendron ferrugineum*. The most abundant grasslands are acidophilous Nardus stricta grasslands (*Carici macrostylidi-Nardion*) on deep soils, communities of *Festucion scopariae* on the sunny and rocky slopes, and of *Primulion intricatae* at locations where snow accumulates.

In the late afternoon, we will travel to Bilbao, where our journey will finish.

Fig. 16. Larra karstic area in the Western Pyrenees. Photo: A. Berastegi.

Fig. 17. Pic d'Anie, 2,507 m a.s.l., in the border between France, Navarre and Aragón. Photo: A. Berastegi.

Fig. 18. *Festuca gautieri* in scree. Photo: A. Berastegi.

Fig. 19. *Festuca altopyrenaica* on rocky slope. Photo: A. Berastegi.

Arantzazu Sanctuary

Txalapartaris

Grassland Party

The Grassland Party will take place on 14th September, near the Arantzazu sanctuary, where the participants of the two mid-conference excursions will arrive at around 19:00. The Sanctuary, located above a steep ravine at 750 m a.s.l., is the main entrance to Aizkorri-Aratz Natural Park, and is famous for its great artistic and architectonic value.

During the Grassland Party we will taste local food (cheese, vegetables, meat, etc.) and drink (cider, wine). We will have the opportunity to see and listen to Basque traditional dances and music, including an exhibition of *txalaparta*, a traditional percussion instrument where two *txalapartaris* (*txalaparta* musicians) play music using two wooden sticks each over a board (https://en.wikipedia.org/wiki/Txalaparta).

Auction

The auction will take place during the Grassland Party in Arantzazu.

Conference participants are encouraged to bring foods and drinks from their countries. Any other object related to grasslands, their management and biodiversity are also welcome, e.g., books, traditional tools and musical instruments, plant and animal drawings, etc. All items brought for the auction can be delivered upon registration, so that they can be exhibited already during the first day of the conference. The organizers will be responsible for transporting all the objects for the auction to the Grassland Party.

Fees

	Early Bird Registration until 30th April	**Late Registration until 15th June**
Student IAVS members*	**€ 160**	**€ 190**
Students, not IAVS members*	**€ 180**	**€ 210**
Other IAVS members*	**€ 210**	**€ 240**
Non-students and non-IAVS members	**€ 230**	**€ 260**
Accompanying person	**€ 100**	**€ 100**

**Please submit evidence of IAVS membership and/or your enrolment at a University by emailing confirmation of matriculation to idoia.biurrun@ehu.eus*

The registration fee covers full participation in the conference, including registration and conference materials, admission to the conference, lunches and coffee breaks on 13th and 15th September, mid-conference excursion with lunch pack, grassland party, and Meet the Editors workshop. Fees of accompanying persons include lunches, coffee breaks, mid-conference excursion with lunch pack and grassland party. A childcare service will be offered upon demand and free of charge. Please indicate during registration if you will need this.

Fees of the optional events

The basic registration fee does **NOT include** the following, which can be booked separately:

- Post-conference excursion (16-18 September): €200
- Workshop on Orthoptera (12 September): €25

Financial support

Thanks to the EDGG's mother organization IAVS, we can support a number of participants with travel grants. Travel grants will be awarded according to the IAVS criteria, based on income level and country of origin. They will preferentially be given to early-career and other financially constrained scientists. The support usually covers only part of the participant's costs, depending on the number of successful applications. To qualify for a travel grant, active participation at the conference (oral presentation or poster) is required. After the conference, grantees must provide a short report of the event, and some photos that can be used in Palaearctic Grasslands.

Travel grants can be applied for during registration until 30th April, including a short motivation letter. Applicants for IAVS travel grants must be IAVS members for the year 2022. Information about travel grants will be given at the latest by 31th May.

Young Investigator Prizes

As in previous years, prizes will be awarded to young scientists for excellent presentation of their research (orally or in poster form). For these purposes, early career scientists (less than 35 years old) will be asked during registration if they wish to participate in the contest.

Organizers

The conference is organized by the EDGG and the University of the Basque Country. It is supported by the Basque Government, the Provincial Council of Gipuzkoa, the City Council of Tolosa, the University of the Basque Country and Hazi, public agency for rural, coastal and food development.

The Eurasian Dry Grassland Group (EDGG) was established in August 2008 as the European Dry Grassland Group. Recently it expanded its ecological and geographical scope to cover all types of semi-natural grasslands of the whole Palearctic realm. The EDGG is an official group of the International Association for Vegetation Science (IAVS). Its basic aims are to compile and to distribute information on research in and conservation of natural and semi-natural grasslands beyond national borders, and to stimulate active cooperation among scientists, practitioners and all who work with or are interested in grasslands.

The University of the Basque Country (UPV/EHU). In a prosperous region stretching along the Atlantic coast of northern Spain, the people of the Basque Country are the custodians of one of Europe's most ancient languages and cultures. Yet, they not only have a high esteem for tradition, but are also remarkably forward-looking and have established a highly regarded industrial sector. The region's success and scientific and technological progress are underpinned by the University of the Basque Country, a vibrant 30-year-old institution with 45,000 students, 5,000 world-class academic staff and state-of-the-art facilities. Our logo, symbolizing the tree of science, was created by the Basque artist Chillida, motivated by a strong popular movement in the 70s for the creation of the Basque university. Following our motto 'Give and spread knowledge', the University of the Basque Country is an integrating institution, willing to produce knowledge, experience and research, in order to forward them to the general public.

Local Organizing Committee

Idoia Biurrun, University of the Basque Country

Asun Berastegi, Gestión Ambiental de Navarra, guide on the Post-conference excursion

Juan Antonio Campos, University of the Basque Country

Itziar García-Mijangos, University of the Basque Country

Javier Loidi, University of the Basque Country

Peter B. Pearman, University of the Basque Country

Raquel Ponti, University of the Basque Country

Isabel Salcedo, University of the Basque Country

Sara Sánchez, University of the Basque Country

Irati Sanz, University of the Basque Country

Scientific Committee

Alla Aleksanyan, Armenia

Didem Ambarlı, Turkey

Idoia Biurrun, Spain

Iwona Dembicz, Poland

Jürgen Dengler, Switzerland

Anna Kuzemko, Ukraine

Rocco Labadessa, Italy

Peter B. Pearman, Spain

Peter Török, Hungary

Wolfgang Willner, Austria

Stephen Venn, Poland/Finland

Supporters

Basque Government

International Association of Vegetation Science

University of the Basque Country (UPV/EHU)

Council of Tolosa

Government of Gipuzkoa

Governement of Navarre

Hazi Foundation

Idoia Biurrun, Bilbao, Spain

idoia.biurrun@ehu.es

Talk Grasslands!
Winter 2021-2022

The second series of our online winter talks on diverse themes related to grasslands, has just come to an end. The series opened in November with a talk by Martin Diekmann (Bremen) on *Driving factors of long term vegetation changes in grasslands*. Martin presented studies on the changes in vegetation composition in a number of grassland habitats over time and considered the environmental drivers behind those changes. The second talk, presented in December, was by Paolo Biella (Milan) on *Linking plants and pollinators: a story of local disturbance events and anthropized landscapes*. Paolo presented a set of studies in which the vegetation community was manipulated and he looked at the effects on the communities of pollinators. The final talk of this winter's series was given by Jitka Klimešová (Třeboň) on *Grasslands: the hidden part*. Jitka's talk focused on the functional ecology of plants according to their belowground traits.

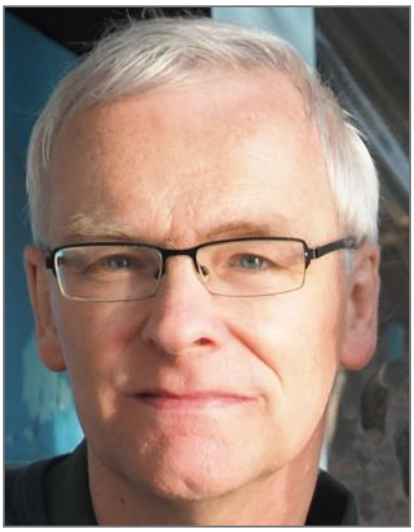
If you missed any of the talks, they can all be found from the EDGG YouTube channel, where you can also find recordings of last winter's talks too. The links can be found from the EDGG Talk Grasslands web-page.

The talks comprised a presentation of about 1 hour in duration, followed by questions. The recordings were stopped at the end of the questions, after which anyone who was interested could open their videos and microphones and chat informally.

We introduced these talks last winter, as a response to the lack of academic exchange because of the cancellations of conferences due to Covid-19 pandemic, and so that we could continue to facilitate stimulating presentations on diverse topics related to grasslands. Now it looks as if there are going to be conferences this summer, including the postponed 17th EGC in Tolosa but hopefully there will still be sufficient enthusiasm for Talk Grasslands next winter too.

We hope that everyone found the talks interesting. We will also be glad to receive suggestions regarding potential presenters for such talks in the future. The objective is to provide talks that are stimulating for a wide audience.

Stephen Venn, Helsinki, Finland
stephen.venn@helsinki.fi



Martin Diekmann, Paolo Biella and Jitka Klimešová.

Announcements

Initial Workshop on the foundation of IAVS Regional Section(s) in Asia

Online discussion to stimulate international cooperation among vegetation scientists in Asia, 22 April 2022, 7:00-8:30 UTC

In Europe, IAVS has the flourishing European Vegetation Survey (EVS), in North America the North American Regional Section, in Middle and South America the Regional Section for South America and the Caribbean, and recently an African Regional Section became active. However, Asia, the largest and most populated of all continents, is still without a regional subgroup of IAVS, and we hope to change this.

We would like to bring together vegetation ecologists dealing with any vegetation type (tropical to boreal forests, savannas, steppes, deserts, tundra and wetlands, from semi-natural to natural habitats), in any part of Asia, to discuss possible options of international collaboration.

Our plan is to discuss the proposal to establish one (or more) Regional Section(s) of IAVS for Asia. Examples of existing Regional Sections and Working Groups of IAVS show that this format allows for multiple joint activities, such as organizing regional workshops and conferences, networking and cooperation on joint projects. Other examples include, but are not limited to joint research expeditions, organization of special features in international journals, mailing list and internet platforms for job offers. All of these can benefit from logistic and financial support by IAVS, a truly international society of researchers.

Photos: J. Dengler.

We invite all vegetation ecologists based in or working in Asia, whether IAVS members or not, to join the **Initial Workshop on the foundation of IAVS Regional Section(s) in Asia**. It will take place on IAVS' Zoom platform on **Friday 22 April 2022 from 7:00 to 8:30 UTC** (see https://bit.ly/3Gi3dmx for the time at your time zone). If interested, please register free of charge at https://forms.gle/zJF8sFtR8gcysvW96. This workshop is also a part of the activities within the first **Asian Grassland Conference, 19–21 April 2022**, organized by the IAVS Working Group EDGG (see pp. 5-6); if you attend this conference, use its online platform for registration.

We tentatively plan the following program:

- Welcome by David Zelený (IAVS Secretary) and Jürgen Dengler (IAVS Membership Committee)
- Presentation of IAVS, benefits of IAVS membership, an overview of IAVS Working Groups and Regional Sections; how they work, and how they benefit from IAVS
- Sharing of experiences by Milan Chytrý (Secretary of the IAVS Working Group European Vegetation Survey) and Reginald Tang Gurooh (Chair of the recently founded IAVS Regional Section for Africa)
- Questions from the floor
- Plenum discussion: Should there be one Regional Section for whole of Asia or two or three Regional Sections and, if so, with which delimitation
- Optional: if we decide to have several Regional Sections, we may split participants into breakout rooms for each section to get to know each other and plan further steps

The Initiative Committee:

- **David Zelený (IAVS Secretary)**, National Taiwan University, Taipei, Taiwan, zeleny@ntu.edu.tw
- **Jürgen Dengler (Chair of the IAVS Membership Committee)**, Zurich University of Applied Sciences, Switzerland; dr.juergen.dengler@gmail.com
- **Alla Aleksanyan**, Academy of Sciences of Armenia, Yerevan, Armenia
- **Didem Ambarlı**, Düzce Unitersity, Düzce, Turkey
- **Sumanta Bagchi**, Centre of Ecological Sciences, Indian Institute of Science, Bengaluru, India
- **Kwek Yan Chong**, Singapore Botanic Gardens, National Parks Board, Singapore
- **Behlül Güler**, Dokuz Eylul University, Izmir, Turkey
- **Yasuhiro Kubota**, University of the Ryukyus, Naha, Japan
- **Frank Yonghong Li**, Inner Mongolia University, Hohhot, P. R. China
- **Cheng-Tao Lin**, National Chiayi University, Chiayi, Taiwan
- **Alireza Naqinezhad**, University of Mazandaran, Babolsar, Iran
- **Arkadiusz Nowak**, University of Opole, Poland, working in Middle Asia
- **Marcelo Sternberg**, Tel Aviv University, Tel Aviv, Israel
- **Viktoria Wagner**, University of Alberta, Canada, working in Kazakhstan
- **Jianshuang Wu**, Chinese Academy of Agricultural Science, Beijing, P. R. China
- **Jian Zhang**, East China Normal University, Shanghai, P. R. China

Jürgen Dengler, Wädenswil, Switzerland
dr.juergen.dengler@gmail.com

Photo: T. M. Bragina.

Call to contribute to the special issue "Grazing effects on vegetation: biodiversity, management and restoration" in *Applied Vegetation Science*

Guest editors

Péter Török (Hungary, chair of guest editors), Regina Lindborg (Sweden), David Eldridge (Australia), Robin Pakeman (United Kingdom).

Outline

Grazing has a major influence on vegetation composition and functioning and is considered to be essential for managing open vegetation types worldwide. While in historical times wild grazers maintained most open landscapes, nowadays free wild grazers have been replaced by domestic herbivores in many areas, e.g. various types of livestock. Understanding grazing effects on the composition and functional diversity of vegetation, as well as its effects on ecosystem functioning and services is essential from both theoretical and applied aspects. Grazing animals can influence vegetation dynamic processes in multiple ways. The most evident direct way is selective biomass removal from the community, but grazers also influence vegetation dynamic processes through trampling, nutrient addition by dung and urine or by the transport of propagules both by ecto- or endozoochory.

Also, several indirect effects of grazing occur, for example the alteration of microclimate, competition symmetry or alteration of reproductive success. There is a vast knowledge accumulated on grazing and its effects on vegetation, but our understanding of the interaction between the type of grazer, grazing intensity and subjected plant community type is far from complete. The aims of this special issue are to i) discuss the role of grazing in vegetation dynamics and functioning, ii) understand compositional and diversity changes in plant communities subjected to grazing by wild grazers and/or livestock, and iii) provide guidelines for effective biodiversity conservation and restoration in fragmented and human-driven landscapes.

Scope

The collection of contributions in this Special Issue will address the role of grazing in vegetation dynamics of natural and semi-natural habitats. Contributions analysing grazing effects on vegetation are the focus, but contributions dealing with management, restoration and ecosystem service issues are also welcome. Research papers on theoretical problems and case studies, as well as opinion and review papers fitting the topic are welcome.

Procedure and deadlines

Abstracts for preliminary evaluation should be submitted as an MS Word file (*.doc) to Péter Török (molinia@gmail.com) with a deadline of **31st March 2022**. The format of the abstracts (length, style etc.) should be in agreement with the author guidelines of the journal *Applied Vegetation Science*.

The guest editor team evaluates the submitted abstracts based on scope, scientific quality, scientific novelty and form. They decide about the invitation of a full paper in collaboration with the journals' chief editor team. The **full paper submission deadline** is scheduled on the **15th of September 2022**. The invited papers will undergo a regular review for the journal and **the whole issue is expected to be completed within the first half of 2023**.

Péter Török, Debrecen, Hungary
molinia@gmail.com

Cattle grazing in Australian rangelands. Photo: D. Eldridge.

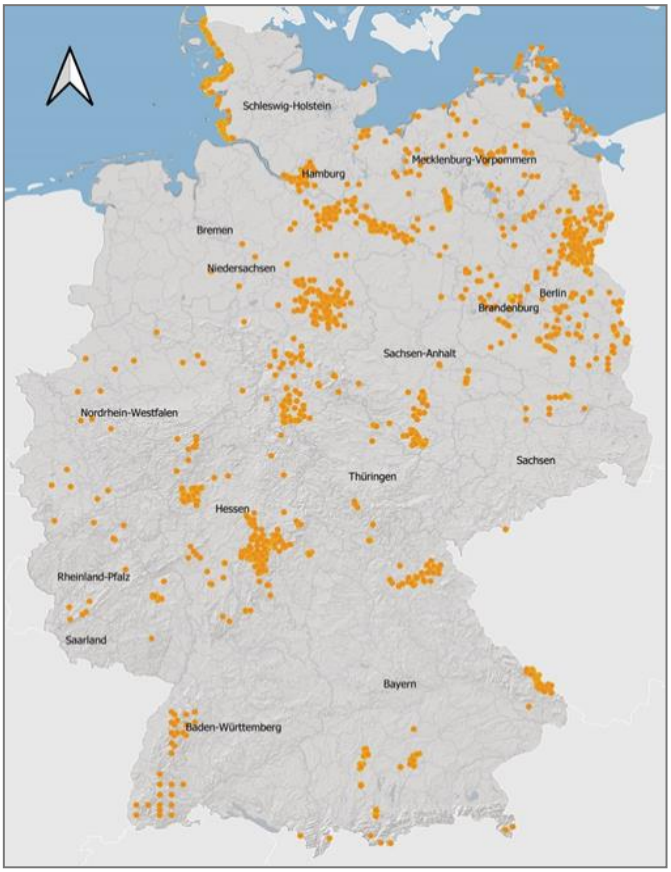
GrassVeg.DE is growing: call for vegetation-plot data of grasslands and other open habitats in Germany

The German Grassland Vegetation Database "GrassVeg.DE" (Dengler et al. 2017, 2018) is a collaborative database, self-governed by the data contributors (Bylaws GrassVeg.DE). We aim to fill geographical and phytosociological data gaps in Germany to increase the coverage of vegetation data in the European Vegetation Archive (EVA), by providing datasets not yet available via other German databases. Since we joined EVA in 2017, we already integrated more than 11,000 plot-based vegetation data distributed over 14 federal states (Figs. 1 & 2). This in return offered our contributors an opportunity to become opt-in authors of multiple exciting European paper projects.

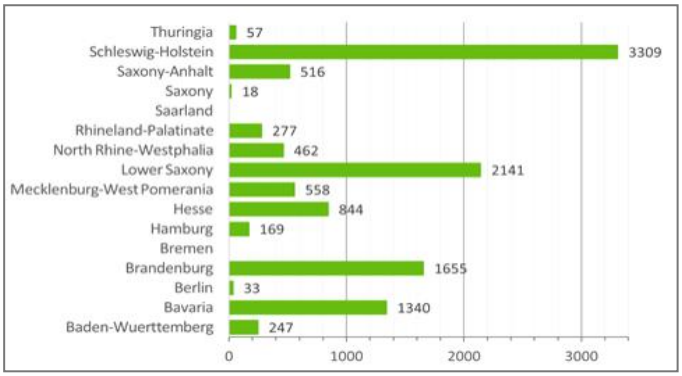
Today, we would like to kindly invite you to make your plot-based grassland data available to GrassVeg.DE. As a standard, we invite each data provider to become a member of the GrassVeg.DE consortium. In addition, we would like to offer you a co-authorship in a Long Database Report planned for 2022 for the IAVS journal Vegetation Classification and Survey, provided that you send your data before 15th of March 2022.

More specifically, we are looking for valuable datasets of the following phytosociological classes: *Festuco-Brometea, Koelerio-Corynephoretea* (including *Sedo-Scleranthetea*), *Violetea calaminariae, Molinio-Arrhenatheretea, Juncetea maritimi* (including *Saginetea maritimae*), *Juncetea trifidi, Carici-Kobresietea, Calluno-Ulicetea* (including *Nardetea strictae*), *Loiseleurio-Vaccinietea, Salicetea herbaceae, Trifolio-Geranietea sanguinei* (including *Melampyro-Holcetea*), *Artemisietea vulgaris* (incl. *Galio-Urticetea*) and *Mulgedio-Aconitetea*. To keep our workload manageable, we kindly ask you to send your datasets including not less than 20 plots provided as an excel sheet or a TurboVeg 2 database. Plots sizes should range between (0.1-) 1-100 (-400) m² and their position should be indicated (preferably with coordinates). The cover of all vascular (and, if available, non-vascular) plants should have been estimated in % or in an ordinal scale (Br.-Bl. scale, Londo scale or similar).

Please send your datasets via mail to ricarda.paetsch@gmail.com. We are looking forward to your contributions!



Distribution of plot-based vegetation data already integrated in GrassVeg.DE in Germany.



Distribution of plot-based vegetation data over the 14 federal states of Germany.

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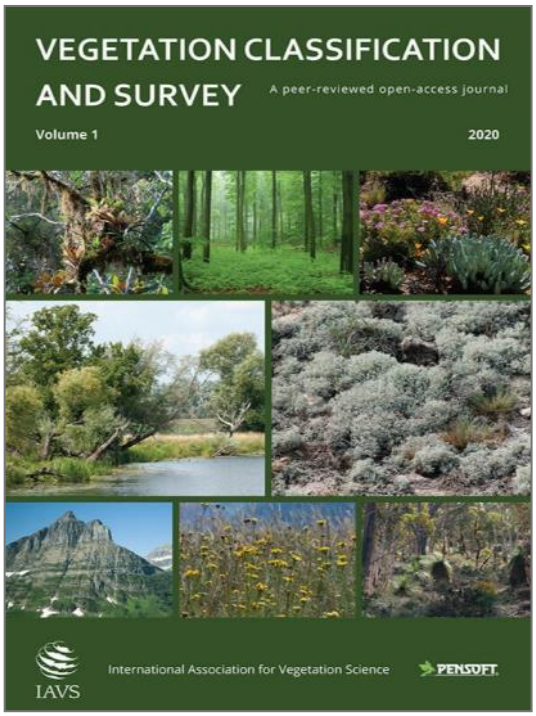
Vegetation Classification and Survey: 2nd volume completed and news for 2022



The second voume of ***Vegetation Classification and Survey*** (VCS), IAVS' gold open access journal, has been published. Compared with the first volume we were able to increase the content from 22 to 25 articles (+14%) and from 220 to 310 printed pages (+41%). The Chief Editors have selected the paper by Dembicz et al. (2021) on fine-grain beta diversity in Palaearctic open vegetation types (based on EDGG's GrassPlot database) for the Editor's Award 2021. Accordingly, the cover of the printed version of volume 2 of VCS is composed of motifs related to this paper. Thanks to these positive developments, VCS in February 2022 has been accepted for inclusion in the Scopus bibliometric database, and we are optimistic that the Web of Science will follow in the not too distant future.

For 2022, VCS welcomes two new **Associate Editors**:

- Jorge Capelo, Instituto Nacional de Investigação Agrária e Veterinária, Oeiras, Portugal
- Arkadiusz Nowak, Opole University, Opole, Poland

Further, we welcome four new members of our **Editorial Board**:

- Reginald Tang Guuroh, Forest Research Institute of Ghana, Kumasi, Ghana
- Alireza Naqinezhad, University of Mazandaran, Balbolsar, Iran
- Vanessa Leite Rezende, Universidade Federal de Lavras (UFLA), Lavras, Brazil
- Gaolathe Tsheboeng, University of Botswana, Gaborone, Botswana

For 2022, three new **Special Collections** of articles have been launched, two of which cover topics within the scope of EDGG:

- **African vegetation studies** (edited by Reginald Tang Guuroh, Miguel Alvarez, Leslie Brown, Manfred Finckh, Ute Schmiedel, Gaolathe Tsheboeng & Jürgen Dengler)
- **Grasslands of Asia** (edited by Jürgen Dengler, Idoia Biurrun, Pavel Krestov, Alireza Naqinezhad & Arkadiusz Nowak)

Finally yet importantly, it should be highlighted that thanks to the generous support of IAVS, papers of first authors who are **IAVS members will be exempt from article processing charges (APCs)**, if the original submission takes place until 31 December 2022. Please take advantage of this unique opportunity! For a paper of typical length, IAVS members thus will save 1100 EUR.

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Dembicz, I., Dengler, J., Gillet, F., Matthews, T.J., Steinbauer, M.J., Bartha, S., Campos, J.A., De Frenne, P., Dolezal, J., (…) & Biurrun, I. 2021. Fine-grain beta diversity in Palaearctic open vegetation: variability within and between biomes and vegetation types. *Vegetation Classification and Survey* 2: 293–304.

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Research Article

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Phytosociology, ecology and plant species diversity of grasslands within nature protection sites near Zurich (Switzerland)

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Palaearctic Grasslands 52 (2022): 28-43

Abstract: The study covers dry to mesic grasslands and litter meadows which have shown drastic declines in Switzerland, including in the canton of Zurich. The aim is to provide an overview of the hitherto floristically unexplored protected areas of the local nature conservation society Verein Naturnetz Unteramt. The areas of Erliweid and Hofstetterweid were more humid and less alkaline. This contrasts with the drier and more basic areas of Rohmatt, Schleetal, Stückliberg, and Tägerst, with Stückliberg being the least fertile and Rohmatt the most fertile area. A total of 30 vegetation plots (10 m2), i.e. five plots in each of the six different areas, were surveyed. For vegetation classification, I compared several methods used in Switzerland to assign phytosociological syntaxa. Depending on the method used assignments to different phytosociological alliances resulted. In particular, the classification of *Arrhenatherion* instead of *Mesobromion* or *Molinion* leads to different assessment of the importance for protection according to the Federal Ordinance. I also applied a modified TWINSPAN analysis and identified three clearly separated clusters. To compare the areas in terms of diversity and site conditions I used Analysis of Variance. The areas Erliweid and Hofstetterweid, mainly assigned to the alliance of *Molinion caeruleae*, were significantly richer in species. A linear mixed model with random effects showed a negative effect of *Brachypodium pinnatum* cover on species richness. On this basis, an additional second cut at an early or late time, depending on the area and species composition, can be recommended for management at least as an experiment.

Keywords: *Brachypodium pinnatum*; conservation; grassland; management; nature conservation association; syntaxonomy; Switzerland; Stallikon.

Nomenclature: The nomenclature of the vascular plants follows Juillerat et al. (2017).

Abbreviations: ANOVA = analysis of variance; BAFU = Bundesamt für Umwelt, DCA = Detrended Correspondence Analysis; LC = Least Concern, VU=Vulnerable, EN = Endangered; VNU = Verein Naturnetz Unteramt (local nature conservation association).

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Scientific Editor: Iwona Dembicz

Linguistic Editor: Paul Goriup

Introduction

Dry grasslands, including xeric and meso-xeric grasslands, lost around 95% of their area in Switzerland between 1900 and 2010 (Lachat et al. 2011) and a further fifth of the remaining area in the last 20 years (Urech & Eggenberg 2007 according to BAFU 2017). Even extensively managed mesic grasslands at lower altitudes have declined to 2 to 5% of their original area due to intensification (Bosshard 2015). Peatlands, including some of the litter meadows, lost 82% of their area between 1900 and 2010 (Lachat et al. 2011), with the decline being particularly severe at lower altitudes.

These losses have also had an impact on individual species, with 44% of the 2,700 native plants classified as endangered or potentially endangered in the 2016 Swiss Red List (BAFU 2017). The proportion of habitat-specific species is particularly high in peatlands and dry grasslands at lower altitudes, among other places (BAFU 2017). National biodiversity monitoring also shows that the species composition of vascular plants in grasslands at middle altitudes is becoming increasingly uniform and that forest and nutrient-loving plants are becoming increasingly widespread, especially at middle altitudes.

At present, around 12.5% of Swiss territory is designated for biodiversity conservation. However, protected areas of national importance constitute only 6.2% of the territory, which is a low level by international standards (BAFU 2017). Management is regulated over around 81% of the entire area (BAFU 2019). In the canton of Zurich, peatland occupies around 1,800 ha, of which some 80% is subject to long-term management under a protection ordinance. The area of species-rich dry grasslands is around 600 ha, of which just under half has management secured by a long-term protection ordinance (Baudirektion Kanton Zürich 2021).

The timing and number of cuts depend on the respective habitats and species present, which is why it is important to know the biodiversity and syntaxonomy of the stands. Fur-

thermore, management recommendations for individual stands must be adapted again and again due to, among other things, climate change, nutrient inputs, invasive and spreading species, and new findings in general. The distribution of financial resources means that most protected areas in the canton of Zurich are maintained by farmers (Baudirektion Kanton Zürich 2021). However, especially in the case of protected areas at the communal level, many communal authorities are supported by volunteers who are often organised in nature conservation associations (dialog:umwelt GmbH 2015).

Verein Naturnetz Unteramt (VNU) was founded 90 years ago. It is the local nature conservation association of the municipalities of Bonstetten, Stallikon and Wettswil. In the course of time, the association has leased or purchased 16 parcels in six different areas of the municipality of Stallikon. The association maintains these areas in cooperation with local farmers. The areas are cultivated extensively, i.e. without fertilisation and most of the areas are nature protection zones according to the ordinances of the canton of Zurich whilst one area is a communal protected object. Today's management indicates that the stands are species-rich dry to mesic grasslands and litter meadows.

Previously, some areas managed by VNU were surveyed for specific species groups (e.g. orchids), but to the best of my knowledge and knowledge of the VNU, the areas were never comprehensively floristically surveyed. Therefore, I aimed at classifying the vegetation and investigating the influence of different site conditions and environmental factors. Differences between different classification systems would be noted and their consequences for legal protection discussed. A further objective was to determine biodiversity patterns of different areas and their classified syntaxa.

The aim of this study would is to elucidate the relationships between floristic biodiversity and current management regimes as well as possible changes in management regimes to favour floristic diversity of the sites. In particular, during initial inspections it was noticeable that in many areas there was a dense sward, especially of *Brachypodium pinnatum* so it might be possible to show whether or not it had the negative effects described by some authors (Antognoli et al. 1995 and Maubert & Dutoit 1995 according to Dipner et al. 2010; Hurst & John 1999).

Study area

The six study areas maintained by the VNU, Erliweid, Hofstetterweid, Rohmatt, Schleetal and Stückliberg, are located in the municipality of Stallikon, Zurich in the Reppisch valley (see Fig. 1).

In common with the entire canton of Zurich and also the Swiss Plateau, Stallikon has an Atlantic-type climate (Wohlgemuth et al. 2020). Depending on the altitude, Stallikon has a mean annual temperature of 6 to 10°C (Bundesamt für Meteorologie und Klimatologie MeteoSchweiz 2020a) and the mean annual precipitation is 1,200 to 1,500 mm (Bundesamt für Meteorologie und Klimatologie MeteoSchweiz 2020b).

The Reppischtal is a marginal glacial valley, formed by the deepening of the glacial rivers of the Reuss glacier (Amt für Landschaft und Natur Kanton Zürich year unknown). The bedrock, which can be seen in places as outcrops, consists of mudstone, sandstone, marl or conglomerate. On the steep slopes, landslides and slumping often occur; these are slipped Quaternary unconsolidated rock or slumped and disrupted consolidated Quaternary gravel (Gubler 2009). This is the case in the study areas of Erliweid, Rohmatt, Schleetal, Stückliberg and Tägerst. In places, slopes also contain hanging clay, predominantly composed of layered silty clays mixed with slope debris (Gubler 2009). This is the case in the Hoffstetterweid study area. The valley floor is composed of fine-grained alluvial and lake sediments (Gubler 2009). This is the case in the study areas of Erliweid,

Fig. 1. Left: Location of the municipality of Stallikon in Switzerland. Right: Location of the six study areas in the municipality of Stallikon.

Rohmatt, Schleetal, Stückliberg and Tägerst. In places, slopes also contain hanging clay, predominantly composed of layered silty clays mixed with slope debris (Gubler 2009). This is the case in the Hoffstetterweid study area. The valley floor is then composed of fine-grained flood sediments and lake sediments (Gubler 2009).

In the Reppisch valley near Stallikon, the flat valley floor is predominantly used for arable farming, although the suitability for use is limited by its tendency for it to become waterlogged (Amt für Landschaft und Natur Fachstelle Bodenschutz 2018). The slopes are used as meadow and pasture or are forested. Dry forests as well as dry meadows and pastures can be found in the area, especially on the bordering Uetliberg-Albis chain in exposed southern and southwestern locations (Amt für Landschaft und Natur Fachstelle Naturschutz 2017a; Wohlgemuth et al. 2020). In the more humid southern half of the canton, several smaller wetlands occur in the Stalliker Reppischtal: these are mainly fed by groundwater or run-off from the slopes of the Uetliberg-Albiskette (Amt für Landschaft und Natur Fachstelle Naturschutz 2017b).

The study areas do not differ that much with respect to mean elevation, lying between 550 and 680 m a.s.l. Although the study areas are very heterogeneous in terms of slope, they do not differ much in terms of mean slope, so all areas are clearly sloped. Rohmatt and Stückliberg are primarily exposed to the east, Hofstetterweid is primarily exposed to the west, Schleetal is primarily exposed to the south and southeast and Tägerst is primarily exposed to the south and southwest (see Table 1).

The habitats appear to differ with respect to the exposure according to Amt für Landschaft und Natur Fachstelle Naturschutz (2004, 2017a, 2017b). Thus, Rohmatt, Schleetal and Tägerst show a potential for nutrient-poor, dry grasslands, while Stückliberg has a potential for dry grasslands as well as alternating wet grasslands, and Hofstetterweid shows a potential for wetlands and alternating wet grasslands and is also mapped as a mosaic of litter meadow but also dry grassland.

According to the habitats and productivity, the area management regimes differ. Erliweid, Hofstetterweid, and Rohmatt are cut once a year starting 1 September at the earliest. In Stückliberg, part of the area is cut once a year from 1 August and part from 15 August. In Schleetal, part of the area is cut on 15 July and part on 1 August. In Tägerst, the area is cut on 15 July. In each case, these areas will be mown by the farmer and the cuttings will be collected and removed by the local nature conservation association. The areas have been maintained in this or a similar way by the local nature conservation association in Erliweid since 2009, in Hofstetterweid since 1992, in Rohmatt since 1988, in Schleetal since 1987, in Stückliberg since 2014 and in Tägerst since 1991. This does not mean that the management before the Nature Conservancy took over necessarily differed from the current management. The history of the areas has not been further elaborated, but based on the

Table 1. Results from a GIS analysis of the area, elevation, slope and exposure of the study areas and corresponding subsites with cutting regimes according to the management plan.

Name of the area	Parcel number	Cutting regime (earliest cutting date)	Area m^{-2}	Mean altitude (m a.s.l.)	Minimal altitude (m a.s.l.)	Maximum altitude (m a.s.l.)	Mean slope (°)	Minimum slope (°)	Maximum slope (°)	Mean aspect (°)	Minimum aspect(°)	Maximum aspect (°)
Erliweid	1750	1.9.	10,154	630.2	612.4	640.2	14.0	0.0	25.0	55.0	0.0	120.0
	2231	1.9.	6,456	632.4	605.2	643.0	12.2	0.0	32.0	35.0	0.0	156.0
Hofstetterweid	1066f	1.9.	3,241	679.4	660.1	696.1	20.4	0.9	51.4	275.4	0.0	360.0
Rohmatt	1725a	1.9.	478	564.6	556.4	571.6	21.1	9.6	40.8	103.8	4.3	358.2
Schleetal	1452j	1.8.	474	552.7	550.5	555.3	8.1	0.9	27.1	133.3	6.3	359.0
	1466d	15.7.	3,063	584.5	573.0	591.9	29.6	8.0	49.4	150.7	78.4	205.8
	1452f	1.8.	5,398	570.7	559.7	580.7	19.0	1.0	51.2	143.1	13.0	354.8
	1452e	15.7.	2,684	565.9	554.8	578.0	26.3	0.9	52.2	135.8	31.0	251.5
Stückliberg	1452i	15.8.	2,209	614.0	598.5	627.9	18.5	0.3	39.3	85.1	0.0	360.0
	1452h	1.8.	437	602.6	597.7	605.0	22.7	2.6	43.6	83.2	17.8	189.8
	1452g	15.8.	1,743	611.4	597.7	626.2	28.0	5.5	60.8	88.1	2.6	154.6
	2334	15.8.	2,161	628.9	623.7	638.8	12.0	0.0	51.6	87.0	0.0	360.0
Tägerst	2334	15.7.	283	612.0	607.5	616.5	25.3	15.3	44.6	223.8	198.6	248.1
	2334	15.7.	1,153	608.3	601.0	616.6	25.1	0.4	51.9	221.4	66.8	341.5

suitability for agricultural use, it can be assumed that some areas were traditionally grazed. This would also be suggested by the field names Erliweid and Hofstetterweid (the suffix -weid comes from the German "Weide", meaning pasture).

Methods

Vegetation surveys

In each of the six areas, I collected vegetation and environmental data at five locations, resulting in a total of 30 plots. I stratified the areas according to management regimes (specifically, the earliest cutting date). This means I tried to cover the management regimes with earliest cutting dates on 15 July, 1 August, 15 August, and 1 September with as many plots as possible according to the possibilities of the area (see Table 2). I made no plots in very small but well-defined stands with visibly different site conditions (e.g., stands of rushes or tall perennials along ditches). Otherwise, I randomly selected plot locations in the field.

I visited the plots between 1 June and 14 June 2020 (15 plots) and from 13 July to 21 July 2020 (15 plots). In each case, I collected a complete record of all vascular plants with percent cover estimates using FlorApp for Android, version 2.8 (Info Flora 2018) in a 10 m^2 quadrat (edge length 3.162 m) with a north-south orientation. Species were identified in both generative (Eggenberg et al. 2018; Lauber et al. 2018) and vegetative states (Eggenberg & Möhl 2013) according to the nomenclature of Juillerat et al. (2017). Furthermore, I collected exposure (of the assumed orientation using Compass 360 Pro application, version 3.3.134), slope (of the assumed main fall line using Precise Level application, version unknown), maximum height of vegetation (using double meter), and pH of a soil sample at 10 cm depth (using a colorimetric method).

Statistical analyses

I assigned the plots to phytosociological associations according to reference surveys from Pantke (2008) and the list of species from Delarze et al. (2015), the latter by different methods in Vegedaz (Küchler 2014; WSL 2017): number of common species, Jaccard similarity coefficient and Eggenberg (number of common species and weighted by so called characteristic and accompanying species according to Delarze et al. 2015). I performed TWINSPAN analysis (pseudospecies cut level = 3, values of cut levels = 0, 5, 25, minimum group size = 3, maximum level of divisions = 3) according to Hill (1979) and a modified TWINSPAN classification (same parameters but minimal Sorensen dissimilarity index = 0.3) according to Roleček et al. (2009) to create the synoptic table. For both TWINSPAN analyses I used Juice software, version 7.1.102 (Tichý et al. 2018), and for the GIS analyses, I used QGIS, version 3.16.3 software. I calculated the cover weighted mean indicator values according to Landolt (1977) of the study plots in Vegedaz (Küchler 2014; WSL 2017). I performed all other statistical analyses in R, Version 4.0.2. To perform the Analysis of Variance Model to assess differences in biodiversity and site conditions I used the function 'aov' from the 'stats' package version 4.2.0. I calculated a linear mixed model for all plots with area and cutting regime as random effects to test the influence of Brachypodium pinnatum cover on species richness using the function 'lmer' from the 'lme4' package version 1.1.23. For the results of Analysis of Variance Model, I performed post-hoc Tukey tests using the function 'glht' from the 'multcomp' package, version 1.4.17. For the results of the linear mixed model with random effects, I performed post-hoc Tukey tests using the function 'emmeans' from the 'emmeans' package, version 1.7.0. Furthermore, I performed a DCA using the function 'decorana' and to fit the environmental vectors and factors onto the ordination using the function 'envfit' from the 'vegan' package, version 2.5.7. 'Vegan' was also used to calculate species richness, Eveness H', Shannon index J' and Simpson index.

Table 2. Number of vegetation plots according to different cutting regimes and areas.

	Erliweid	Hofstetterweid	Rohmatt	Schleeta	Stückliberg	Tägerst	Number of plots per cutting regime
1 cut per year from 15 July				2		5	7
1 cut per year from 1 August				3			3
1 cut per year from 15 August:					5		5
– 1 cut per year from 15 August					1		1
– 1 cut per year from 15 August, 1/3 remains standing alternately					4		4
1 cut per year from 1 September	5	5	5				15
Number of plots per area	5	5	5	5	5	5	

Table 3. Overview of the assigned clusters with plot ID, areas, cutting regimes (earliest cutting date), assignment to vegetation units according to the habitats of Switzerland of Delarze et al. (2015) by means of assignment according to number Common, Jaccard (Common / Association) and method Eggenberg. Hey to codes: 2.3.1. = *Molinion*, 2.3.3.= *Filipendulion*, 4.2.3. = *Diplachnion*, 4.2.4. = *Mesobromion*, 4.5.1. = *Arrhenatherion*, 5.3.3.= *Pruno-Rubion*, 5.3.4.= Blackberry Scrub, 4. 5.2. = *Polygono-Trisetion*, 5.1.1. = *Geranion sanguinei*, 5.1.2. = *Trifolion medii*, 4.5.3. = *Cynosurion*, 6.2.1. = *Cephalanthero-Fagenion*, 6.2.3. = *Galio-Fagenion*, 6.3.2. = *Tilion platyphylli*. In addition, the assignment according to Pantke et al. (2008) at the level of alliance and association, and assignment by TWINSPAN analysis (Hill 1979) and Modified TWINSPAN analysis (Roleček et al. 2009) with Sorensen dissimilarity index min. 0.3 (Cluster 2: 0.63, Cluster 3: 0.567).

Cluster ID		Plot ID	Area	Number common	Jaccard	Eggenberg	Alliance	Association	Cutting regime
Custer 1		5	Rohmatt	4.5.3.	5.3.4.	4.5.3.	*Berberidion vulgaris*	*Evonymo-Sambucetum nigrae*	1 September
		4	Rohmatt	4.5.2.	6.2.3.	2.3.1.	*Trifolion medii*	*Geranio-Astragaletum glyciphylli prov.*	1 September
		3	Rohmatt	5.1.2.	5.3.3.	5.1.1.	*Berberidion vulgaris*	*Evonymo-Sambucetum nigrae*	1 September
		2	Rohmatt	6.2.3.	6.2.3.	6.2.1.	*Berberidion vulgaris*	*Evonymo-Sambucetum nigrae*	1 September
		1	Rohmatt	5.1.3.	6.3.2.	6.2.3.	*Fagion sylvaticae*	*Circaeo-Abietetum*	1 September
Cluster 2		4	Hofstetterweid	2.3.1.	2.3.1.	2.3.1.	*Molinion caeruleae*	*Calamagrostio-Solidagonetum*	1 September
		5	Hofstetterweid	2.3.1.	6.4.1.	2.3.1.	*Molinion caeruleae*	*Saturejo-Molinietum arundinaceae*	1 September
		3	Hofstetterweid	2.3.1.	2.3.3.	2.3.1.	*Molinion caeruleae*	*Saturejo-Molinietum arundinaceae*	1 September
		2	Hofstetterweid	2.3.1.	2.3.1.	2.3.1.	*Molinion caeruleae*	*Calamagrostio-Solidagonetum*	1 September
		1	Hofstetterweid	2.3.1.	2.3.3.	2.3.1.	*Molinion caeruleae*	*Saturejo-Molinietum arundinaceae*	1 September
		5	Erliweid	2.3.1.	2.3.1.	2.3.1.	*Molinion caeruleae*	*Saturejo-Molinietum arundinaceae*	1 September
		3	Erliweid	4.5.2.	4.5.1.	4.5.1.	*Trifolion medii*	*Colchico-Brachypodietum*	1 September
		2	Erliweid	4.5.2.	4.5.1.	4.5.1.	*Molinion caeruleae*	*Saturejo-Molinietum arundinaceae*	1 September
		1	Erliweid	2.3.1.	4.5.2.	4.5.1.	*Molinion caeruleae*	*Stachyo-Brometum*	1 September
Cluster 3	3a	2	Stückliberg	4.2.4.	4.2.4.	4.2.4.	*Mesobromion*	*Seselio libanotidis-Mesobrometum*	15 August
		4	Erliweid	4.5.2.	4.5.1.	4.5.1.	*Molinion caeruleae*	*Saturejo-Molinietum arundinaceae*	1 September
		4	Stückliberg	4.2.4.	4.5.1.	4.2.4.	*Mesobromion*	*Coronillo-Mesobrometum*	15 August
		4	Schleetal	4.2.4.	4.5.1.	4.2.4.	*Mesobromion*	*Medicago falcatae-Mesobrometum*	1 August
		5	Stückliberg	4.5.2.	4.5.1.	4.2.4.	*Mesobromion*	*Dauco-Salvio-Mesobrometum*	15 August
		3	Stückliberg	4.2.4.	4.5.1.	4.5.1.	*Mesobromion*	*Coronillo-Mesobrometum*	15 August
		1	Stückliberg	4.2.4.	4.5.2.	4.2.4.	*Arrhenatherion elatioris*	*Centaureo dubiae-Arrhenatheretum*	15 August
	3b	5	Schleetal	4.5.1.	4.5.1.	4.2.4.	*Molinion caeruleae*	*Stachyo-Brometum*	1 August
		3	Schleetal	4.5.1.	4.5.1.	4.5.1.	*Mesobromion*	*Inulo conyzae-Mesobrometum*	1 August
		2	Schleetal	4.5.1.	4.5.1.	4.5.1.	*Arrhenatherion elatioris*	*Centaureo dubiae-Arrhenatheretum*	15 July
		1	Schleetal	4.5.1.	4.5.1.	4.5.1.	*Arrhenatherion elatioris*	*Centaureo dubiae-Arrhenatheretum*	15 July
		3	Tägerst	5.1.2.	5.1.2.	4.5.1.	*Trifolion medii*	*Trifolio medii-Agrimonietum*	15 July
		5	Tägerst	4.5.1.	4.5.1.	4.2.3.	*Trifolion medii*	*Trifolio medii-Agrimonietum*	15 July
		4	Tägerst	4.5.1.	4.5.1.	4.5.1.	*Mesobromion*	*Inulo conyzae-Mesobrometum*	15 July
		2	Tägerst	4.2.4.	4.2.3.	4.5.1.	*Mesobromion*	*Inulo conyzae-Mesobrometum*	15 July
		1	Tägerst	4.5.1.	4.5.1.	4.5.1.	*Mesobromion*	*Inulo conyzae-Mesobrometum*	15 July

Table 4. Diagnostic and dominant species ordered by cluster according to TWINSPAN analysis. Individual records are listed on the left, and frequency for the three clusters is listed on the right. Diagnostic species are ordered by decreasing fidelity (fidelity; phi values) within clusters. Superscripts indicate phi values (phi ≥ 0.50, * phi ≥ 0.25, ° phi > 0.00). Diagnostic and common diagnostic species are indicated with thick border lines. Constant species are shown in black, all other species in grey. Dominant species are shown in bold.**

Cluster ID	Custer 1					Cluster 2								Cluster 3							Cluster 3a							Cluster 3b								Freq.	Fid.	Freq.	Fid.	Freq.	Fid.
Area / Plot ID	Rohmatt / 5	Rohmatt / 4	Rohmatt / 3	Rohmatt / 2	Rohmatt / 1	Hofstetterweid /4	Hofstetterweid /5	Hofstetterweid /3	Hofstetterweid /2	Hofstetterweid /1	Erliweid / 5	Erliweid / 3	Erliweid / 2	Erliweid / 1	Stückliberg / 2	Erliweid / 4	Stückliberg / 4	Schleetal / 4	Stückliberg / 5	Stückliberg / 3	Stückliberg / 1	Schleetal / 5	Schleetal / 3	Schleetal / 2	Schleetal / 1	Tägerst / 3	Tägerst / 5	Tägerst / 4	Tägerst / 2	Tägerst / 1	n=5		n=9		n=16							
Diagnostic species Cluster 1																																										
Polygonatum multiflorum	5	1.5	0.4	1	3	.	.	.	1	.	.	.	.	.	.	.	z	.	.	.	.	.	.	.	.	.	.	.	.	100	**	11	°	.	°						
Viola reichenbachiana	0.5	1	0.6	0.3	0.1	.	.	.	.	.	0.01	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	**	11	°	.	°						
Tamus communis	0	0	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	80	**	.	°	.	°						
Glechoma hederacea	0	0	0	.	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	80	**	.	°	.	°						
Prunus spinosa	0.8	0.1	0	0.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	80	**	.	°	.	°						
Fragaria vesca	0.5	0.1	0	0.1	0	.	.	.	.	.	0	.	0	0	.	0	.	.	.	.	.	.	0.5	0.5	1	.	0.1	0.1	0.1	0.1	100	*	33	°	50	°						
Paris quadrifolia	.	0	0.6	0.1	1.5	0.01	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	80	*	11	°	.	°						
Clematis vitalba	0.3	.	1	0.6	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	1	0.5	0.5	1	80	*	.	°	31	°						
Fraxinus excelsior	1	0	0	.	0	.	0	.	.	.	0.1	.	0	0.1	.	0.01	.	.	.	.	.	.	0.1	.	0.1	.	.	.	.	.	80	*	44	°	19	°						
Phyteuma spicatum	0.3	.	.	0.7	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	60	*	.	°	.	°						
Galium mollugo	0.5	0.6	0.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	60	*	.	°	.	°						
Taraxacum officinale aggr.	1	0.6	.	.	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	0.1	60	*	.	°	12	°						
Euphorbia stricta	.	.	.	0.01	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	40	*	.	°	.	°						
Aquilegia atrata	.	.	0.8	0.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	40	*	.	°	.	°						
Galium odoratum	.	0.3	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	40	*	.	°	.	°						
Rubus caesius	4	3	15	15	7.5	1	.	0.1	0	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	°	*	°	44	.						
Carex tomentosa	6	2	0.5	.	2	.	.	0.6	0.5	0.4	0.2	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	80	°	*	°	56	.						
Diagnostic species Cluster 2																																									
Agrostis gigantea	.	.	.	.	.	15	15	23	1	2	.	5	4	12	.	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	89	**	6	°						
Prunella vulgaris	.	.	.	.	.	1.5	.	1	0.3	0.6	3	0.8	1	5	.	0.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	89	**	6	°						
Carex flacca	.	.	.	.	.	1	7	0.5	2	3	1	1	17	2	.	1	0.5	0.1	1	.	0.8	0.5	.	.	.	.	.	0.5	0.1	0.01	.	°	100	*	56	°						
Lathyrus pratensis	1	0.6	.	.	.	0	0.1	0	0	0.8	0.8	1	0.3	1.5	.	0.6	.	0.1	.	.	.	0.1	.	.	.	0.3	.	0.1	0.1	.	40	°	100	*	38	°						
Filipendula ulmaria	.	.	.	.	.	1	.	0.5	1	.	2	0.5	0.8	0.8	.	7	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	°	78	*	12	°						
Potentilla erecta	.	.	0	.	.	0.1	0	0	0.6	0.8	0.5	.	.	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	°	78	*	.	°						
Lysimachia vulgaris	.	.	.	.	2	3	0.4	7	15	5	0.1	0.4	.	.	0.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	°	78	*	6	°						
Cirsium oleraceum	.	.	.	0.3	.	0.1	.	.	0.5	0.5	1	1.5	3	2	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	°	78	*	6	°						
Pimpinella major	.	.	.	.	.	.	.	.	1	4.5	5	3	1.5	2.5	0.7	1.5	0.2	.	.	0.5	0.5	.	.	.	.	.	.	.	.	.	.	°	67	*	31	°						
Angelica sylvestris	.	.	.	.	.	0.5	0.3	.	5	0.2	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	56	*	.	°						
Rhinanthus glacialis	.	.	.	.	.	0.5	0.6	0.5	0.5	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	56	*	.	°						
Equisetum telmateia	.	.	.	.	.	2	0.4	2	1	1	.	.	.	.	.	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	56	*	6	°						
Geum urbanum	.	.	.	.	.	.	0	.	.	.	0.8	.	0.5	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	44	*	.	°						

Table 4. continued

Cluster ID	Custer 1					Cluster 2									Cluster 3																					
															Cluster 3a							Cluster 3b									Freq.	Fid.	Freq.	Fid.	Freq.	Fid.
Area / Plot ID	Rohmatt / 5	Rohmatt / 4	Rohmatt / 3	Rohmatt / 2	Rohmatt / 1	Hofstetterweid /4	Hofstetterweid /5	Hofstetterweid /3	Hofstetterweid /2	Hofstetterweid /1	Erliweid / 5	Erliweid / 3	Erliweid / 2	Erliweid / 1	Stückliberg / 2	Erliweid / 4	Stückliberg / 4	Schleetal / 4	Stückliberg / 5	Stückliberg / 3	Stückliberg / 1	Schleetal / 5	Schleetal / 3	Schleetal / 2	Schleetal / 1	Tägerst / 3	Tägerst / 5	Tägerst / 4	Tägerst / 2	Tägerst / 1	n=5		n=9		n=16	
Carex sylvatica	.	.	.	.	.	2	.	.	0.1	0	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	44	*	.	°
Pteridium aquilinum	.	.	.	.	.	1	5	3	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	44	*	.	°
Euphorbia platyphyllos	.	.	.	.	.	.	0.1	0	.	0	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	44	*	.	°
Colchicum autumnale	.	.	.	.	.	.	.	.	.	.	0.2	0.5	1.5	1	.	.	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	44	*	6	°
Equisetum arvense	.	.	.	.	.	.	.	.	.	.	6	8	7	30	.	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	44	*	6	°
Molinia arundinacea	.	.	.	.	1	2	20	7	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	°	44	*	.	°
Dactylorhiza maculata	.	0.05	0.01	.	.	0.1	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	40	°	44	*	.	°
Galium boreale	.	.	.	.	.	2	2	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	33	*	.	°
Hypericum maculatum	.	.	.	.	.	.	.	2	0.05	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	33	*	.	°
Euphorbia cyparissias	.	.	.	.	.	.	0	1	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	33	*	.	°
Carex panicea	.	.	.	.	.	.	.	.	.	0.4	.	.	3	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	33	*	.	°
Anthericum ramosum	.	.	.	.	.	.	4	.	1	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	33	*	.	°
Linum catharticum	.	.	.	.	.	0	.	.	.	.	0	.	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	33	*	.	°
Deschampsia cespitosa	.	.	.	.	.	.	.	.	.	1	3	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	33	*	.	°
Gymnadenia conopsea /cf	.	.	.	.	.	.	.	0	.	.	0.4	.	0.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	33	*	.	°
Succisa pratensis	.	.	.	.	.	.	.	0.1	0.1	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	°	33	*	.	°
Diagnostic species Cluster 3																																				
Knautia arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	1	0.5	1	1	1	1	1	0.1	1	.	0.7	.	0.3	.	.	°	.	°	81	**
Bromus erectus	.	.	.	.	.	.	2	5	.	7	.	30	.	.	90	15	85	90	93	90	90	87	80	80	95	75	85	90	85	75	.	°	44	°	100	*
Galium album	.	.	.	0.1	.	0.1	0.4	1	0.3	0	0	0	0.5	1	0.1	0.9	0.1	0.1	0.1	0.3	0.2	0.5	0.1	0.1	0.5	0.5	0.3	0.8	0.1	0.1	20	°	100	°	100	*
Centaurea jacea subsp. jacea	.	.	.	.	.	.	.	.	.	.	.	3.5	5	.	0.5	15	0.7	0.5	1.5	2	2	2	0.5	.	2.5	.	2	2	4	4	.	°	22	°	88	*
Leucanthemum vulgare	.	.	.	.	.	.	.	0.1	.	0.2	0.2	0.3	0.6	1	0.5	0.5	0.5	0.5	0.5	0.6	0.8	0.5	0.1	0.5	0.05	1	0.1	.	0.2	.	.	°	67	°	88	*
Lotus corniculatus	.	.	.	.	.	.	.	.	.	.	.	1	0.7	.	0.1	1	0.5	0.1	0.1	0.1	0.2	0.1	.	.	0.1	.	0.3	0.7	.	0	.	°	22	°	75	*
Scabiosa columbaria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1.5	0.1	0.5	1	2	3	.	.	.	.	5	.	2.5	2	.	°	.	°	62	*
Salvia pratensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.5	.	1	1.5	1	1.5	0.3	1	3	.	.	.	.	.	0.8	.	.	°	.	°	56	*
Poa angustifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	.	0.1	0	0	.	0	.	0.1	0.5	.	°	.	°	50	*
Medicago lupulina	.	.	.	.	.	.	.	.	.	.	.	0.01	.	.	.	0.1	0.1	0	0.1	.	.	0.1	.	.	0	.	0	0.1	.	.	.	°	11	°	50	*
Sanguisorba minor	.	1	.	.	.	.	.	.	.	.	.	0.5	.	.	2	0.9	2	0.8	1	2	3	.	.	.	0.5	.	.	.	.	.	20	°	11	°	50	*
Buphthalmum salicifolium	.	.	.	.	.	2	.	.	.	.	.	.	.	.	1	.	0.8	.	1	1.5	0.8	.	.	.	.	.	.	3	.	5	.	°	11	°	44	*
Anemone nemorosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	0.1	0.1	.	0.1	0.01	0.1	.	°	.	°	38	*
Thymus serpyllum aggr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	0.2	.	0.5	0.4	2	.	.	.	.	.	.	.	.	.	.	°	.	°	31	*
Diagnostic species Cluster 1 and 2																																				
Knautia dipsacifolia	1	5	0.8	0.5	0.3	7	2	7	4	7	10	3	4	5	.	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100	*	100	*	6	°
Further relevant species																																				
Brachypodium pinnatum	70	70	70	45	70	45	35	17	25	17	30	10	30	3	1	15	0.5	5	0.5	2	5	1	1	10	0.1	10	1	3	4	2	100	°	100	°	100	°
Molinia caerulea	.	.	.	.	.	.	.	.	3	35	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	°	22	°	12	°

Results

Vegetation classification

The assignment to phytosociological alliances according to Pantke (2008) revealed that most of the study sites can be assigned to *Molinion caeruleae* (litter meadows) and *Mesobromion* (dry or meso-xeric grasslands), with ten and nine study sites respectively. Erliweid and Hofstetterweid were almost exclusively assigned to *Molinion caeruleae*, while Schleetal and Stücklibergseveral were assigned to *Arrhenatherion elatioris* (mesic grasslands). Other single plots in Erliweid, Rohmatt and Tägerst could be assigned to *Trifolion medii* (mesophilous herbaceous margin), *Berberidion vulgaris* (dry warm scrub) or *Fagion* (beech woodland).

However, he assignment to phytosociological alliances according to Delarze et al. (2015) differed fundamentally. Depending on the method, 7 to 14 study plots and thus the clear majority were assigned to *Arrhenatherion*. This alliance was especially characteristic of Schleetal but also occurred in Erliweid, Stückliberg and Tägerst. Using the Jaccard classification, only one plot in Stückliberg could be assigned to *Mesobromion* analogous to the Pantke (2008) classification. With the common number method or Eggenberg method, six plots could be assigned to *Mesobromion*.

The comparison of cutting regimes and alliances according to Pantke (2008) showed that almost all of the plots assigned to *Molinion* are cut late, i.e. at the earliest on 1 September (Table 3). The plots in Rohmatt and Erliweid (which are assigned to forests, shrubs and margins) are also cut late. On the other hand, the plots in Schleetal, Stückliberg and Tägerst, which are assigned to *Mesobromion* as well as *Arrhenatherion elatioris* and *Trifolion medii*, are all cut earlier, i.e. from 15 July, 1 August or 15 August. The only exception was a plot in Schleetal which could be assigned to *Molinion* and is cut on 1 August. According to Delarze et al. (2015), plots assigned to *Arrhenatherion* were detected for all the cutting regimes.

The results of the TWINSPAN analyses are summarised in Table 4. Using a classical TWINSPAN classification, the plots could be divided into four groups. However, a modified TWINSPAN classification showed that only three groups could be identified that exceeded the Sorensen dissimilarity of 0.3 (maximum Sorensen dissimilarity cluster 2: 0.63, cluster 3: 0.567, see Table 3). The first cluster delimited Rohmatt. The second cluster delimited, with one exception, Hofstetterweid (mainly by *Molinion caeruleae* according to Pantke (2008)) and Erliweid (predominantly *Saturejo-Molinietum arundinaceae*). The third cluster included Schleetal, Stückliberg and Tägerst as well as a plot in Erliweid. It contained chiefly *Mesobromion* and *Arrhenatherion elatioris*, but also *Trifolion medii* and *Molinion caeruleae* according to Pantke (2008). This third cluster could be further subdivided by means of the classical TWINSPAN classification into a cluster 3a with mixed associations (found mainly in Stückliberg) and a cluster 3b characterised by *Inulo conyzae-Mesobrometum* (present in Schleetal and Tägerst).

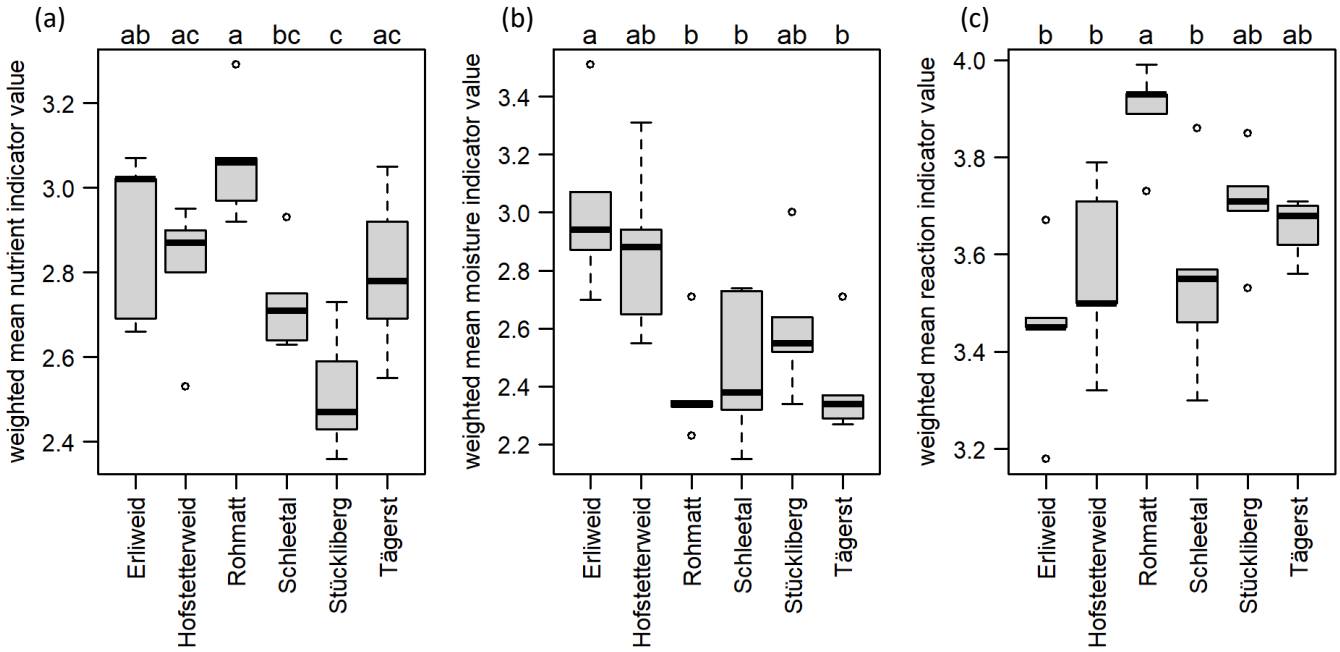

Fig. 2. Box-whisker plots of (a) the indicator weighted means of nutrient value ($p < 0.001$ *, $F_{5,24} = 6.078$, $r^2 = 0.5587$), (b) the indicator weighted means of moisture value ($p = 0.002$**, $F5,24 = 5.292$, $r^2 = 0.5244$), and (c) the indicator weighted means of reaction value ($p = 0.003$**, $F5,24 = 5.063$, $r^2 = 0.5133$) of the different study areas. Lowercase letters denote homogeneous groups on $p < 0.05$ using Tukey's post-hoc test.**

Site conditions

The indicator weighted means of the nutrient value of Erliweid (with 3.0) and Rohmatt (with 3.1) were significantly higher than those of Stückliberg (with 2.5) (p = 0.016*, t = 3.601 and p < 0.001***, t = 5.316, respectively, see Fig. 2a). The indicator weighted means of the moisture value of Erliweid (with 2.9) were also significantly higher than Rohmatt (p = 0.008**, t = 3.914), Schleetal (p = 0.045*, t = 3.142) and Tägerst (p = 0.008*, t =3.889), which all had a mean between 2.3 and 2.5 (see Fig. 2b). For the indicator weighted means of the reaction value significant differences were found between Rohmatt (with 3.9) and Erliweid (p = 0.001**, t = 4.674), Hofstetterweid (p = 0.024*, t = 3.427), and Schleetal (p = 0.026*, t = 3.393) with means of about 3.5 (see Fig. 2c).

Ordination

In the DCA, the 1st and 2nd axes of the DCA could account for most of the species composition (eigenvalues: 0.5980 and 0.1714). The gradient length of the first axis was 2.3411 SD and of the second axis 1.4556 SD. Some of the variables used had significant influence (see Table 5, Fig. 3 above).

Diversity of the areas

A total of 178 species of vascular plants were detected. Fig. 4 shows that the study area plots differed significantly with respect to their species richness (p < 0.001***, $F_{5,24}$ = 18.36, r^2 = 0.7928). Erliweid and Hofstetterweid were significantly richer in species on average with 41.8 and 36.4 species, respectively, than Rohmatt with 26.4 species (p < 0.001***, t = 7.345 and p > 0.001***, t = 4.770), Schleetal with 27.0 species (p < 0. 001***, t = 6.655 and p = 0.004**, t = 9.400), Stückliberg with 29.3 species (p < 0.001***, t = 6.211 and p = 0.019*, t = 7.067) and Tägerst with 26.6 species (p < 0.001***, t = 7.250 and p = 0.001**, t = 9.800) (see Fig. 4). Plots at Erliweid and Rohmatt showed a lower variability of species numbers, both for the minimum and maximum values and the standard deviation. In contrast, plots at Hofstetterweid and Tägerst showed a high variation of species numbers.

Also, for the biodiversity indices evenness (p < 0.001 ***, $F_{5,24}$ = 69.08, r^2 = 0.935), the Shannon index (p < 0.001 ***, $F_{5,24}$ = 89.5, r^2 = 0.9491) and the Simpson index (p < 0.001 ***, $F_{5,24}$ = 69.67, r^2 = 0.9355) significant differences were found between the sites (see Fig. 5a–c). Thus, the more species-rich Erliweid and Hofstetterweid had a significantly higher equal distribution of species (evenness) than the other sites. Rohmatt occupied a middle position in all three biodiversity measures tested and differed significantly from all the other areas.

One Red List species, *Ophrys apifera*, with vulnerable status (VU = vulnerable, see Bornand et al. 2016) was detected in the Schleetal area (see Fig. 6).

Brachypodium pinnatum

A linear mixed model with area and cutting regime as random effects showed that the cover of *Brachypodium pinnatum* had a significant effect on species richness, which decreased by 0.26 species per one percent of *Brachypodium pinnatum* cover (p = 0.011*, t = 7.085, r^2 = 0.35) (see Fig. 7a). The effect was not stronger, but more pronounced, when the model was restricted to study plots with the earliest cutting date of 1 September. Also in this case, species richness decreased significantly by 0.22 species per one percent of *Brachypodium pinnatum* cover with increasing cover of *Brachypodium pinnatum* (p = 0.004**, t = 7.901, r^2 = 0.66) (see Fig. 7b).

Table 5. Results of the DCA: influence of individual variables used on the 1st axis (DCA1) and 2nd axis (DCA2) as well as coefficient of determination (r^2) and significance (p).

		DCA1	DCA2	r^2	p	
N	Slope (°)	0.95237	-0.30494	0.2404	0.029	*
E	Exposure (°)	0.13401	0.99098	0.5424	0.001	***
pH	Soil pH	-0.46636	-0.8846	0.2008	0.042	*
gNZ	Weighted mean values of the nutrient indicator value	0.69452	-0.71947	0.4531	0.001	***
gRZ	Weighted mean values of the reaction indicator value	0.38432	-0.9232	0.0346	0.613	
gFZ	Weighted mean values of the moisture indicator value	0.85288	0.52211	0.0738	0.349	
Bra.pi	Cover of *Brachypodium pinnatum* (%)	0.87215	-0.48924	0.727	0.001	***
Sz	Cutting regime (earliest cutting date):			0.7789	0.001	***
Sz 15.7	From 15. July	-1.0521	0.2555			
Sz 1.8	From 1. August	-1.1631	0.2697			
Sz 15.8	From 15. August	-1.1371	0.2425			
Sz 1.9	From 1. September	1.1852	-0.2727			

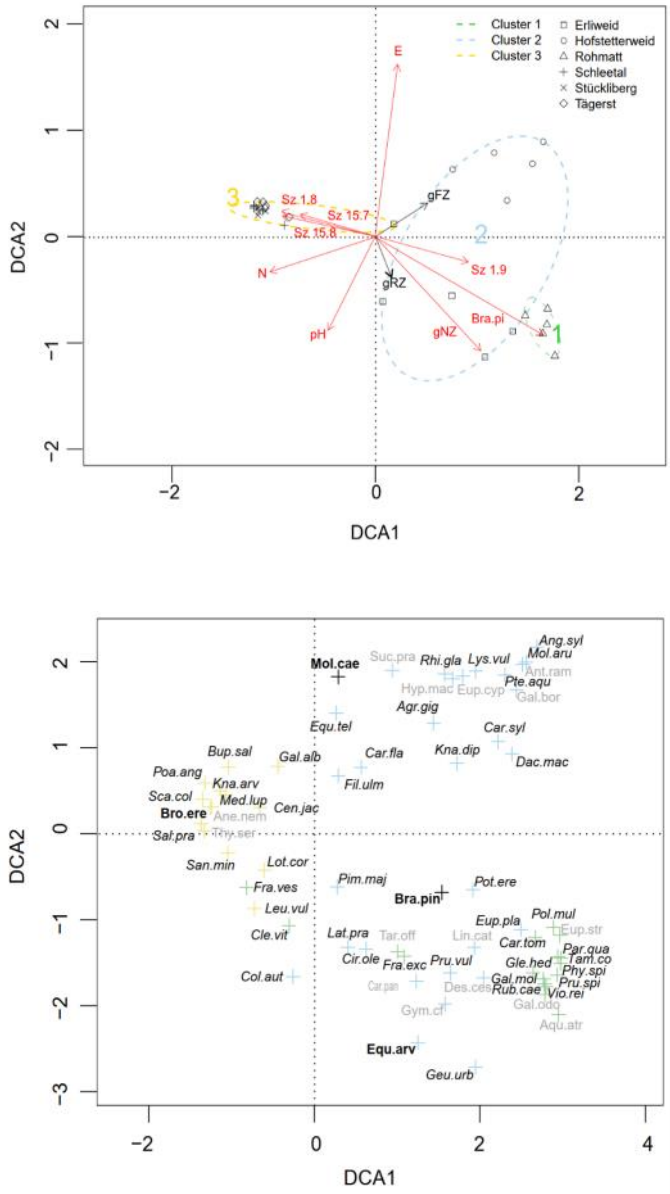

Fig. 3. Top: DCA ordination of 30 vegetation plots in six areas (shown by different symbols). The coloured ellipses indicate the affiliation to the clusters according to TWINSPAN analysis. The correlation with variables between the two ordination axes is shown by arrows (slope (°) (N), aspect (°) (E), soil pH (pH), cutting regime as earliest cutting date (Sz+date), indicator weighted means of nutrient value (gNZ), indicator weighted means of reaction value (gRZ), indicator weighted means of moisture value (gFZ) and cover of *Brachypodium pinnatum* (%) (*Bra. pi*)), with significant variables shown in red (see Table 5). Bottom: Diagnostic species of cluster 1 (+), cluster 2 (+) and cluster 3 (+) according to TWINSPAN analysis. Constant species are shown in italics and black, all other species in grey. Dominant species are shown in bold. The first three letters of genus and species are separated by a dot. The complete species names can be taken from Table 4.

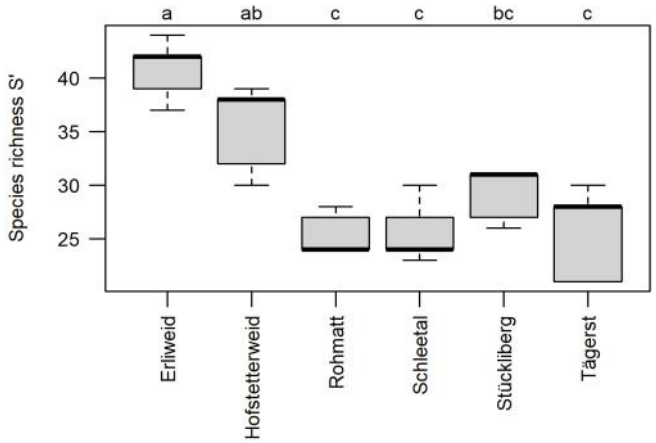

Fig. 4. Box-whisker plots of species richness S' ($p < 0.001$ *, $F_{5,24} = 11.89$, $r^2 = 0.7123$) of the different study sites. Lowercase letters denote homogeneous groups on $p < 0.05$ using Tukey's post-hoc test.**

Discussion

Vegetation classification

Cluster 1, at Rohmatt, is differentiated primarily by the presence of numerous forest species. It is strongly characterised by the forest edge situation and shading, which is why no assignment to a grassland alliance was possible. For clusters 1 and 2, *Knautia dipsacifolia* could also be identified as a diagnostic species, being a characteristic species within the alliance *Trifolion medii* (Oberdorfer & Müller 1977). It clearly shows the influence of the forest edge situation on the corresponding study plots and areas. *Carex tomentosa* should be emphasized as a constant differential species. Koch (1926) described this species as the denominated differential species for the *Molinietum caricetosum tomentosae*, which is distinguished by lower soil moisture within the *Molinietum caeruleae*.

For cluster 2, *Filipendula ulmaria* and *Galium boreale*, among others, could be identified as differential species, which Oberdorfer & Görs (1983) refer to as differential species of the alliance *Molinion caeruleae*. The other differential species *Prunella vulgaris*, *Carex flacca*, *Lathyrus pratensis*, *Potentilla erecta*, *Lysimachia vulgaris*, *Linum catharticum*, *Deschampsia cespitosa*, *Gymnadenia conopsea* and *Succisa pratensis* are described by Klötzli (1969) as common species of litter meadows in the narrow sense.

Bromus erectus, which was recognized as a constant and dominant differential species of cluster 3, is considered a class character species of *Festuco-Brometea*, which includes the alliance *Mesobromion erecti* (Oberdorfer & Korneck 1976). *Scabiosa columbaria* was also identified as a differential species of cluster 3 and is referred to by Oberdorfer & Korneck (1976) as a differential species of the alliance *Mesobromion erecti*. Pictures of some of these diagnostic species are shown in Fig. 8.

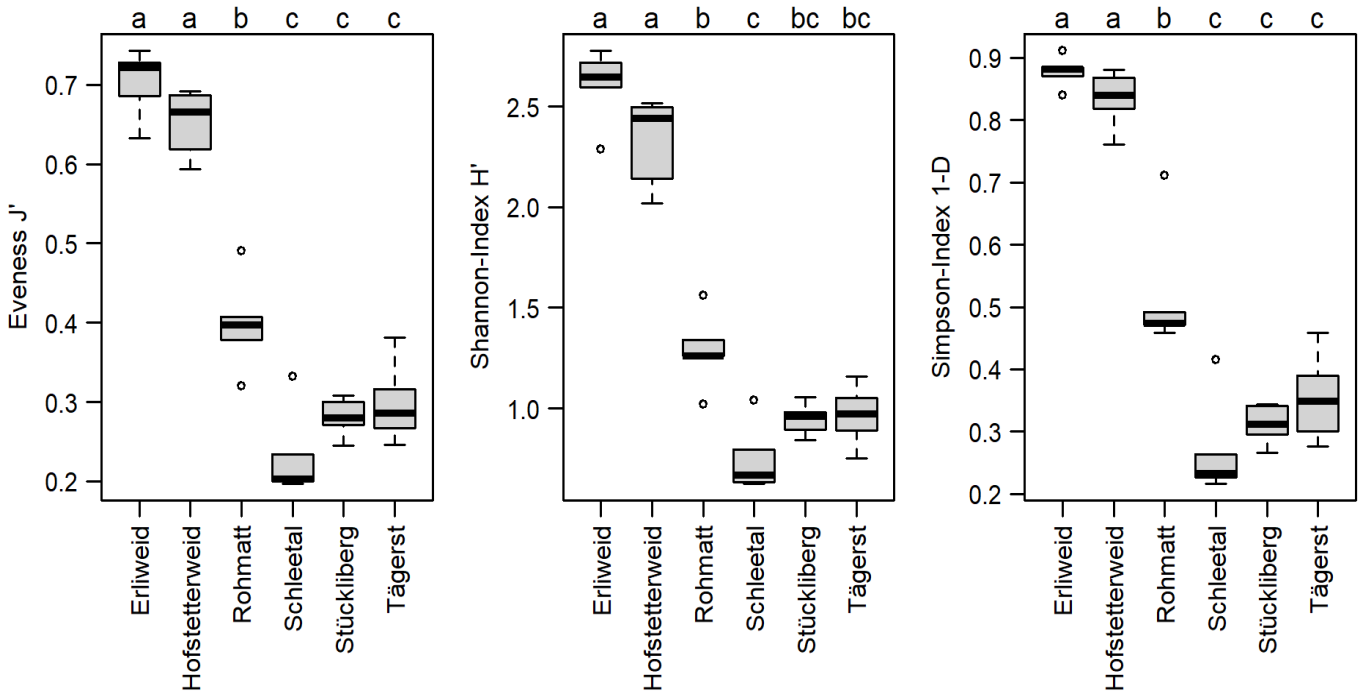

Fig. 5. Box-whisker plots of (a) the equal distribution of species (evenness H') ($p < 0.001$ *, $F_{5,24} = 45.42$, $r^2 = 0.9044$), (b) the Shannon index J' ($p < 0.001$ ***, $F_{5,24} = 46.68$, $r^2 = 0.9068$), and (c) the Simpson index 1 – D of the different sites. Lowercase letters denote homogeneous groups on $p < 0.05$ using Tukey's post-hoc test.**

The alliances *Molinion* and *Mesobromion* assigned according to Pantke (2008) thus seem to be quite justified for Cluster 2 (at Erliweid and Hofstetterweid) and Cluster 3 (with one exception, at Schleetal, Stückliberg and Tägerst), respectively. Interestingly, one plot at Erliweid, which was assigned to *Molinion* according to Pantke (2008) was assigned to cluster 3, which suggests transitions between the areas and syntaxa. The rather low occurrence of indicator species of moistness and wetness, as well as the frequent occurrence of indicator species of moderate dryness, show that the plots of cluster 2 probably belong to a drier to variable formation of the *Molinion*. The frequent assignment to the *Saturejo-Molinietum arundinaceae*, which grows on non-flooded soils and occurs in a dry formation on terrain crests (Klötzli et al. 1973), fits this pattern. It is also evident in the low occurrence of the alternating wetness indicator *Molinia caerulea* but the dominance of the indicator for alternating dryness *Brachypodium pinnatum*. However, this could also be a result of the land use history since Oberdorfer & Korneck (1976) describe at least for the dry meadows that grazing can lead to the displacement of *Bromus erectus* in favour of *Brachypodium pinnatum*. As mentioned in the introduction at least Erliweid and Hofstetterweid may have been grazed for a long time based on their field names. For cluster 3, the frequent assignment to Inulo *conyzae-Mesobrometum* seems quite appropriate. The formation is generally found on steep, dry, south to east facing slopes and was often unused in past decades. This leads to a herb layer rich in grasses and a deep litter layer, which limits the spread of light-demanding species (Keel 1993).

The *Molinion* and *Mesobromion* alliances, assigned according to Pantke (2008) and confirmed by the TWINSPAN analysis, are scarce habitats in Switzerland and are listed as highly endangered (EN) and vulnerable (VU), respectively (Delarze et al. 2016). Both natural habitats are also covered by the Federal Ordinance on the Protection of Nature and Cultural Heritage. Nevertheless, according to Delarze et al. (2015), regardless of the method chosen, assignment to *Arrhenatherion* was more frequent. This habitat type is not

Fig. 6: *Ophrys apifera* in Schleetal. Photo: P. Schmid.

endangered (LC) or vulnerable (VU), depending on its composition, and is not covered by the Federal Ordinance. Thus, the diverging classification of *Mesobromion* or *Molinion* and *Arrhenatherion* could well have consequences, e.g. in expert assessments of habitat protection status in the context of construction projects. In the present case, the results from the Eggenberg method and that using the number of common species are very similar, and apparently more robust than the results from the Jaccard method.

Site conditions

The vegetation of Erliweid and Hoffstetterweid is mostly assigned to *Molinion caeruleae* according to Pantke (2008). They have weighted means of the nutrient value of 3.0 and 2.9, respectively, which is in agreement with a mean of 3.0 derived from the data of Bergamini et al. (2019) for wet grasslands in the Swiss lowlands. The same is true for the study plots at Rohmatt which have with a mean of 3.1. Schleetal and Tägerst could not be identified as significantly poorer in nutrients, but with a weighted mean nutrient value of 2.7 and 2.8, respectively, they are closer to the 2.7 mean ascribed to the dry grasslands of Swiss lowlands (Bergamini et al. 2019). Stückliberg has a weighted mean nutrient value of 2.5, which is significantly more nutrient-poor than Erliweid and Rohmatt, and is even drier than the dry grasslands in the Swiss lowlands; it is probably more comparable to dry grasslands throughout Switzerland with a mean of 2.5 (Bergamini et al. 2019).

For the weighted means of the moisture level, the drier areas of Rohmatt, Schleetal, Stückliberg and Tägerst with values between 2.3 to 2.5 are similar to the 2.4 mean for dry grasslands according to Bergamini et al. (2019). However, the significantly moister sites of Erliweid with 2.9 and Hoffstetterweid with 2.8 are clearly distinct from the 3.6 mean for wet grasslands in the Swiss lowlands according to Bergamini et al. (2019).

In summary the Erliweid and Hofstetterweid sites are moister and less alkaline. At least for Hofstetterweid this can be traced back to geological conditions due to the hanging clay. They contrast with the drier and more basic sites of Rohmatt, Schleetal, Stückliberg, and Tägerst, with Stückliberg having the lowest nutrient level and Rohmatt the highest.

Ordination

The gradient of the cutting time is clearly visible, which separates Schleetal, Stückliberg and Tägerst in cluster 2 (with an early first cutting date) from Erliweid, Hofstetterweid in cluster 3 and Rohmatt in cluster 1 (with a later first cutting date). Similarly, the weighted mean indicator values of nutrient level and the cover of *Brachypodium pinnatum* increases, while the slope decreases. The exposure and the pH of the soil mainly distinguished Erliweid and Hofstetterweid, although they are combined in cluster 2. The separation of Schleetal, Stückliberg and Tägerst from Erliweid, Hofstetterweid and Rohmatt is clear. Schleetal, Stückliberg and Tägerst cannot then be further differentiated, while Erliweid, Hofstetterweid and Rohmatt are relatively distinct. However, TWINSPAN produced three clusters, though the assignment of just one plot at Erliweid to cluster 1 is surpris-

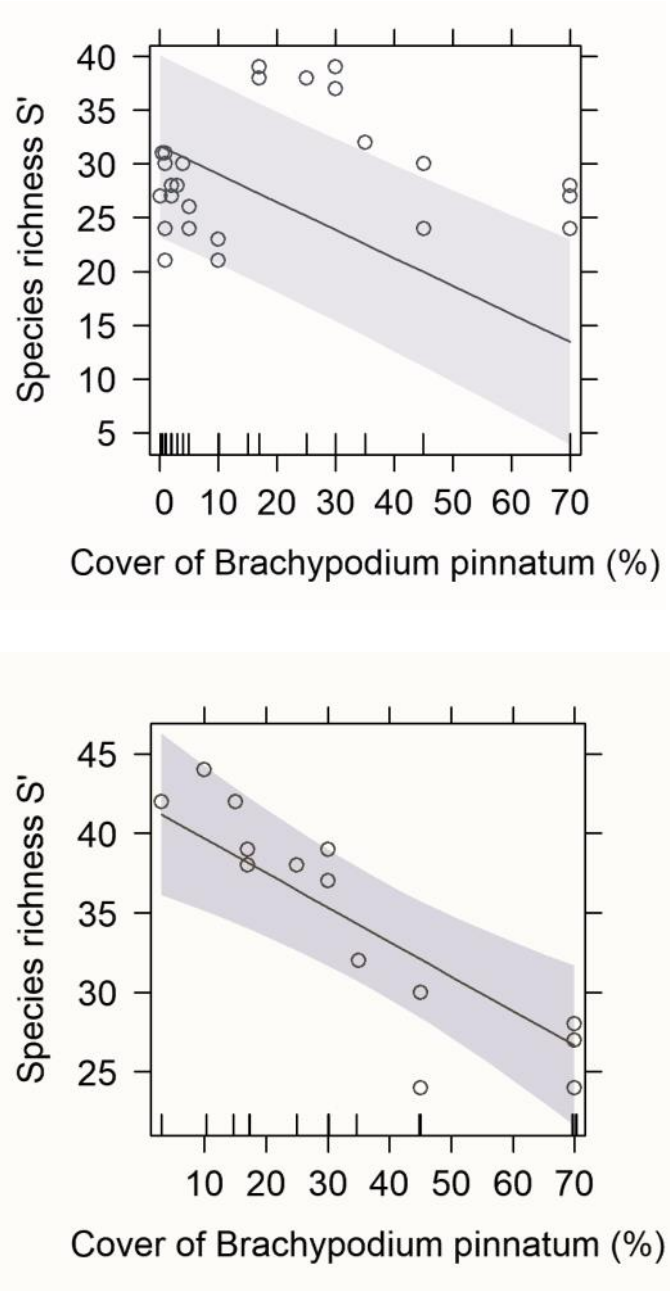

Fig. 7. Partial regression plots showing the regression equation (with 95% confidence interval) of species richness S' and cover of *Brachypodium pinnatum* (%) with the assumption that other factors remain constant for (a) a model across all study plots and (b) a model for the late -cut study plots only.

Table 6. Sample size as well as minimum, 1st quantile, mean, median, 3rd quantile, maximum and standard deviation of number of species of the study plots (10 m^2) at individual sites, and alliances according to Pantke et al. (2008) as well as Swiss reference plots of corresponding associations (Biurrun et al. 2019, 2021; GrassPlot Diversity Explorer 2020a, 2020b, 2020c).

	n	Min	Q1	Mean	Median	Q3	Max	Std.Dev
Area								
Erliweid	5	38.0	40.0	41.8	43.0	43.0	45.0	2.8
Hofstetterweid	5	31.0	33.0	36.4	39.0	39.0	40.0	4.1
Rohmatt	5	25.0	25.0	26.4	25.0	28.0	29.0	1.9
Schleetal	5	24.0	24.8	27.0	26.5	28.8	31.0	3.2
Stückliberg	5	25.0	27.3	29.3	30.0	32.0	32.0	3.1
Tägerst	5	22.0	22.0	26.6	29.0	29.0	31.0	4.3
Alliance								
Arrhenatherion elatioris	3	23.0	24.5	25.3	26.0	26.5	27.0	2.1
Berberidion vulgaris	3	24.0	24.0	25.0	24.0	25.5	27.0	1.7
Fagion sylvaticae	1	24.0	24.0	24.0	24.0	24.0	24.0	NA
Mesobromion	9	24.0	28.0	28.9	30.0	31.0	31.0	2.4
Molinion caeruleae	10	24.0	33.3	36.1	38.0	39.0	42.0	5.7
Trifolion medii	4	21.0	21.0	28.5	24.0	32.0	44.0	10.9
Reference (Biurrun et al. 2019, Biurrun et al. 2021, GrassPlot Diversity Explorer 2020 a, b, c)								
Mesobromion (meso-xeric)		10.0	31.0	38.9	38.0	46.0	68.0	10.9
Arrhenaterion (mesic)		5.0	28.0	36.2	37.0	44.0	73.0	12.5
Molinion (wet)		8.0	22.0	31.3	32.0	40.0	66.0	12.0

ing. The clear separation of the three clusters also reflected the distribution of the diagnostic species for each cluster in the ordination diagram.

Species diversity of the areas

Overall, 10.1% of the core flora of the canton of Zurich (able to survive in nature over several generations without human intervention including extinct and lost species, Wolgemuth et al. 2020) and 4.8% of all wild species known in Switzerland and border areas (Juillerat et al. 2017) occur on the study sites. Table 6 shows that most sites and most of the plots which are assigned to *Mesobromion* are on average less species-rich compared to the Swiss references (Biurrun et al. 2019, 2021; GrassPlot Diversity Explorer 2020a, 2020b, 2020c) for the corresponding most frequently assigned associations. By contrast, the flora of Erliweid and Hofstetterweid, which could be mainly assigned to *Molinion caeruleae*, are on average rather more species-rich than the references. However, none of the sites are particularly species-rich or species-poor. A comparison with the biotopes of national importance in the Swiss lowlands shows that the mean values at 10 m2 for both dry grasslands with 31.9 species and wet meadows with 34.7 species (Bergamini et al. 2019) are higher than in the study sites with the exception of Erliweid and Hofstetterweid. Nevertheless, the mean number of species in the sites is higher than the mean of 24 species determined for herbaceous meadows in dry meadows and pastures of national importance (Bergamini et al. 2019).

Impact of *Brachypodium pinnatum*

The negative effect demonstrated on species diversity of increasing cover of *Brachypodium pinnatum* confirms the results of Antognoli et al. (1995), Maubert & Dutoit (1995, according to Dipner et al. 2010) and Hurst & John (1999). In general, it appears that a later cutting time or the omission of a cut leads to an increase of dominant grass species, such as *Brachypodium pinnatum*, and a corresponding decrease of herbs (Bobbink et al. 1988; Hurst & John 1999; Köhler et al. 2005; Peter et al. 2010).

Recommendations

These results should primarily serve as an overview for the VNU of the floristic diversity of the study sites. In the long term, they could also serve as a basis for monitoring the plant diversity of the sites as well as the effects of possible future changes in management or further measures taken in favour of biodiversity conservation.

However, the results should be treated with caution, as the comparison of different areas, cutting regimes and alliances involves methodological difficulties. Furthermore, a high degree of stratification took place through the selection of areas of the VNU, which are often integrated into larger nature reserves. In terms of ecological gradients, parcel boundaries do not represent meaningful delineations. Accordingly, it would be interesting to extend the study to other areas of the region. Nevertheless, the results can be valuable not only locally but for protection of other grasslands in the region and similar grasslands in adjacent areas. Based on these results and various studies showing that species diversity tends to decrease due to underuse (Köhler 2001; Köhler et al. 2005; Peter et al. 2010), at least as a trial management in terms of cutting regime in certain areas of the region could be adjusted. Thus, Dipner et al. (2010) according to Maubert & Dutoit (1995) recommend intervening when the cover *Brachypodium pinnatum* reaches 50%, as grasses are very difficult to push back once they have become dominant. That threshold is already reached in four plots at the study sites.

For Erliweid, Rohmatt and Hofstetterweid, i.e. clusters 1 and 2, the cutting time could be adjusted to reduce the dominance of *Brachypodium pinnatum* by alternating a cutting date as early as July or a late cutting date in October every two years (Köhler et al. 2005). Since the alliances are stands of Molinion and the cutting date is already in September, it would be more effective to try to mow the areas significantly earlier every two years.

For Schleetal, Stückliberg and Tägerst, i.e. Cluster 3, an additional late cut (not shifting the date of an earlier cut) could reduce the dominance of *Bromus erectus* (Köhler et al. 2005; Peter et al. 2010; Humbert et al. 2012).

In Rohmatt, its location and characteristics at the forest edge should be taken into account when considering management options. In the plots and the wider area, light-demanding species of dry-warm locations such as *Orchis purpurea* and *Cypripedium calceolus* were present. To promote these typical species of open canopy forests, scrub encroachment and litter cover should be reduced. In addition to an additional cut, for *Orchis purpurea* and potentially other typical orchid species, grazing with goats from August onwards could be considered, while for *Cypripedium calceolus*, clearing shrubs and thinning forest stands but no grazing would be effective management options (Sigrist 2020).

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Fig. 8. From left to right: *Carex tomentosa, Gymnadenia conopsea* and *Scabiosa columbaria* as differential species of clusters 1, 2 and 3. Photos: P. Schmid.

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Grasslands and coastal habitats of Southern Ukraine: First results from the 15th EDGG Field Workshop

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Abstract: The 15th EDGG Field Workshop took place from 24 May to 3 June 2021 in Southern Ukraine (Kherson and Mykolaiv administrative regions). Over 10 days, we sampled different types of grasslands, mainly focusing on dry grasslands of the classes *Festuco-Brometea, Koelerio-Corynephoretea canescentis*, and *Festuco-Puccinellietea* (steppic, sandy and saline, respectively) but also taking into account other open habitats, such as mesic grasslands and dunes. In total, we sampled 50 nested-plot series with 7–8 grain sizes from 1 cm2 to 100 m2 and, in some cases, up to 1000 m2 ("EDGG Biodiversity Plots"), plus 74 additional normal plots of 10 m2 . We comprehensively sampled vascular plants as well as terricolous bryophytes and lichens, and, for the first time also Sciaridae (Diptera, Insecta). One vascular plant species (*Torilis pseudonodosa*), as well as two lichen species (*Cladonia conista* and *Endocarpon loscosii*), were recorded for the first time from Ukraine. Two species of moss (*Rhynchostegium megapolitanum* and *Ptychostomum torquescens*) and three species of lichen (*Cladonia cervicornis, C. symphycarpa*, and *Involucropyrenium breussi*) were reported for the first time for the Kherson region. We summarize the scale-dependent richness values and compare them with those from other studies. The report concludes with a photo diary with impressions from the Field Workshop.

Keywords: biodiversity; bryophyte; coastal habitat; grassland; lichen; nested plot; sandy grassland; species richness; steppe; syntaxonomy; Ukraine; vascular plant.

Nomenclature: Euro+Med (2006-2021) for vascular plants, Boiko (2014) for bryophytes, Kondratyuk et al. (2021) for lichens and lichenicolous fungi; Mucina et al. (2016) for syntaxa.

Abbreviations: EDGG = Eurasian Dry Grassland Group; FW = Field Workshop; NNP = National Nature Park; RLP = Regional Landscape Park.

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Introduction

One of the most prominent activities of the Eurasian Dry Grassland Group (EDGG) are Field Workshops (FWs). These are research expeditions that aim to collect high-quality phytodiversity data in different types of grasslands and other open habitats throughout the Palaearctic, applying the standard EDGG methodology, including nested-plot sampling (Dengler et al. 2016, 2021). They take place in different countries once or twice per year. Since the first FW in Transylvania (Romania) in 2009 (Dengler et al. 2012), and up until 2020, the EDGG has organized 14 of these events. A series of papers has already been published based on the results of the FWs. Among them, there are regional syntaxonomical surveys (Dengler et al. 2012; Pedashenko et al. 2013; Kuzemko et al. 2014; García-Mijangos et al. 2021; Magnes et al. 2021) and regional studies of patterns and drivers of plant diversity (Turtureanu et al. 2014; Kuzemko et al. 2016; Polyakova et al. 2016; Dembicz et al. 2021b). Additionally, data from the FWs represent a relevant part of the "GrassPlot" database (Dengler et al. 2018; Biurrun et al. 2019) and have been used for several overarching papers dealing with alpha and beta diversity on the continental scale (Dengler et al. 2020a; Biurrun et al. 2021; Dembicz et al. 2021a, 2021c; Zhang et al. 2021).

In 2021, two more Field Workshops were held aiming to sample grasslands in Southern Ukraine (15th FW) and alpine habitats in Switzerland (16th FW). The 15th was the second FW organized in Ukraine. The first was in 2010 in Central Podolia, Vinnytsia region, which is located in the Forest-Steppe zone (Barbarych 1977). The main focus then was on dry grasslands, mainly meadow steppes and rocky grasslands (Kuzemko et al. 2014, 2016). During the second Ukrainian FW, we conducted sampling in the southern part of the steppe zone (Kherson and Mykolaiv regions), focusing mainly on dry grasslands (desert steppes, bunchgrass steppes, saline and sandy grasslands), but other vegetation types - mesic grasslands, dunes and saline communities - were also included in our survey:. For the first time in the history of the EDGG FWs, we sampled a few 1000-m² plots in addition to the seven standard grain sizes of 0.0001–100 m², as recommended in the second amendment of the standardized EDGG sampling methodology (Dengler et al. 2021). Also, for the first time, Sciaridae (Diptera, Insecta) were recorded during the event.

In this report, we give an overview of the sampling and present initial data on first records for species and scale-dependent biodiversity values. The report concludes with an extensive photo diary summarizing the impressions.

The 15th EDGG Field Workshop

The Field Workshop was attended by 20 participants from four countries (Ukraine, Italy, Poland and Switzerland) (Fig. 1). The majority of the participants had experience of vegetation sampling. In addition, our team included experts in the taxonomy of the genus *Festuca*, lichens, bryophytes, and also of the family Sciaridae (Diptera). Along with nested -plot series, we sampled so-called "normal" vegetation plots of 10 m2. In each 10-m2 plot (i.e., normal plots + subplots of nested series), several environmental and structural parameters were recorded including cover of vegetation layers and of litter, slope, aspect, inclination, maximum microrelief, soil depth, etc. In addition, we also sampled soil and above-ground biomass of four fractions: necromass, living

Fig. 1. Above: Participants of the 15th EDGG Field Workshop during the first day in meadows dominated by *Ventenata dubia* ("Chorna Dolyna'' steppe depression). Photo: J. Dengler. Below: Participants of the Field Workshop near Syvash Lake. Photo: D. Vynokurov.

bryophytes and lichens, living herbs and living woody species using a circle-shaped frame of 0.25 m2.

During the Field Workshop, the so-called "dark-winged fungus gnats" (family Sciaridae, order Diptera, class Insecta) were collected inside the plots and their surroundings within the same habitat by non-accounting sweep-netting. Sciarid imagos were picked with an aspirator, killed in ethyl acetate vapor, transferred into 5 ml vials and stored in 70% ethanol. In the laboratory, male specimens were dehydrated in absolute ethanol and mounted on slides in Euparal.

During 10 days of intensive sampling, we studied different types of grasslands in two administrative regions of Ukraine, i.e., Kherson and Mykolaiv oblasts (Fig. 2, Table 1). Except in a few cases, we worked in nature protected areas: Black Sea Biosphere Reserve, and five national nature parks (NNP): Azov-Syvash, Dzharylgach, Biloberezhzhia Sviatoslava, Oleshkivski Pisky and Kamians'ka Sich.

This area is situated in the central-southern part of the Black Sea Lowlands in the southern part of the steppe zone of Ukraine, within two geobotanical belts using the national classification system (Barbarych 1977); namely sagebrush-fescue-steppes (or desert steppes) and fescue-feathergrass-steppes (or bunchgrass steppes). The climate of the study area is characterized by hot summers with a long dry period and short mild winters with little snow cover. The average annual precipitation is about 380 mm. The average temperature of the warmest month (July) is 23–24°C (maximum 39°C; the average temperature of the coldest month (January) ranges from -1 to -4°C (minimum -31°C) (Marynych & Shyshchenko 2005). In the belt of the desert steppes, the soils are mainly dark kastanozems occurring in in combination with saline soils. In the belt of bunchgrass steppes, they are southern chernozems with low amounts of humus and alluvium of the sand terraces of the new and older riverbeds of the Dnipro River (Skliar & Hil'chenko 1969).

In total, we sampled 50 nested-plot series (EDGG Biodiversity Plots) with 7 grain sizes from 1 cm^2 to 100 m^2, in 16 cases with an 8th grain size of 1000 m^2, and 74 additional "normal" plots of 10 m^2. When the 10-m^2 subplots from the nested-plot series are included, a total of 174 10-m^2 plots were sampled. Compared to the previous EDGG Field Workshops, this makes the 15th Field Workshop the most productive in terms of the number of EDGG biodiversity plots recorded, followed by the ones in Khakassia, Russia (39) and Navarra, Spain (35). Moreover, this year's event ranks second with respect to the number of 10-m^2 plots sampled, after the 2nd Field Workshop in Central Podolia, Ukraine (226) and followed by 12th Field Workshop in Switzerland (142).

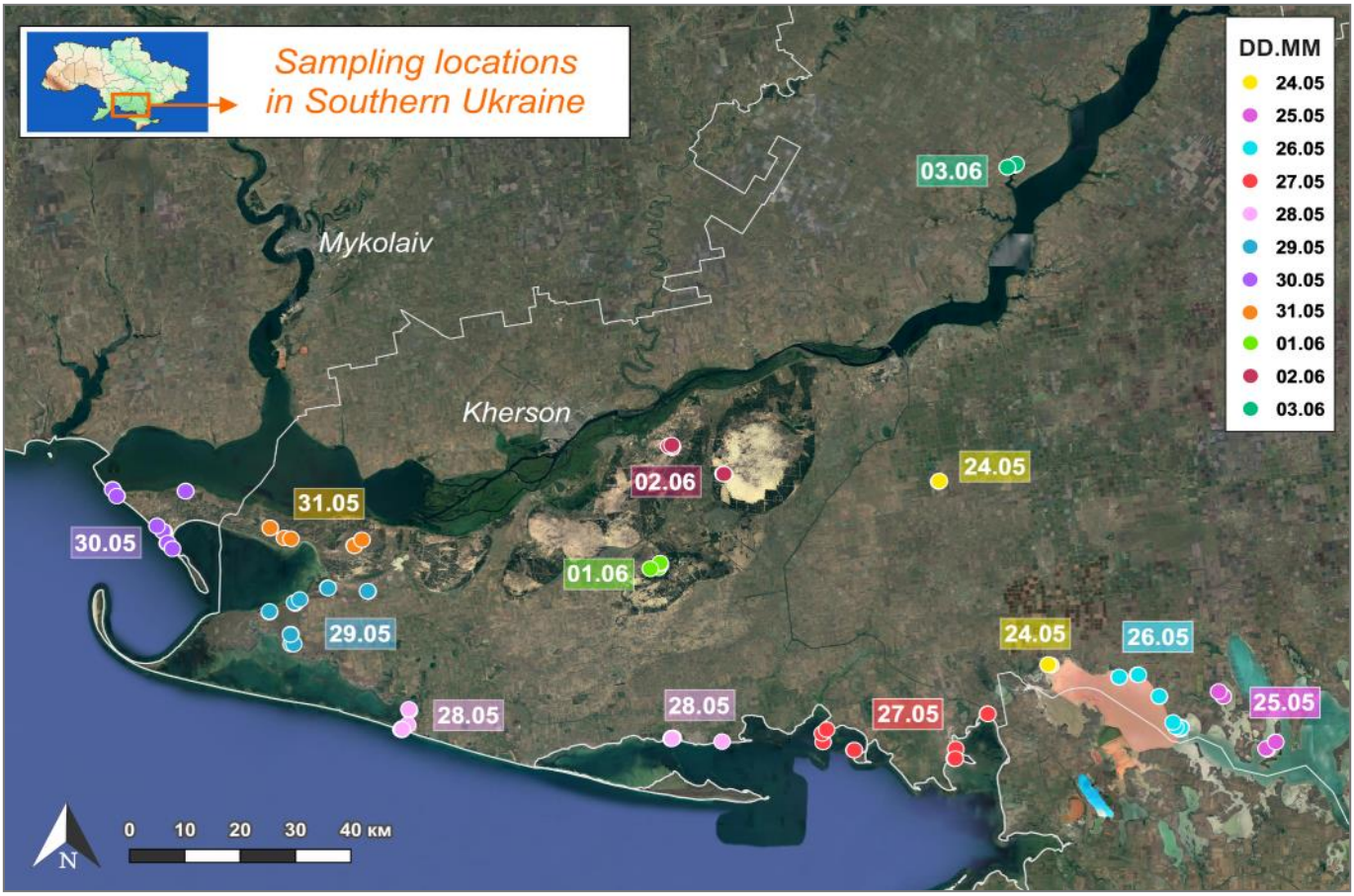

Fig. 2. Map of the study region showing sampling localities. Base map: ©2021 Google (satellite image) and ©www.minregion.gov.ua (administrative boundaries). Prepared by D. Shyriaieva.

Table 1. Sampling sites studied during the 15th EDGG Field Workshop 2021 in Ukraine (A – number of EDGG Biodiversity Plots, B – number of additional 10-m² plots, C – total number of 10-m² plots considering those from biodiversity series, D - number of 1000 m² plots). The location of the sites is shown in Fig. 2. NPP - National Nature Park. Protected areas marked with an asterisk (*) are projected.

Date	Region (oblast)	Protected area	Site location	Vegetation type	A	B	C	D
24 May	Kherson	"Chorna Dolyna" Landscape Reserve (*)	Pid "Chorna Dolyna"	Steppe depression (pody)	2	0	4	1
24 May	Kherson	"Western Syvash" Landscape Reserve (*)	Pershokostyantynivka	Desert steppe	2	2	6	1
25 May	Kherson	Azovo-Syvash NNP	Churiuk Island	Desert steppe, bunchgrass steppe	2	4	8	1
25 May	Kherson	-	Vasylivka, Zelenovsky Island	Desert steppe, bunchgrass steppe	3	1	7	0
26 May	Kherson	"Western Syvash" Landscape Reserve (*)	Vasylivka, Kutara Cape	Desert steppe	3	6	12	1
26 May	Kherson	"Western Syvash" Landscape Reserve (*)	Ivanivka, Berezina Cape	Desert steppe, saline grassland	2	4	8	0
27 May	Kherson	"Peninsula Mala Kosa" Landscape Reserve (*)	Oleksandrivka, Mala Kosa, Stavky	Bunchgrass steppe	2	1	5	0
27 May	Kherson	"Sofia`s Steppe" Landscape Reserve (*)	Khorly Peninsula	Bunchgrass steppe	1	4	6	0
27 May	Kherson	"Karadai" Landscape Reserve (*)	Karadai Peninsula	Bunchgrass steppe, subsaline steppe	1	2	4	1
28 May	Kherson	Dzharylhach NNP	Skadovs'k	Subsaline steppe, desert steppe	2	5	9	1
28 May	Kherson	Black Sea Biosphere Reserve	Potiivska site	Subsaline steppe, dune and saline grassland	3	6	12	1
29 May	Kherson	"Yagorlyts`kyi Step" Zoological Reserve (*)	Yagorlytsky Kut, Yagorlyk Polygon	Subsaline steppe, bunchgrass steppe, dune vegetation	3	8	14	1
29 May	Kherson	Valley of Kurgans NNP (*)	Valley of Kurgans	Subsaline steppe, saline grassland	2	4	8	2
30 May	Mykolaiv	Kinburn Spit RLP	Kinburn Peninsula, Pokrovska spit	Sand steppe, dune vegetation, saline grassland	7	4	18	1
30 May	Mykolaiv	Black Sea Biosphere Reserve	Kinburn Peninsula, Volyzhyn Forest	Sand steppe	1	3	5	1
30 May	Mykolaiv	Biloberezhzhia Sviatoslava NNP	Kinburn Spit	Saline grassland, dune vegetation	1	5	7	0
31 May	Kherson	Black Sea Biosphere Reserve	Solonoozerna Dacha	Sand steppe	3	2	8	2
31 May	Kherson	Black Sea Biosphere Reserve	Ivano-Rybal'chanska Dacha	Sand steppe	2	2	6	0
01 Jun	Kherson	Oleshkivski Pisky NNP	Burkuty	Sand steppe, mesic sandy grassland, hemipsammophitic steppe	2	5	9	1
02 Jun	Kherson	Oleshkivski Pisky NNP	Radensk	Sand steppe	2	2	6	0
02 Jun	Kherson	"Sahy"Landscape Reserve	Sahy	Sand steppe	2	4	8	1
03 Jun	Kherson	Kamianska Sich NNP	Mylove	Bunchgrass steppe, calcareous rocky grassland	2	0	4	0

Initial results and discussion

Floristic composition and species of special interest

Vascular plants

According to preliminary results, 502 vascular plant species were recorded across all vegetation plots. After final checking, the number may be slightly amended.

We recorded many rare and endangered vascular plant species, according to the Red Data Book of Ukraine (Didukh 2009) and regional red lists of Kherson and Mykolaiv regions (Andriyenko & Peregrym 2012), in different habitat types as described below:

- white dunes: *Crambe maritima, Eryngium maritimum, Odontarrhena borzaeana, Polygonum euxinum, P. mesembricum*;
- psammophitic dry grasslands: *Agropyron dasyanthum, Centaurea breviceps, Odontarrhena tortuosa* subsp. *savranica, Stipa borysthenica*;
- steppe depressions: *Elytrigia repens* subsp. *pseudocaesia*;
- bunchgrass steppes: *Caragana scythica, Ephedra distachya, Stipa capillata, S. lessingiana, S. ucrainica*;
- desert steppes: *Goniolimon rubellum, Limonium tschurjukiense*;
- mesic sandy grasslands: *Anacamptis coriophora, A. morio* subsp. *picta, A. palustris, Schoenus nigricans*, etc.

We also recorded a new vascular species for Ukraine – *Torilis pseudonodosa*. It was discovered on May 28, 2021 in the territory of the Potiivska site of the Black Sea Biosphere Reserve in the EDGG Biodiversity Plot UAS20. A scientific paper on this topic has been published (Moysiyenko et al. 2022).

Narrow-leaved fescues

During the Field Workshop, Iryna Bednarska, our specialist on the genus *Festuca*, sampled 39 populations of narrow-leaved fescues that belong to the critical taxa of *Festuca valesiaca* agg. (F. *valesiaca, F. stricta* subsp. *sulcata* and a number of taxa related to *F. callieri*) and to F. *beckeri*. The total number of samples was around 1,000. Preliminary analysis of anatomical and morphological features, as well as chromosome number analysis, allowed us to outline that the large majority of the studied samples/populations belong to *Festuca callieri* and related taxa. Populations of *F. stricta* subsp. *sulcata* were only confirmed from the Kamianska Sich NNP (last day of the expedition). F. *valesiaca* s.str is also rare. So far, only two localities of the latter species were confirmed: in the vicinity of the village Vasylivka on the shore of Syvash Lake (plot UAS09) and in the Karaday Peninsula (plot UAS70R). Such results are surprising, as until now, it has been generally accepted that the two species – *Festuca rupicola* Heuff. (*Festuca stricta* subsp. *sulcata* according to Euro+Med) and *F. valesiaca* – are the main dominants of dry grasslands in the steppe zone of Ukraine. At the same time, F. *callieri* s.str. to date, has only been known from Ukraine from the Crimea. Thus, the widespread distribution of the species and related taxa in southern Ukraine was discovered for the first time. The data show significant heterogeneity within the group of *Festuca callieri* and possibly include a new species to science. Based on the morphological features, our provisional conclusion is that hybrids between the species related to F. *callieri* (4x) and *F. beckeri* (2x) are present in the "Oleshkivski Pisky" NNP and in the "Sahy" reserve which would be a novel discovery. However, this needs to be confirmed by flow cytometry and sequencing of both the assumed hybrids and their tentative parent species.

Bryophytes

We collected more than 200 herbarium specimens of bryophytes during the Field Workshop. Three liverwort species (*Riccia lamellosa, R. pseudopapillosa* and *Cephaloziella divaricata*) and 37 moss species were identified. The moss layer most often consisted of *Syntrichia ruralis, S. ruraliformis* and *Ceratodon purpureus*, with admixtures of ephemeral *Tortula* and *Pterygoneurum* species. Combinations of different *Bryum* species were also observed. In areas with dense grass cover, a combination of *Syntrichia ruraliformis* with pleurocarpous mosses of the family Brachytheciaceae were found. Two species were reported for the first time for the Kherson region namely *Rhynchostegium megapolitanum* and *Ptychostomum torquescens*. Other moss species were typical representatives of the European steppe zone (Boiko 1999), together with *Microbryum curvicollum* and *Weissia levieri*, which are included in the Red Data Book of European bryophytes (Stewart et al. 1995). The list of species will be updated after finalizing the identification of some specimens of *Bryum* that were in a sterile and partly necrotized state at the time of collection.

Lichens

In the sampled plots, we registered 44 lichens and lichenicolous fungi in different grassland types, among them 33 species growing on soil, and nine species on shrubs and plant debris, while two species were lichenicolous fungi. Only terricolous lichens were counted for the species richness values so as to be consistent with the EDGG standardized sampling methodology. The lichens *Cladonia conista* and *Endocarpon loscosii* were recorded for the first time from Ukraine. The foliose lichens *Cladonia cervicornis* and *C. symphycarpa*, as well as the inconspicuous crustose lichen Involucropyrenium breussi recorded from the desert steppes, are new records for the Kherson region. The latter was described recently and its locality in the Kherson region is only the second known site worldwide apart from the type locality in the Kharkiv region (Gromakova & Kondratyuk 2017). Surprisingly, immersed in soil we found the fruiting bodies of the ephemeral lichen *Thelocarpon imperceptum*, that has few records worldwide (Khodosovtsev et al. 2010). Moreo-

ver, further studies may lead to the description of a lichen (Megasporaceae) new to science, which was collected in the "Sahy" Landscape Reserve. Among the rare species, the Red Data book lichens *Agrestia hispida* and *Xanthoparmelia camtschadales* were recorded in plots of desert steppe vegetation. The richest cover of lichens was observed in sandy grasslands of Black Sea Reserve. There, *Cladonia foliacea, C. mitis, C. rangiformis* and *C. furcata* had up to 30% cover in the plots. Moreover, strange forms of *Cladonia rangiformis*, which had strongly-branched podetia with a dark brown exposed side and a marble dot-white bottom side (typical for the species) and a K+ yellow reaction, were found in open places in the Black Sea Reserve. The cyanolichens *Enchylium tenax* and *Blennothallia crispa* were frequently found in semi-desert steppes along Syvash Lake. Sometimes, in vegetation plots, twigs (of *Kochia, Halocnemum* and *Artemisia*) hosted small, corticolous lichens, such as *Caloplaca sterilis, Fominiella skii, Rinodina pyrina, Seawardiella lobulata, Xanthocarpia raesaenenii, Xanthoria parietina*, etc.

Sciaridae

During the expedition, we collected 17 ethanol samples in which 320 female and 62 male imagos were found. Female imagos were left in the samples because identification to species is impossible. Males were mounted on slides and studied using a PZO "Biolar" microscope. All of the studied material is kept in Andriy Babytskiy's private collection, Kyiv (PABK) – specimens No 3628 – 3689. Among the mounted material, we identified 14 sciarid species from six genera (examples: Fig. 3). Apparently, all of these species are new for Ukraine but their identification needs additional confirmation.

Vegetation

We can preliminarily assign the sampled plots to eight vegetation classes (Table 2). Zonal vegetation was represented by steppe communities of the *Festuco-Brometea*: bunchgrass steppes with dominance of narrow-leaved turf grass species, such as taxa of *Festuca valesiaca* agg., *Stipa spp*., and desert steppes, characterized by higher proportion of subshrubs, namely *Artemisia taurica, A. lerchiana, Salsola laricina, Camphorosma monspeliaca* and *Bassia prostrata* (Fig. 4E). We sampled these vegetation types on the northern shore of Syvash Lake (Fig. 5) and along the Black Sea coast. During the last day of the expedition, we sampled two EDGG Biodiversity Plots in calcareous rocky grasslands which also belong to the *Festuco-Brometea* vegetation class. In some areas, due to higher salinity, zonal communities were replaced by subsaline steppes, with *Limonium gmelinii, Artemisia santonicum* and *Halimione verrucifera*, which are assigned to the class *Festuco-Puccinellietea* within the alliance *Diantho guttati-Milion vernalis* (Fig. 4D). We sampled such communities mainly in the territory of the Black Sea Biosphere Reserve (Potiivka and Yahorlytsky Kut sites), but also along the sea coast. Among the non-zonal herbaceous vegetation types, the most common were saline (mostly *Festuco-Puccinellietea*, occasionally Juncetea *maritimi*) and sandy grasslands (*Koelerio-Corynephoretea canescentis*). The former was common along the seacoast; the latter is widely spread on the vast alluvial deposits of the Dnipro River (Fig. 4F), as well as on the dune system of the Black Sea (*Cakiletea maritimae* and *Ammophiletea*) (Figs. 4B, 5). Mesic grassland communities were not common in the study region. They occupied temporarily-flooded steppe depressions with Planosol soils (so called 'pody') and are classified within the *Molinio-Arrhenatheretea* vegetation

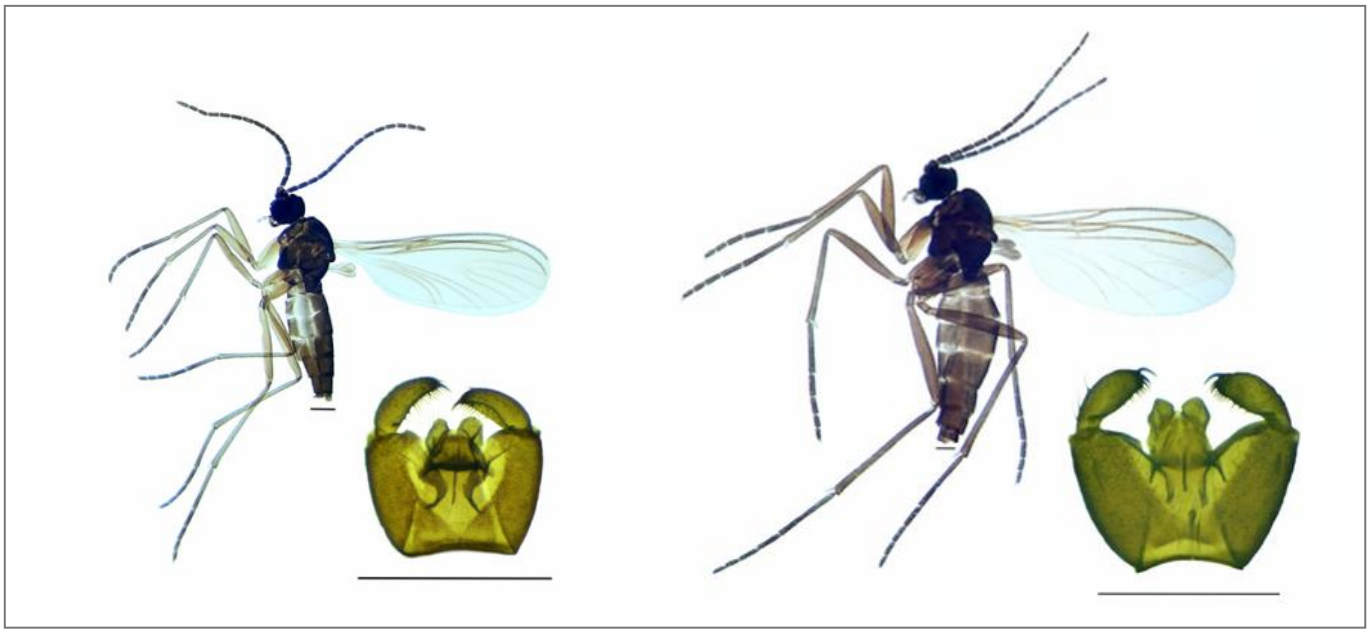

Fig. 3. Sciaridae specimens collected during the Field Workshop: male imago and terminalia (scale bars 0.2 mm). A - *Lycoriella sp*., B - *Bradysia sp*.

Fig. 4. Different grassland types sampled during the Field Workshop. A - steppe depression (pody) vegetation with *Ventenata dubia* and *Anthemis ruthenica*; B - white dunes with *Leymus racemosus* subsp. *sabulosus*, *Odontarrhena borzaeana* and *Carex colchica*; C - sandy mesic grasslands with *Scirpoides holoschoenus* and *Anacamptis palustris*; D - subsaline steppes with *Festuca callieri* agg. and *Limonium gmelinii*; E - desert steppes with *Artemisia taurica*, *A. lerchiana* and *Tanacetum achilleifolium*; F - sand steppe with *Stipa borysthenica, Koeleria glauca* subsp. *sabuletorum* and *Artemisia campestris* subsp. *inodora.* Photos: A-C - I. Dembicz, D - D. Shyriaieva, E-F - J. Dengler.

Table 2. Preliminary syntaxonomical assignment of plots to the class level.

Vegetation type	Vegetation class	Number of biodiversity plots	Number of additional normal plots
Bunchgrass steppes	*Festuco-Brometea*	7	11
Desert steppes	*Festuco-Brometea*	6	11
Calcareous rocky grasslands	*Festuco-Brometea*	2	0
Subsaline steppes	*Festuco-Puccinellietea*	9	18
Saline grasslands	*Festuco-Puccinellietea, Juncetea maritimi*	4	6
Sandy dry grasslands	*Koelerio-Corynephoretea canescentis*	11	17
Sandy mesic grasslands	*Koelerio-Corynephoretea canescentis or Molinio-Arrhenatheretea*	4	2
Coastal dune vegetation	*Cakiletea maritimae* and *Ammophiletea*	4	6
Steppe depressions (pody)	*Molinio-Arrhenatheretea*	2	0
Hemipsammophitic steppes	*Festuco-Brometea or Koelerio-Corynephoretea canescentis*	1	3

class (Shapoval & Kuzemko 2021) (Fig. 4A). They also occurred in sandy depressions in Burkuty and Kinburn spit sites (Fig. 4C).

Species richness patterns

Richness values of the different taxonomic groups (complete vegetation, vascular plants, bryophytes, lichens) are shown in Tables 3 and 4. Mean total species richness increased from 2.6 species in the smallest grain size (1 cm^2) to 56.8 species in the largest grain size (1000 m^2). When our results were compared to those from previous EDGG FWs, we found generally lower mean richness values, especially in the larger grain sizes. For example, at the grain size 10 m^2, mean species richness value was 28.1 species for complete vegetation (24.3 for only vascular plants) in comparison with the mean richness obtained in the FWs in Armenia: 51.3 (48.7) (Aleksanyan et al. 2020), Austria: 41.5 (34.1) (Magnes et al. 2020), Switzerland: 34.4 (28.9) (Dengler et al. 2020b), Siberia: 48.5 (43.9) (Polyakova et al. 2016), Bulgaria: 38.5 (34.1) (Dembicz et al. 2021b), Romania: 60.5 (57.2) (Turtureanu et al. 2014).

This is mainly due to the fact that on this occasion, we recorded many more plots of sparse vegetation such as sandy dry grasslands, that, as shown in Biurrun et al. (2021) are relatively species-poor vegetation types. The richest plot at 1000 m^2 was located in a desert steppe (complete vegetation: 84 species; vascular plants: 78 species), at 100 m^2, 10 m^2 and 1 m^2 – in a bunchgrass steppe (complete vegetation: 80, 59 and 42 species respectively; vascular plants: 69, 50 and 35 species respectively). Mean values of the richness patterns of complete vegetation across vegetation types are shown in Table 4, where the highest mean value per grain size is highlighted in bold. Our first biodiversity plot in the steppe depression "Chorna Dolyna" supporting mesic grasslands appeared to be the richest plot at the smallest grain sizes – 0.01 m^2, 0.001 m^2 and 0.0001 m^2 (complete vegetation: 17, 14 and 11 species respectively; vascular plants: 15, 11 and 9 species). The published world record at the grain size 0.0001 m^2 is 10 species for complete vegetation and 11 species for vascular plants (Biurrun et al. 2021). Thus, our plot shares the world record for the number of species at the grain size 0.0001 m^2.

Mean species richness for bryophytes and lichens increased from 0.3 species in the smallest grain size to 3.6 and 3.3 species in the largest grain size, respectively. Comparing the results to those obtained from previous EDGG FWs (Armenia (Aleksanyan et al. 2020), Austria (Magnes et al. 2020), Switzerland (Dengler et al. 2020b), Russia (Polyakova et al. 2016), Bulgaria (Dembicz et al. 2021b) and Romania (Turtureanu et al. 2014), mean number of bryophytes in this FW was generally lower, especially for the larger grain sizes. For example, for 100 m^2, the number of bryophytes was on

Table 3. Descriptive statistics of the scale-dependent richness patterns across all sampled plots from the 15th EDGG Field Workshop in Southern Ukraine.

Area (m^2)	n	All species			Vascular plants			Bryophytes			Lichens		
		mean	min	max	mean	min	max	mean	min	max	mean	min	max
0.0001	100	2.6	0	11	2	0	9	0.3	0	3	0.3	0	3
0.001	100	4.1	0	14	3.3	0	11	0.4	0	4	0.4	0	4
0.01	100	7	1	17	5.8	0	15	0.6	0	6	0.6	0	4
0.1	100	12.5	2	28	10.6	0	26	1	0	6	1	0	6
1	100	18.9	3	42	16.1	2	35	1.5	0	9	1.4	0	6
10	174	28.1	4	59	24.3	3	50	2.1	0	9	1.8	0	8
100	50	43	11	80	36.8	8	69	3.3	0	13	2.8	0	10
1000	16	56.8	16	84	49.9	13	78	3.6	1	6	3.3	0	12

average 3.3 species, whereas in all other mentioned FWs it was higher. Interestingly, mean richness values for lichens for the smaller grain sizes in general were the highest in the Ukrainian FW, whereas in the larger grain sizes the mean richness of lichens obtained in some other FW were higher. For example, for 0.1 m^2, the mean richness value for lichens was 1.0 in Ukrainian FW; in Armenia: 0.3, Austria: 0.8, Switzerland: 0.5, Siberia: 0.6, Bulgaria: 0.4, Romania: 0.2.

Most of the richest plots for bryophytes were recorded in desert steppes (1, 10, 100 m^2 with 9, 9 and 13 species, respectively) and bunchgrass steppes (0.001, 0.01, 0.1, and 1000 m^2 with 4, 6, 6 and 6 species). The maximal number of lichens was recorded in sand steppes for the majority of the grain sizes: for 0.0001 m2 – 3 species, 0.001 m^2 – 4, 0.01 m2 – 4, 1 m^2 – 6, 10 m^2 – 8, 100 m2 – 10 and 1000 m^2 – 12 species. Only at the grain size 0.1 m^2 was the maximum recorded in desert steppes with 6 species.

Nature conservation

Almost all the localities studied during the FW belong to existing or projected nature protection areas (Table 1). We sampled vegetation in nine existing protected areas: Black Sea Biosphere Reserve, Azovo-Syvash NNP, Biloberezhzhia Sviatoslava NNP, Dzharylhach NNP, Oleshkivski Pisky NNP, Kamianska Sich NNP, Kinburn Spit RLP, "Karadai" Landscape Reserve and "Sahy" Landscape Reserve. Six other areas have high conservation value and were recently proposed as new nature protected objects (Moysiyenko et al. 2020): "Valley of Kurgans" NPP, "Chorna Dolyna" Landscape Reserve, "Western Syvash" Landscape Reserve, "Peninsula Mala Kosa" Landscape Reserve, Landscape Reserve "Sofia`s Steppe" and "Yagorlyts`kyi Step" Zoological Reserve.

Highly valuable pieces of land have been transferred from government ownership to private hands during the administrative-territorial reform which has been conducted over the last few years in Ukraine. Some areas have been ploughed out in part causing irreparable damage to the nature value of these territories, for example, 700 hectares of the "Valley of Kurgans" in 2020 and 69.7 hectares of the "Chorna Dolyna" in 2021. The last case happened after the FW, and in particular, our sampling localities were destroyed. The preliminary results from our expedition confirmed the high conservation value of these areas. Therefore, we support the formal adoption of the above mentioned six projected nature protection territories.

Conclusions and outlook

The initial results of the FW in Southern Ukraine are very promising and have already shown that the joint efforts of its participants greatly improved the knowledge of the biodiversity of Southern Ukraine.

The importance of the data from the Field Workshop is that it helps to improve the classification of grasslands in Ukraine, as it describes underrepresented grassland types. The data can also assist in refining the European vegetation classification. Interestingly, the high-quality biodiversity data of dry grasslands in Southern Ukraine show much lower richness across all scales especially for the bigger grain sizes. However, at the same time, we had relatively high maximal richness values for the lower grain sizes compared to other regions in Europe, including a new world record for a 1 cm2 plot. These data will make a major contribution to the development of models of patterns and drivers of scale- and taxon-dependent plant diversity of grasslands across the Palaearctic biogeographic realm (Dengler et al. 2018, 2020a).

We have already finalized the identification of the collected specimens of bryophytes, lichens and vascular plants, except for specimens of the genus *Festuca*. The determination of numerous samples of *Festuca* genus is being undertaken by Iryna Bednarska, an expert on this genus and a participant in our FW. A combination of analytical methods are

Table 4. Descriptive statistics of the scale-dependent richness patterns of complete vegetation differentiated according to the main vegetation types. The highest richness value per grain size is highlighted in bold.

Area (m^2)	All vegetation types		Desert steppes		Bunchgrass steppes		Steppe depressions (pody)		Subsaline steppes		Sand steppes		Sandy mesic grasslands		Saline grasslands		Hemipsammophytic steppes		Coastal dune vegetation		Calcareous rocky grasslands	
	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean	n	mean
0.0001	100	2.6	12	2.1	14	2.8	4	**5.8**	18	3.2	22	2.4	8	3.5	8	1.4	2	2	8	0.9	4	2.3
0.001	100	4.1	12	3.4	14	4.9	4	**8.3**	18	5	22	3.5	8	5.3	8	2.4	2	4.5	8	1.4	4	3.5
0.01	100	7	12	6.1	14	9.6	4	**11.3**	18	8.7	22	5.7	8	9.9	8	3.6	2	7	8	2	4	6
0.1	100	12.5	12	14.4	14	**17.4**	4	15.3	18	13.5	22	11.3	8	17.3	8	5.9	2	13.5	8	3.8	4	10.5
1	100	18.9	12	24.2	14	**27.4**	4	19.8	18	17.9	22	18	8	23.3	8	7.8	2	20	8	6.4	4	19
10	174	28.1	**23**	**33.5**	**25**	**39.4**	4	26.8	36	26.4	39	29.2	10	33.1	14	14.9	5	31	14	9	4	29.8
100	50	43	**6**	**56**	**7**	59.4	2	46.5	9	36.2	11	42.7	4	52.8	4	18.8	1	**63**	4	14.5	2	51
1000	16	56.8	**1**	**84**	**2**	77.5	1	55	4	42	5	54.6	1	77	1	16	1	81	0	NA	0	NA

being used, in particular cytometry, microanatomy and morphology. Various parameters of the soil samples are currently being analyzed in the "Podillia-Agrochimservis" Agrochemical Laboratory using EDGG protocols (Dengler et al. 2021), and the biomass samples have already been weighted. We intend to use our comprehensive dataset to prepare two main publications, one on syntaxonomy of the studied dry grasslands and one on biodiversity patterns and their drivers. Where appropriate, we will include some additional plots sampled by I.M. and colleagues using similar methods (e.g. research project NFDU 2020-2021 leaded by A. Kuzemko). The first manuscript resulting from the FW, is a short communication concerning *Torilis pseudonodosa* as a new species for the Ukrainian flora. This has already been completed and submitted to a scientific journal. The preparation of a manuscript describing a new species for science of the lichen genus *Aspicilia* has also recently commenced.

As soon as the vegetation data are ready, they will be integrated into the GrassPlot database (Dengler et al. 2018; Biurrun et al. 2019) and the Ukrainian Grassland Database (Kuzemko 2012) and subsequently via these to the European Vegetation Archive (EVA; Chytrý et al. 2016) and the global vegetation plot database "sPlot" (Bruelheide et al. 2019) to ensure their best possible use. Moreover, the floristic information will be fed into the worldwide GBIF database.

Fig. 5. Above: Sampling a desert steppe with *Artemisia lerchiana*: EDGG biodiversity plot on the northern shore of Syvash Lake, near Vasylivka village, Kherson Region. Photo: D. Shyriaieva. Below: Kinburn spit - our sampling locality for the 7th day of the Field Workshop. Photo: D. Vynokurov.

Author contributions

I.M., D.V., D.Sh., N.S., A.Kh organized the Field Workshop, I.D. coordinated the organization, all co-authors participated in the field sampling. I.B. collected and determined *Festuca* specimens, A.B. determined dark-winged fungus gnats; A.Kh. identified lichens, N.Z. bryophytes. I.M. and D.V. led the writing of the report, D.S prepared the map; the photo diary was compiled by D.Sh., O.B., O.Ch., K.K. All authors checked, improved and approved the manuscript.

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Bunchgrass steppe near Stavky village.

Appendix: Photo diary of the 15th EDGG Field Workshop

Compiled by Dariia Shyriaieva, Olesia Bezsmertna, Olha Chusova and Kateryna Kalashnik.

With photos by Iryna Bednarska, Olesia Bezsmertna, Olha Chusova, Iwona Dembicz, Jürgen Dengler, Riccardo Guarino, Kateryna Kalashnik, Oleksander Khodosovtsev, Vitalii Kolomiichuk, Oksana Kucher, Anna Kuzemko, Ivan Moysiyenko, Dariia Shyriaieva, Olga Umanets, Denys Vynokurov & Natalia Zagorodniuk.

When the Field Workshop "Ukrainian steppes along climatic gradients" was officially postponed to 2022, we decided to attempt to organize an alternative Field Workshop in Southern Ukraine in the spring of 2021. Following the restrictions associated with Covid-19, we limited the study area to remote and sparsely populated corners of the Kherson region. The team consisted of Ukrainian scientists and several foreign guests - those who had received the vaccine and were thus able to come to Ukraine. After a year of quarantine restrictions, this expedition was a breath of fresh air for us – in fact the brackish air of the southern Ukrainian steppes! We would like to share with you the spirit of our scientific discoveries and travel adventures by introducing this diary.

Day 1 (May 24, 2021)

Our field workshop started in Kherson city, where we met in the morning. Unlike other EDGG Field Workshops, most of the participants in this expedition were local Ukrainians. Therefore, we used the participants' own cars for transporting everyone, plus luggage and equipment. On the road to the south, we made a stop for sampling in the steppe depression (pid) known as "Chorna Dolyna". At this stop, our group was joined by Viktor Shapoval, a botanist from the Askania-Nova Nature Reserve, who has studied steppe depressions for over 20 years. Such steppe depressions are termed "pody" in Ukrainian (plural, in singular – "pid") and occur in the south of the country. They are characterised by an abrupt change in the nature of the vegetation, which is influenced by the humidity in different years and seasons: from dry to mesic, wet, moist and even aquatic. We set out the first two biodiversity plots of our expedition in mesic areas dominated by *Ventenata dubia*. These plots were the first biodiversity plots ever sampled in steppe depressions.

After lunch, we drove to the shore of Sivash Lake in the southernmost part of the Kherson region. There we sampled desert steppes which were remarkable and characterised by various dwarf shrubs, such as *Artemisia lerchiana, A. taurica*, and *Caragana scythica*. In the evening, we arrived at the small hotel "Hostynnyi dvir", owned by local people in the village of Grygorivka. This was one of the few opportunities to find accommodation in this remote and unpopulated region, and the hosts were surprised to see such a large and diverse group of scientists in their courtyard.

Left: The beginning of our expedition - meeting of the participants at the gas station. Right: The first rain in the first plot! Southern spring greeted us with changeable weather.

Biodiversity plot in the steppe depression (pid) "Chorna Dolyna" - aerial view.

Left: Remarkable formations in the soil – iron-manganese nodules (beans), characteristic of steppe depressions. Right: Mesic grasslands in the steppe depression "Chorna Dolyna", dominated by *Ventenata dubia* and *Carex melanostachya*.

Semi-desert steppes at the shore of Sivash Lake, warmed by the southern sun and swept by salty winds.

Common shelduck (*Tadorna tadorna*) and black-winged stilt (*Himantopus himantopus*) in shallow water. Sivash Lake is designated as a Wetland of International Importance under the Ramsar Convention and is home to thousands of birds.

Way to Zelenovsky Island

Day 2 (May 25, 2021)

In the morning, we visited Churiuk Island, which is a part of the Azov-Syvash National Park. Vitalii Kolomiichuk, the National Park botanist, was our guide through the territory and its flora. We sampled charming southern bunchgrass steppes dominated by feather grasses and fescues. The vegetation was remarkable for the occurrence of many central -asiatic (eastern steppic) species at the western edge of their distribution range, such as *Ferula caspica, Goniolimon rubellum, Limonium suffruticosum, Prangos odontalgica*, and *Salsola laricina*. For lunch, we visited the house of local rangers (island guards), and nearby we saw a reintroduced population of bobak marmots or steppe marmots (*Marmota bobak*). In the afternoon, the bravest participants crossed the shallow, muddy-bottomed bay to reach Zelenovsky Island. The second part of the group remained to work on the shore and from time to time watched their friends walking in the wild, against the wind and across the mud.

Steppe marmot (*Marmota bobak*)

Bunchgrass steppes with *Stipa ucrainica* and *Stipa lessingiana* at Churiuk Island.

Sampling at Churiuk Island.

Zelenovsky Island: walking through the saline and muddy lake (above), view from the top (below).

A working session in the evening: plant identification on the terrace and the fescue herbarium.

Day 3 (May 26, 2021)

On the third day, we continued working in the Azov-Syvash National Park. Our groups sampled desert steppes and saline grasslands near Vasylivka village (Kutara Cape) and Ivanivka (Berezina Cape). We spent all day near the saltiest part of Lake Sivash which is famous for its pink water.

The shades of pink changed during the day, which was very surreal. In the evening, we said goodbye to the hosts of our first hotel. They prepared a barbecue for us, and then we spent a nice evening engaged in pleasant conversation, eating delicious food and singing Ukrainian and Italian songs.

Sampling desert steppes at Kutara Cape.

Lunch time: car repair (left) and the lunch spot in the shade (right).

Berezina Cape near Ivanivka village in the evening, view from the top. Believe it or not, the unreal pinkish color on the left side is water!



The last evening in "Hostynnyi dvir", from left to right: barbecue; our landlord Volodymyr playing his harmonica (accordion); and the landlady Natalia looking at plant samples with a binocular microscope.

Day 4 (May 27, 2021)

The fourth day was full of various impressions and incidents, but – looking ahead – we must assure you that everything ended well. In the morning, we divided between three different locations - Oleksandrivka, Mala Kosa and Stavky. Bunchgrass steppes delighted us with feather-grasses and wonderful sunny weather. For lunch, we visited a very interesting place in the Khorly village. This was a small hotel "Pomistia" situated in a historic building that was formerly built and owned by Sofia Falz-Fein (mother of Friedrich Falz-Fein, establisher of Askania-Nova Nature Reserve). Anton Petrosovych Hukasian, the current owner of the hotel, was very hospitable and prepared a table with various dishes which resulted in an extended lunch! In the afternoon, we worked in two groups on Khorly Peninsula and Karaday Peninsula. The work was completed at sunset, but we still had to get to the next hotel. It was a long and eventful day… Unfortunately, one of the cars needed repairing on the way resulting in an additional delay. Finally though, we all arrived at our new hotel "Galychanochka" in Zaliznyi Port. We were very tired, but happy that we were together again. Our kind hosts kept their kitchen open until our late arrival and served us a delicious dinner.


Above: Feather grass in front of a windturbine, near Stavky village. Below: During sampling in species-poor saline meadows we were diligent in looking out for diminutive plants.

Malabaila graveolens **– a plant with a very specific smell which is very attractive to flies, but unpleasant to those in the sampling spot…**

Lunch in Khorly village: our hospitable friends Anton Petrosovich Hukasian and Vyacheslav Volodimirovich Rolland.

North-facing slope with mesophilous dry grasslands at Khorly Peninsula. This habitat supported the most species-rich biodiversity plot of the expedition (complete vegetation per 100 m^2: 80 species).

Above: Fescue-woman Iryna Bednarska - the superhero of our expedition in the process of collecting population herbariums of *Festuca* species. Below: Unexpected delay on the road: car repair in progress.

Day 5 (May 28, 2021)

After a rest and a delicious breakfast, we were ready for adventures again!

During the first half of the day, we sampled subsaline and desert steppes, as well as psammophilous grasslands near Skadovs'k. For lunch, we arrived at the area of the Black Sea Biosphere Reserve known as Potiivska dilianka. The local botanist Olga Umanets, a scientist of the Biosphere Reserve, joined us in our work for this day, as well as for the next three days. In the afternoon at Potiivska dilianka, we sampled subsaline steppes, dune and saline vegetation. It was a great pleasure to work on the seashore and many participants took the opportunity to swim in the Black Sea.

In the evening, we witnessed an incredible sunset over the sea and Tendrivska Spit (one of the largest sand spits - 78 km long!). During our dinner, we organized a session of "short talks" by each of the participants. Each talk covered their work, hobbies and involvement with EDGG.

Sampling spot within the meso-xeric psammophilous grasslands near Skadovsk.

The caravan of our cars, looking for the right road and attractive sampling locations.

Happy moments of rest and sampling in the coastal zone, Black Sea Biosphere Reserve (Potiivska dilianka).

A sunset over the sea and Tendrivska Spit.

Evening in the hotel: interesting conversations and productive work with samples.

Day 6 (May 29, 2021)

On this day, we moved to our next location - Kinburn Spit. However, on the way, we visited many interesting places and did a lot of work sampling five biodiversity plots and 12 normal plots of subsaline steppes, bunchgrass steppes, halophytic vegetation, and coastal dunes. For the first half of the day, we worked at Yagorlytsky Kut and Yagorlyk Polygon, which are parts of the Black Sea Biosphere Reserve. After lunch at the sandy beach, we moved to a new location. It was the Valley of Kurgans, a coastal saline plain with a large number of kurgans (kurgan – a tumulus constructed over a grave, widespread in the Pontic–Caspian steppes).

There are a total of 308 kurgans of various sizes in the Valley of Kurgans. The territory between kurgans is subsaline steppe that is periodically-flooded with seawater under the influence of strong winds. After sampling, we had a long drive to the village Pokrovka on Kinburn Spit. On the way, we were surrounded by seemingly boundless areas of sandy grasslands dominated by the feather grass *Stipa borysthenica* which shone with silver and gold at sunset. In the evening, we arrived at our new accommodation – the cozy hotel Larina Dacha with very hospitable hosts and local-grown food.

Packing luggage when moving to a new hotel was like "Tetris": all items should match and fit!

Sampling in Yagorlytsky Kut and Yagorlyk Polygon: we are ready for sampling biomass with wire circles (left); biodiversity plot in a saline grassland (right).

Sampling in the Valley of Kurgans: side view of the kurgan with a small human silhouette (left); intensive work in a 1000 m^2 plot (right).

Moments of teamwork in the Valley of Kurgans.

Psammophytic grassland dominated by *Stipa borysthenica*, a sunset photo taken during a short stop on the road to the Kinburn Spit.

Day 7 (May 30, 2021)

Our morning started with orchids - we found pretty meadows with *Anacamptis palustris* right next to our house. Then one part of the group using two cars spent the day sampling sandy grasslands in the Pokrovka village and its surroundings. The other team in the all-terrain car drove along sandy roads to remote parts of the Kinburn spit – the so-called "Tip of the Kinburn spit" and "Volyzhyn Forest". It was very surprising for us to see a forest oasis among the sand dunes of the Kinburn Spit. In the 4th century BC, large primary forests in the lower reaches of the Dnieper River were described by Herodotus as "Gilea''. Volyzhyn Forest is the only part of Gilea that now remains. One of the many interesting moments of this day was swimming in the sea between sampling relevés in the coastal zone. The journey back did not pass without incident either as one of the cars got stuck in the sand. However, in the end, we all returned to the hotel safe and sound. The most active and energetic members of the team arranged dancing after dinner, while others preferred to relax on the evening terrace, answering urgent emails while sampling a variety of beverages.

Left: breakfast on the terrace. Right: photo hunt for the orchids, behind a barbed wire fence near our hotel.

Natural boundaries Volyzhyn Forest (right) and Kovalivska Saha (left) a wetland oasis with alder trees and oaks among the sand dunes of the Kinburn Spit.

Open sandy communities with *Odontarrhena borzaeana*, in the vicinity of Pokrovka village.

The steppe-runner lizard (*Eremias arguta*).

Moments of relaxation after productive work.

Left: The unreliable roads of the Kinburn Spit. Here it was easy to get stuck in the sand! Right: Evening moments of rest and work on the hotel's terrace.

Day 8 (May 31, 2021)

We spent this day sampling sandy grasslands in a new remote area - Solonoozerna Dilianka and Ivano-Rybal'chanska Dacha, which are parts of the Black Sea Biosphere Reserve. Not all of our cars were able to drive along the sandy roads in this part of the reserve, so the administration of the Biloberezhzhia Sviatoslava National Park helped us with transport. An old, all-terrain car with open seats became our "Ukrainian safari car", and on the way, we enjoyed the views of psammophytic steppes on the hills and oak-birch forests in the depressions. For lunch, we visited the so-called "kordon", a remote house with a backyard in the wilderness where the ranger of the reserve and his family live. There we were met by very kind and friendly people who prepared local food for us and provided tasty milk from their cows. At the end of the day, we arrived in Kherson and stayed at the hostel of the Kherson State University.

The best way to travel across the sand dunes was in our Ukrainian "safari car", an old all-terrain car with an open cabin.

Left: Sampling psammophytic grasslands. Right: Biomass collection requires a large number of participants in order to collect each gram of biomass!

Oak-birch forests in the depressions between sandy dunes.

Lunch at the ranger's house in the reserve (“kordon”), with delicious pies and pancakes.

Revision of data forms and checking plant specimens in the evening at the Kherson State University dormitory.

Day 9 (June 1, 2021)

The weather on the ninth day was extreme due to very low temperatures and intensive rainfall. It rained heavily, almost without stopping. However, we tried to keep working notwithstanding the unfavourable conditions and established and sampled two biodiversity plots and five normal plots at the Burkuty site (National Park Oleshkivski Pisky). After lunch in the shelter, a special hide for birdwatching, we said goodbye to several participants of our expedition party, who then left us in one car.

Then, totally wet and tired of the rain, we decided to return to Kherson and work with our samples at the Kherson State University. The Botany Department welcomed us and provided a warm room, hot tea and the necessary environment for the work.

Working in the rain, where everything was wet and cold… not the most pleasant time, but we all did our best!

Raincoats and umbrellas helped us. But, at one moment, the rain was so hard and the wind was so strong, that even good equipment was not enough.

Our team in the birdwatching hide during lunch.

Photo session of the best "penetrometer operators" among the group.

We spent the second half of the day working with samples and materials in the Botany Department at the Kherson State University.

Day 10 (June 2, 2021)

On the last official day of the expedition, we sampled the sandy vegetation of the lower reaches of the Dnipro River. One group went to the part of National Nature Park known as Oleshkivski Pisky with the informal name "Oleshky desert". There we sampled vegetation of recently disturbed sandy dunes which resemble a real desert. Another group visited the "Sagy" landscape reserve. The most remarkable finding of the day was a strange lichen from the family Megasporaceae, which preliminary investigations indicate may be a new lichen species to science! In the evening, we had the farewell dinner in a restaurant in Kherson. The participants shared their impressions of the 10-day expedition in the remote corners of Southern Ukraine. We were happy to be together during the 15th EDGG Field Workshop and we hope to meet again this year in the FW "Ukrainian steppes along climatic gradients"!

Exploring "Oleshky desert", which is a territory with recently-disturbed sandy dunes. It looks like a real desert!

In “Oleshky desert”, we even met a camel!

Sampling in the “Sagy” landscape reserve.

Psammophytic grasslands in the “Sagy” landscape reserve.


The farewell dinner of the 15th EDGG Field Workshop "Grasslands of Southern Ukraine".

Day 11 (June 3, 2021)

After the official completion of the workshop and the departure of most of the participants, the remaining group undertook a short post-excursion and spent one day in the National Park. There we sampled bunchgrass steppe and calcareous rocky grassland vegetation.


Post-excursion with sampling of bunchgrass steppes in the Kamyanska Sich National Park.

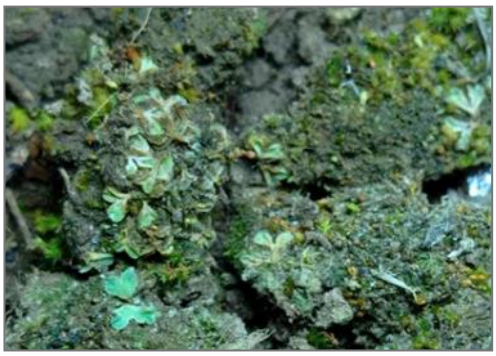

Left: Steppe gulley near Milove village in the Kamyanska Sich National Park.
Right: A "strawberry prize" - for those who joined the post-excursion day!

Selected pictures of bryophytes

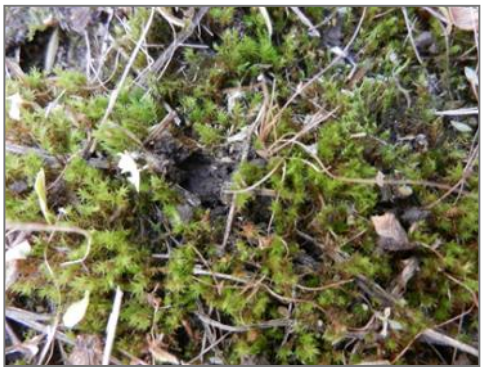
Polytrichum piliferum

Syntrichia ruralis

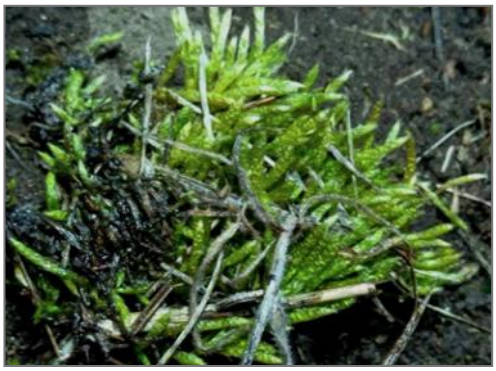
Brachythecium mildeanum



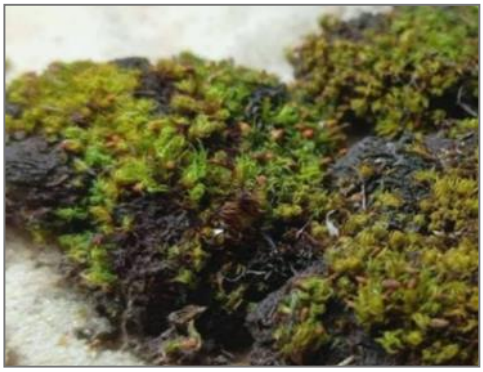
Riccia lamellosa



Ceratodon purpureus



Brachythecium albicans



Weissia levieri

Mycrobryum curvicollum

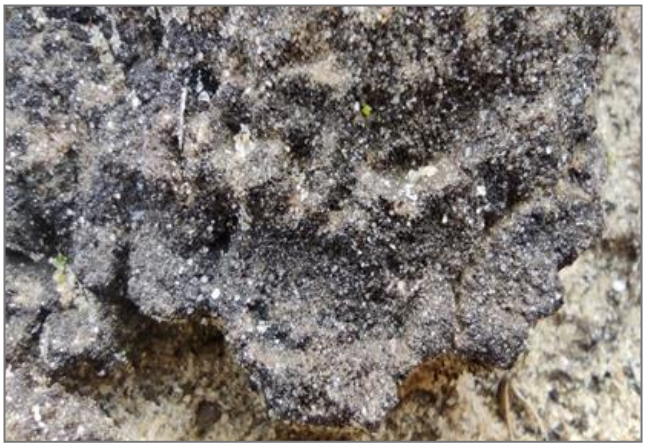
Selected pictures of lichens

Toninia sedifolia

Xanthoparmelia pockornyi

Cetraria aculeata

Diploschistes muscorum



***Placynthiella uliginosa* s.l.**

Cladonia foliacea

Selected pictures of vascular plants

Trifolium subterraneum, Astragalus asper, Astragalus reduncus, Trifolium angulatum

Eremopyrum orientale, Allium regelianum, Rhinanthus borbasii, Anacamptis palustris

Trifolium diffusum, Carduus pycnocephalus* subsp. *marmoratus, Cytisus borysthenicus, Petrosimonia brachiata

Caragana scythica

Onosma arenaria

Prangos odontalgica

Odontarrhena borzaeana

Artemisia lercheana

Agropyron dasyanthum

Participants of the 15th EDGG Field Workshop "Grasslands of Southern Ukraine"

Anna Kuzemko

Jürgen Dengler

Oleksander Khodosovtsev

Denys Vynokurov

Iwona Dembicz

Dariia Shyriaieva

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Iryna Bednarska

Riccardo Guarino

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Viktor Shapoval

Natalia Zagorodniuk

Maryna Zakharova

Vitalii Kolomiichuk

Olha Umanets

Nadiia Skobel

Olesia Bezsmertna

Andriy Babytskiy

Kateryna Kalashnik

Photo Competition

Best Shots on “Grassland orchids”

Here are the three winners of the EDGG Photo Competition dedicated to “Grassland orchids”.
The Jury for the Photo Competition was composed of Edy Fantinato (Chair), Anna Kuzemko, Rocco Labadessa, Jim Martin, Jalil Noroozi and Salza Palpurina.

1st place

***Orchis* x *hybrida* in the Natura 2000 site "K¹ty" near Zamoœæ, SE Poland.**
Sony A7II with adapted Canon EF 200mm f/2.8L II lens.

Piotr Chmielewski, Zamość, Poland
pchmielewski4@wp.pl

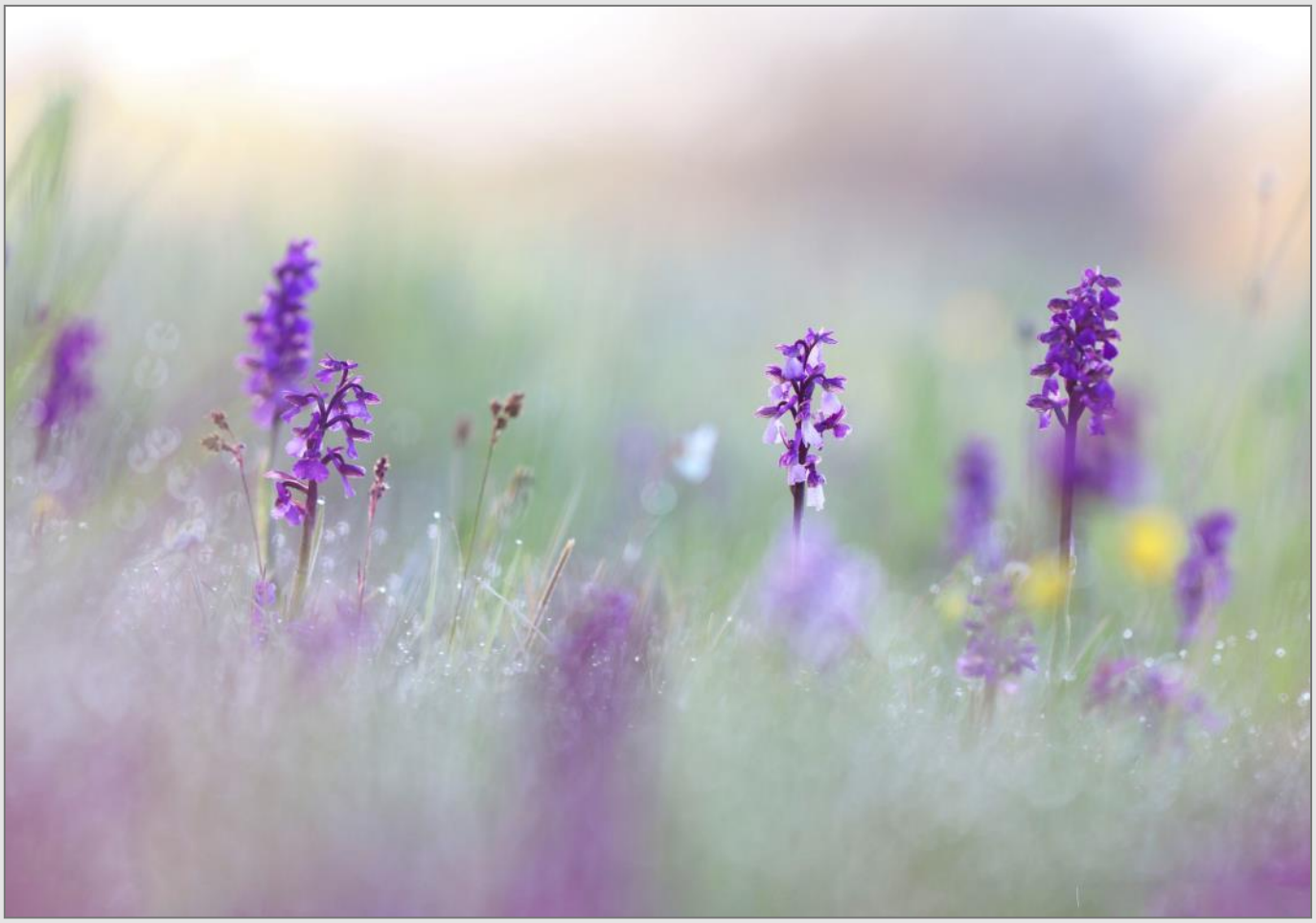
Reviews from the Jury:

“A very successful composition that allows us to appreciate the beauty and unusualness of the orchid and the high density of its population. With respect to the author, who was able to find such an unusual hybrid and shoot it so aesthetically.”

“A wonderful swathe of orchids.”

“I like because of the atmosphere of the photo implying orchids ‘love’ species-rich grasslands. Also nice perspective, light and focus.”

2nd place:



***Anacamptis morio* subsp. *morio* in lime-deficient but base-rich rough grassland (*Viscario-Avenetum pratensis*), Mainfranken, Bavaria, German.**

Robin Nikolei, Darmstadt, Germany
robin.nikolei@web.de

Reviews from the Jury:

"Thanks to the blur effect, the photo looks very gentle. Orchids seem to be hanging in the clear morning air and shiny dew drops enhance this effect."

"The outstanding beauty of orchids is well highlighted within their grassland habitats in a very delicate composition."

3^{3d} place:

***Ophrys tenthredinifera*, Gargano National Park, Puglia, Italy.**

Jürgen Dengler, Wädenswil, Switzerland
dr.juergen.dengler@gmail.com

Reviews from the Jury:

"High-quality macro photography makes unusual Ophrys flowers even more unusual."

"A lovely close-up shot of a bee orchid."

"This close-up of sawfly orchid flowers, underlining the combination of velvety and hairy surface of the label, effectively highlights the perspective of pollinators."

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Photo Story

Vegetation diversity in the Swiss Alps
Impressions from the 16th EDGG Field Workshop

Photos and text by Jürgen Dengler[1,2,3], Beata Cykowska-Marzencka[4,5], Hallie Seiler[1], Chiara Catalano[6], Christian Dolnik[7], Riccardo Guarino[8], Alexander Indermaur[9], Salvatore Pasta[10], Dorothee Putfarken[11], Susanne Riedel[9], Dariia Shyriaieva[12], Denys Vynokurov[12,13] & Iwona Dembicz[14]

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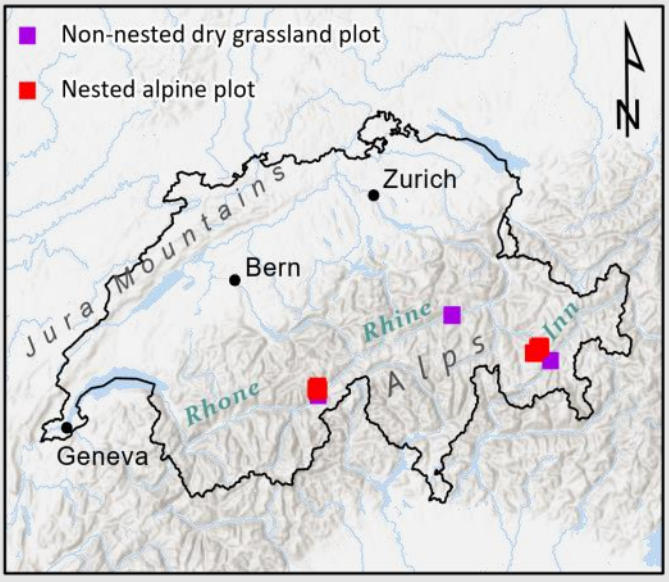
EDGG Field Workshops have brought vegetation scientists together since 2009. They aim to collect high-quality biodiversity data for multiple taxonomic groups across several different spatial grain sizes in a standardised manner. Since the initiation, one or two such events with participants from a multitude of countries have been conducted each year. The collected data have given rise to numerous regional studies on biodiversity patterns and on syntaxonomy. In 2017, the GrassPlot database was founded to collect all the Field Workshop data together with similar data from other projects in one place and make them accessible for overarching analyses across the whole Palaearctic biogeographic realm. Since 2020 an increasing number of such studies has been published on topics such as species-area relationships, alpha diversity and fine-grain beta diversity. Many further studies are currently in preparation.

EDGG Field Workshops are not only a core source of data for GrassPlot, they are also events to learn the local flora and vegetation within a short time and to collaborate intensively with colleagues from many different countries and different academic levels (Bachelor students to professors) united by their enthusiasm for fine details of the vegetation



Map of Switzerland showing the sampling sites of the 16th EDGG Field Workshop.

of grasslands and other non-forested habitats. Field workshop participants are excited when finding 10 species within a single square centimetre and are thrilled to determine tiny, non-flowering plants. Many participants have become "addicted" to the Field Workshops, and try not to miss a single one, wherever it is conducted. With the arrival of the COVID-19 pandemic, a large Field Workshop planned for May 2020 in Ukraine had to be cancelled. When the situation improved somewhat in autumn 2020, a few members organised a spontaneous Field Workshop dedicated to the grasslands and other open vegetation of the subalpine and alpine belts of the Swiss Alps. Up to then, EDGG Field Workshops had been focused on dry grasslands sensu lato, and this was the first event where the focus was shifted to other vegetation types hitherto underrepresented in GrassPlot. The regular Field Workshop along the Ukrainian latitudinal transect was postponed to May 2021, but again had to be cancelled. Instead, a few members of the EDGG conducted two ad hoc Field Workshops, one in Southern Ukraine in May and a second in Switzerland in September. We considered them "ad hoc" as they were planned spontaneously at short notice, without a regular application scheme and without financial support from EDGG or IAVS. Since both were nevertheless very effective in sampling standard EDGG data, the EDGG Field Workshop Coordinators have meanwhile agreed to give them an official number post hoc.

The 16th EDGG Field Workshop took place in the Swiss Alps from 12 to 22 September 2021. In total there were 15 participants from six countries (Germany, Italy, Japan, Poland, Switzerland, Ukraine), although not all of them participated the whole time. The main aim was to complement the dataset of subalpine and alpine habitats collected during the 14th EDGG Field Workshop in 2020 with data from different regions, but we also used the marginal days (starting day, end day and transfer day) to fill some gaps in the already quite comprehensive dataset of the 12th EDGG Field Workshop with dry grassland vegetation of the central valleys of Switzerland with subcontinental climate. We spent five days in a holiday flat in the popular car-free tourist destination Bettmeralp next to the Great Aletsch Glacier in the canton of Valais, and five days in a group house in the tiny and absolutely non-touristic village of Preda in the canton of Grisons. In between, there was a transfer day during which part of the group travelled by one of the most scenic railway connections in the world from Valais to Grisons, with a stop at a nice common pasture with dry grasslands in the gravel plain of the young Rhine Anterior, while another part of the group carried all the equipment and food by car. Unlike during regular Field Workshops, we had to prepare the meals ourselves, but this was quite enjoyable, as this yielded a diversity of regional food types from Grisons (*Capuns*), Swabia (*Käsespätzle*), the Ukraine (*Borscht, Banosh*) and Sicily (Aeolian salad, oven *Caponata*).

We often had nice late summer weather, but even when there was heavy rain or snowfall on one day, this did not discourage us from sampling. In total, we collected 31 nested plots with grain sizes from 0.0001 to 100 m2 according to the EDGG standard methodology, i.e. not only vascular plants, but also terricolous bryophytes and lichens. The plots came from both acidic and limestone bedrock and covered an elevational gradient from 1750 to 2670 m a.s.l. The studied vegetation types were highly diverse and included almost every non-forest and non-aquatic vegetation type that occurs at these elevations in Switzerland, including natural and secondary grasslands, dwarf shrub heaths, screes, moraines and gravel bars, snow patches and fens, natural and ruderal tall forb communities and intensively trampled habitats. Additionally, we sampled ten 10-m2 plots of dry grassland vegetation in four localities (740 to 1780 m a.s.l.). Beyond species combination and cover, we also recorded extensive structural and environmental parameters and took soil and biomass samples for further analyses.

While there is still a lot of work to be done with the determination of the bryophytes and lichens from these often very cryptogam-rich stands as well as the determination of some critical vascular plants, we can already provide some preliminary results (note that numbers might slightly change when determinations are completed). In the subalpine-alpine dataset, the vascular plant species richness at 10 m2 ranges from 10 species in an acidic fen at Bettmeralp to 79 species in a base-rich fen in the flood plain of the Albula river in Preda, which is significantly more than the maximum of 66 vascular plant species found in an alpine limestone grassland in 2020. One stand of rocky alpine grasslands on acidic bedrock in Bettmeralp was probably the richest in non-vascular plants, with 21 species of bryophytes and 26 species of lichens in 10 m2. The dry grasslands had a total species richness (including terricolous bryophytes and lichens) between 32 and 43, making them not outstandingly rich compared to dry grasslands in other European regions.

All in all, this was a scientifically productive and personally inspiring event.

Further reading

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Dengler, J., Cykowska-Marzencka, B., Bruderer, T., Dolnik, C., Neumann, P., Riedel, S., Seiler, H., Zhang, J. & Dembicz, I. 2020b. Sampling multi-scale and multi-taxon plant diversity data in the subalpine and alpine habitats of Switzerland: Report on the 14th EDGG Field Workshop. *Palaearctic Grasslands* 47: 14–42.

The Field Workshop team on 14 September 2021 above the Great Aletsch Glacier in Valais (upper photo). From left to right: Iwona Dembicz, Christian Dolnik, Jürgen Dengler, Denys Vynokurov, Dariia Shyriaieva, Beata Cykowska-Marzencka, Hallie Seiler & Yuki Yaida. Lower photos, from left to right: Susanne Riedel & Alexander Indermaur, Salvatore Pasta & Chiara Catalano, Riccardo Guarino & Dorothee Putfarken.

Day 1 (12 September 2021)

On the first day, eight of us met in Betten Talstation and made the first three 10-m2 plots in dry grasslands above the station. In the evening, we headed to our accomodation in Bettmeralp at 1970 m a.s.l. and finished the day with a delicious, home-cooked dinner.

Dry, rocky steppic grasslands with prominent stands of *Phleum phleoides* and *Odontites luteus*.

We made our way to Bettmeralp via excellent public cable car transport. Having arrived at our flat, we enjoyed the impressive view of the Rhône Valley.

Our accomodation, the holiday flat "Cactus" in Bettmeralp, where we prepared our first shared dinner after settling in for the night.

Day 2 (13 September 2021)

The second day started with perfect weather and a local attraction – the seasonal descent of cattle from their mountain pastures. We took a gondola lift to Bettmerhorn (2872 m a.s.l.) to save time and enjoy the views of the surrounding mountains. During this day we made three EDGG Biodiversity Plots.

The second morning's attractions: Alpabzug with beautiful Eringer cows, and riding the gondola lift together.

The Great Aletsch Glacier.

Hard at work on our second plot in a Nardion grassland. Sometimes, field work can be quite tiring!

Day 3 (14 September 2021)

Next day greeted us with excellent weather and very interesting moraine communities. We made next three 100-m2 plots while enjoying the perfect view of the Great Aletsch Glacier.

On our way to the glacier moraine.

Two beautiful plots with a clear view of the glacier.

Excellent dinner of Borscht made by our Ukrainian participants.

Day 4 (15 September 2021)

Faced with cold, rainy weather, we decided to visit closer and easier locations for the next plots, including heavily grazed pastures.

The first plot in a stand of *Poion alpinae*.

***Caricion fuscae* with *Eriophorum angustifolium* and *Sphagnum subsecundum*.**

Dry, rocky pioneer community with numerous species of *Cladonia* and a happy lichenologist.

Day 5 (16 September 2021)

The gloomy, overcast weather continued on day five. We made plots chosen during previous day, mainly in heavily used places.

***Rumicion alpini* with significant die-back at the end of the season.**

Nardion with a few small flowers remaining.

A moist plot dominated by *Epilobium angustifolium*.

Day 6 (17 September 2021)

After five very intensive days in Bettmeralp, we moved to the second locality in the canton of Grisons, the very tiny village of Preda located in Albula river valley. We separated in two groups: one travelled by train, the second by car, doing the grocery shopping along the way. The train-team made a stop in Waltensbourg/Vuorz in the region of Surselva (Grisons), where they made three 10-m2 plots in grasslands communities. Four more participants joined us in Preda, bringing our team to a total of 12 people.


Some of the plots made in Waltensbourg/Vuorz (Surselva).


Our accommodation in Preda: the group house "Sonnenhof."

Day 7 (18 September 2021)

Our first full day in Preda we spent below Piz Muot, above Val Zavretta. We made five EDGG Biodiversity Plots (100 m^2) in different types of alpine vegetation. The weather was sunny and the day was very fruitful. We finished with a delicious Swabian dish, *Käsespätzle*, prepared mostly by Jürgen.

Beautiful views in Val Zavretta.

One group worked in an *Elynio-Seslerietea* stand on a windy ridge...

...while others made plots on steep grasslands and screes.

Day 8 (19 September 2021)

This rainy day we chose to spend close to our accomodation near the Albula river, completing a total of six EDGG Biodiversity Plots. In the afternoon, after a hearty lunch of oven Caponata prepared by the Italian participants, we entertained ourselves by determining plants and lichens.


Plots in the floodplain of the Albula river.





Intensive identification process made after intensive fieldwork.

Day 9 (20 September 2021)

As the weather forecast had predicted, snow began to fall on the ninth day. Susanne and Alex joined us for two days, sharing their extensive knowledge of alpine habitats. Two participants had to participate on-line conferences, so part of the group stayed close to the group house and made plots in various vegetation types in the close surroundings. The rest of the group returned to Val Zavretta and made two EDGG Biodiversity Plots in nice places we had noticed on day seven. The day was long and cold, but we could warm up in the evening over a plate of *Capuns*, a traditional dish from Grisons made by Susanne and Alex.

EDGG Biodiversity Plots made near the group house. Left: searching for species in a dense *Molinion* grassland; right: plot on a open, but species-rich gravel bar.

Our plots under a thin layer of snow in Val Zavretta.

Enjoying home-made *Capuns* and red wine after a long day in the field.

Day 10 (21 September 2021)

Our last full day in Preda was spectacular. We chose Val Mulix as the next object of our research. The morning greeted us with great weather and amazing views. We made five EDGG Biodiversity Plots


Extremely beautiful views on the way to the research plots.

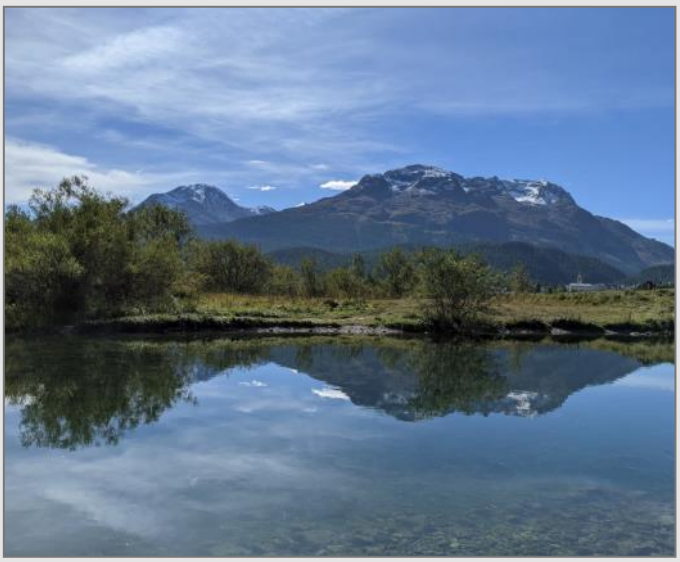

Lunch in the field at 2535 m a.s.l. and view to the surroundings.


***Caricion curvulae* at 2670 m a.s.l.**

Day 11 (22 September 2021)

During our last day we made two "normal" 10-m^2 plots in dry grasslands near Samedan in the Engadin Valley. After a picnic and swimming in the Inn river, we once again had to return to our everyday lives, taking wonderful memories of the Field Workshop with us.

The last two dry grassland plots near Samedan, Upper Engandin.



The young Inn river in the Upper Engandin, location of our last picnic.

Selected pictures of plants and lichens

Leontopodium alpinum

Daphne striata

Crepis terglouensis

Gentiana asclepiadea

Erigeron alpinus

Racomitrium sp. and ***Stereocaulon sp.***

Hieracium alpinum

The participants of the 16th EDGG Field Workshop in Switzerland

Jürgen Dengler

Dariia Shyriaieva

Hallie Seiler

Christian Dolnik

Dorothee Putfarken

Yuki Yaida

Denys Vynokurov

Iwona Dembicz

Riccardo Guarino

Alexander Indermaur

Susanne Riedel

Chiara Catalano

Beata Cykowska-Marzencka

Salvatore Pasta

Short Contributions

European monitoring of biodiversity in agricultural landscapes (EMBAL) – search for surveyors with basic botanical training in 2022 and 2023

EMBAL is a new EU-wide monitoring project funded by the European Commission, with the aim to record the state of and changes in biodiversity in agricultural landscapes. After a pilot phase in 2020 and 2021, the monitoring is being rolled out in 2022-2023 to all 27 EU Member States. To our knowledge this is the first survey using a standardised approach across the whole EU to monitor indicators of biodiversity in agricultural landscapes.

This announcement is a call for anyone interested in working as a field surveyor in EMBAL to contact us: the work is ideal for students or recent graduates of biological, agricultural or botanical courses. Basic plant identification skills are necessary, but you do not have to be an expert. If you are interested, we provide details further below to contact us. Please circulate this announcement in your networks, if you know of anyone who may be interested!

The project

The EMBAL survey is based on observation windows of 500 x 500 m (plots), which the surveyors visit and record predefined land cover and nature value parameters digitally on a smartphone or tablet. The plots are selected from a regular grid (Fig.1), also used in the EU LUCAS project. In 2022 and 2023, a sample of 3000 plots in agriculturally dominated landscape from all 27 EU member states will be surveyed in the field.

Prior to the survey, the land cover within the plots is mapped in GIS on the basis of aerial orthophotos and divided into land use/land cover parcels. This information is delivered to the surveyors in paper and digital form for data collection in the field (Fig. 2).

Within each plot, data is recorded at three levels:

1. Parcels and landscape elements
2. Transects (2.5 m x 20 m areas where detailed observations are made)
3. Photo documentation of the plot: Overview photos and transect photos (Fig. 2).

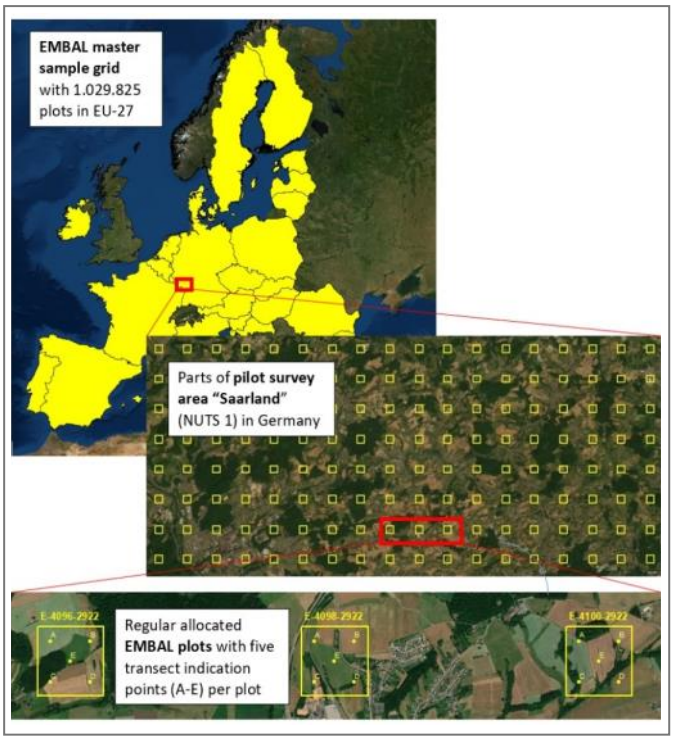


Fig. 1. Example of the coverage of the survey, the density of the master grid and examples of selected plots.

For parcels and transects, parameters are recorded related to land cover (e.g. type of crop) and intensity of use (e.g. density of crop, presence of irrigation), as well as habitat structures and resources (e.g. flower density, type of landscape element) and biodiversity indicators (e.g. number of key indicator species).

These parameters have been designed to be reliably recorded by different surveyors in different years. However, one critical factor in the survey is the time of survey. To accurately reflect the type and biodiversity value of the land cover, the vegetation needs to be surveyed at its peak. For this, we have defined optimum time windows for each plot according to the biogeographic region and elevation, in which the survey has to take place. These range from early April in the southeast Mediterranean to June in northern Scandinavia (Fig. 3).

Fig. 2. Left: Example of a plot dominated by arable fields. Land use/cover parcels are delineated by yellow lines and transects are marked by red lines. Right: Documentation photos taken as part of the EMBAL pilot: Overview of the plot in a grassland-dominated landscape in Romania; Dirt track as a landscape element with high habitat value; Intensive barley transect in Germany.

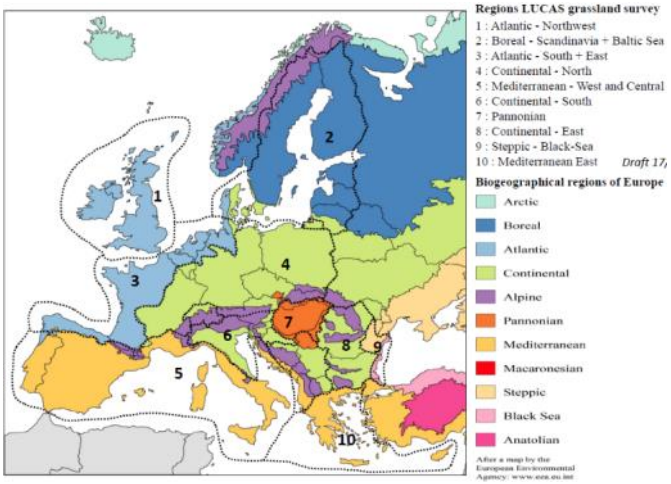


Fig. 3. Timing zones based on biogeographical regions (Image modified from EEA).

Search for surveyors

The project leads, EFTAS Geoinformation and IT Services and IFAB (Institute for Agroecology and Biodiversity), are looking for field surveyors from all EU member states to carry out fieldwork for the EMBAL project in 2022 and 2023: the exact period of the work depends on the region, but will cover several weeks in the time between April and September. The work is ideal for students or recent graduates with some experience of plant identification and a background in ecology/geography/agriculture or similar courses of study. Surveyors will work individually and independently; however, they will be coordinated by a regional supervisor.

They will be provided with 2.5 days of training in their survey country in March/April, including theoretical introduction to the parameters, visits to field and recording a test plot, and data entry and post processing. This training is essential for carrying out the work.

Requirements for surveyors:

- Availability for a period of about 4 weeks from April to June 2022 (ideally also 2023)
- Good knowledge of English (spoken and written)
- A driver's license (ideally with use of your own car)
- Use of an Android smartphone or tablet for the fieldwork.
- Basic knowledge of plant identification (no expert knowledge required)

If you are interested in working on this survey please contact insitu-surveys@eftas.com for more information.

Laura Sutcliffe, Göttingen/Mannheim, Germany
sutcliffe@ifab-mannheim.de

Call for papers to the special issue "Restoration of open ecosystems in the face of climate change" in *Global Ecology and Conservation*

Guest editors

Péter Török (Hungary), Aveliina Helm (Estonia), Jayashree Ratnam (India), Fernando A. O. Silveira (Brazil), Csaba Tölgyesi (Hungary).

Outline

Open ecosystems occur all around the world in various forms including temperate and tropical grasslands, savannas, shrublands, heathlands and many more. Open ecosystems are home to unique biodiversity, provide key ecosystem services and sustain traditional livelihoods of tens of millions of people worldwide. Their dynamic ecology, often including disturbance dependence, as well as their high biodiversity and ecosystem service provisioning capacity have been in the spotlight of research for long, yet open ecosystems have not received adequate conservation and restoration attention. The UN Decade on Ecosystem Restoration and other large-scale biodiversity and climate mitigation strategies now offer outstanding opportunities during the upcoming years. Restoration methods and resulting community assembly mechanisms have been thoroughly explored for temperate grasslands, but we know much less about the recovery of other parameters, including functional trait composition, ecosystem services and functions and potential trade-offs between them.

The importance of post-restoration management is still unclear and understudied, mostly because of the narrow timeframe of most studies. In tropical regions, experience with open ecosystems restoration is way more limited, and we anticipate major advancements in understanding these systems in the coming years. In the meantime, climate change introduces uncertainties into restoration planning and success evaluation, amplifying the challenges restoration practitioners need to face. Climate change promotes range shifts of species and facilitates plant invasions, such as alien C4 grasses into restored open ecosystems. The high societal pressure to use nature-based solutions for global issues often misguides efforts and promotes alternative ecosystem restoration, creating conflicts between open ecosystem restoration and afforestation, which should be reconciled before irreversible loss of biodiversity and depletion of ecosystem services provisioning, such as water shortage. Practitioners aiming to restore open ecosystems need the support of the scientific community more than ever. The aim of this Special Feature is to contribute to the solution of the highlighted imminent challenges with a stimulating collection of high-quality publications.

Restored *Molinion* meadow in Hungary. Photo: P. Török.

Scope

Contributions to this Special Feature will address the new challenges and apparent knowledge gaps of open ecosystem restoration in an era of climate change. We welcome papers spanning restoration planning to implementation, and monitoring. There is no bias for the type of open ecosystems: we expect papers dealing with temperate and tropical grasslands, savannas, heathlands, etc. The role of open ecosystems in climate mitigation, adjustments of restoration practices for projected climate scenarios, directions to tackle potential conflicts with competing non-open ecosystem restoration as well as evaluations of post-restoration management – with a special focus on disturance regimes – are all welcome. Studies improving our understanding on the restoration of ecosystem parameters other than species composition (i.e., as functional trait composition, ecosystem functions and services, resilience, and the general multifunctionality of open ecosystems) are also within the scope. Contributions may also include advances of basic restoration methods and the evaluation of their success in open ecosystem types whose restoration has so far been understudied (e.g., in the Global South). Research papers on theoretical issues and empirical studies, as well as opinion and review papers fitting the topic are welcome. We particularly encourage papers addressing the upscaling restoration of open ecosystems to the landscape-scale.

Procedure and deadlines

The deadline for **full paper submission** is at the **15th September, 2022**.

Expected publication of the whole special issue is scheduled at the **first half of 2023**.

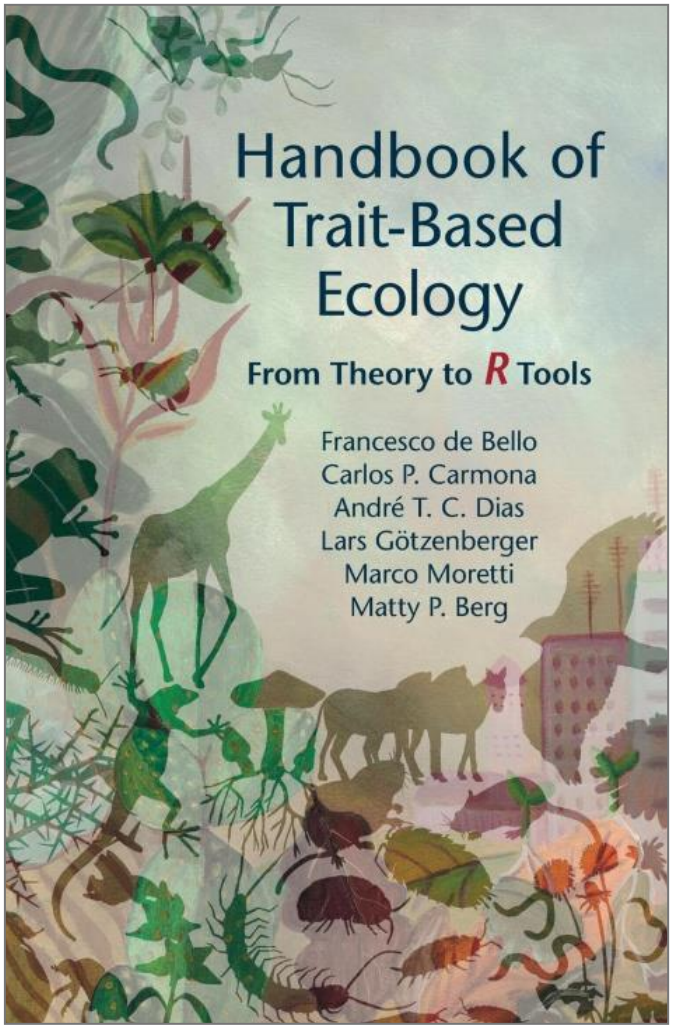
Information about the special issue you can find at the homepage of the journal GECCO.

***Péter Török*,** Debrecen, Hungary
molinia@gmail.com

Book Review

DOI: 10.21570/EDGG.PG.52.106-107

De Bello, F., Carmona, C., Dias, A., Götzenberger, L., Moretti, M. & Berg, M. 2021. Handbook of Trait-Based Ecology: From Theory to R Tools. – Cambridge University Press, Cambridge. ISBN (hardback): 9781108472913 - £74.99, ISBN (paperback): 9781108460750 - £34.99, with available discounts at publisher.
doi:10.1017/9781108628426.



During the last two decades plant community ecology has seen a gradual but fundamental shift of attention from species to their characteristics (i.e. functional traits; sensu Violle et al. 2007), as evidence shows that ecosystem processes are linked to species traits rather than species identities (Díaz & Cabido 2001; de Bello et al. 2010). This paradigm shift has stimulated a vast amount of research focusing on the generality and predictability of ecological processes using the 'trait-based approach', while abandoning the classic 'taxonomic approach' (McGill et al. 2006; Webb et al. 2010). As new theories and related methods have developed, so has the requirement for a comprehensive synthesis of these.

This textbook, or as the authors put it "a hitchhike-R's guide to functional ecology" primarily targets students and those who are familiarizing themselves with trait-based ecology. However, it could find its way onto the shelves of ecologists already working with traits, as a must-have reference book. The book offers a synthesis of both theoretical concepts and analytical tools, focusing on different trophic levels and organisms. It covers a broad range of topics, starting from the history of functional traits, trait-based community assembly, the relationship between traits and phylogeny, as well as the role of traits in applied ecology.

The authors have a decade long experience of teaching trait-based ecology in courses across Europe, and are experts in the fields discussed in the different chapters of the textbook. As the book is probably intended to be used as potential course material, the authors have put a strong emphasis on practicality; each chapter is accompanied by freely accessible R material, where related methods are explained through example analyses.

The book contains 12 chapters, each of which is dedicated to a certain aspect of trait-based ecology. The first chapter is the introduction, which explains the history of the paradigm shift from species-based to the trait-based approach, as well as establishing what a 'functional trait' is. The second chapter focuses on the practical decisions one has to make upon deciding to study functional traits. This part is intended as an introduction to functional traits from a practical point-of view, including trait measurements, standardized protocols, trait databases and handling missing values. The third chapter focuses on species level ecological differences, and how trade-offs between functional traits determine ecological strategies. In the next chapter, one can learn about how species respond to environmental gradients through their functional traits. In this chapter, not only species but community-scale approaches are discussed, which carries on to the next chapter, which is specifically dedicated to community scale metrics. This chapter summarizes what the reader needs to know about community weighted mean and functional diversity indices, when to use which index and how to compute them (also see R material). The sixth chapter is dedicated to within-species trait variability. In the next chapter, the reader can dive deep into (trait-based) community assembly rules and mechanisms, including the classical and modern coexistence-theory, null models and species pools. In the eighth chapter, the focus is on trait evolution.

The reader is introduced to fundamental phylogenetic concepts such as the Brownian motion evolutionary model, indices like phylogenetic signal, phylogenetic diversity as well as different phylogenetic comparative methods. The computation of each of these indices are explained in the attached R practicals. The following two chapters are less technical, but rather focus on larger scale trait variability. Chapter 9 explores the relationship between functional traits and ecosystem processes; and chapter 10 extends the study scale to multiple trophic levels. The final two chapters are more practical. Chapter 11 focuses on the challenges of trait sampling, such as choosing the ideal sample size and number of replicates across different scales. Chapter 12 highlights the importance of functional traits in applied ecology, in the context of agriculture, urban planning, ecological restoration, and invasive species.

The book is written in a style that is easy to understand, bursting with colorful examples and analogies, the illustrations are both informative and artistic, and overall this book is an enjoyable read.

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Flower-rich Xilingol grassland, Inner Mongolia. Photo: K. Uchida.

Book Review

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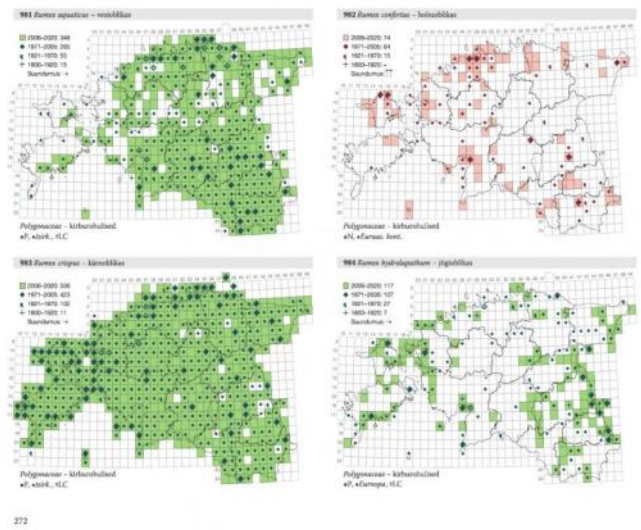
Kuuk, T., Kull, T., Luuk, O., Mesipuu, M. & Saar, P. 2020. Eesti taimede levikuatlas 2020 – Atlas of the Estonian flora 2020 – pp. 643, Institute of Agricultural and Environmental Sciences of the Estonian University of Life Sciences, Tartu. ISBN: 978-9916-4-0258-6 (Hardback print): 47.99€



With the increasing demand on regionally collected plant trait data it became a vital request to have up-to-date plant distribution data from many regions. A very good example of providing distribution data is the very recently published atlas of the distribution data of the Estonian vascular flora. The data background of the atlas is very solid, it is based on more than 2,100,000 data points collected in the last two centuries. The most interesting feature of the atlas is that it displays four temporal "layers". Floristic records from 2006-2020 (records accumulated from the first published distribution atlas of Estonia), 1971-2005, 1921-1970 and data from the pre-1920 period can be distinguished. Thus, some temporal patterns of species distribution including increases or decreases can be followed with the displayed distribution data. This is most valuable in the case of invasive species, where the expansion of the distribution area can be followed by this temporal patterns of records. However, it has to be noted that the last temporal period was supplied with data collected by more than 1900 amateur and professional botanists. It is also a remarkable point that during the compilation of this atlas, most collected and publicly available herbarium specimens with known and exact locations were also considered in the preparation of distribution maps.

The book is attractive and easy to use. It starts with the introduction of the general principles of data collection for the atlas, and also the source of data is properly enumerated here. After these sections there is a section with more than 400 pages, with 1664 distribution maps. The second largest section deals with brief information for each species with some additional data including habitat characteristics, population size, historical records and some ethnobotanical information e.g. on the use of edible/medical plants. It is very important to mention that the whole atlas is bilingual (all descriptions and information is available both in Estonian and English).

To sum up, the book is a very important work for those who are interested professionally or just for fun in the Estonian flora. It provides a very nice example for those groups and countries where such a work is still in progress.

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Recent Publications of our Members

In this section, the contents of which will also be made available via our homepage, we want to facilitate an overview of **grassland-related publications** throughout Eurasia and to improve their accessibility. You are invited to send lists of such papers from the last three years following the format below to Iwona Dembicz, i.dembicz@gmail.com. We will include your e-mail address so that readers can request a pdf. For authors who own full copyright, we can also post a pdf on the EDGG homepage.

Biodiversity & Ecology

Dembicz, I., **Dengler, J.**, Gillet, F., Matthews, T.J., Steinbauer, M.J., Bartha, S., Campos, J.A., De Frenne, P., Dolezal, J., Garcia-Mijangos, I., Guarino, R., Güler, B., Kuzemko, A., Naqinezhad, A., Noroozi, J., Peet, R.K., Terzi, M. & Biurrun, I. 2021. Fine-grain beta diversity in Palaearctic open vegetation: variability within and between biomes and vegetation types. *Vegetation Classification and Survey* 2: 293–304.

Rozwałka R. & **Chmielewski, P**. 2021. Distribution of the purseweb spider (*Atypus muralis*, Bertkau 1890) in the Lublin Voivodship. *Acta Entomologica Silesiana* 29 (online 22): 1–14.

Conservation and Restoration

Tölgyesi, Cs., Vadász, Cs., Kun, R., **Csathó, A.I.**, Bátori, Z., Hábenczyus, A., Erdős, L. & Török, P. 2021. Post-restoration grassland management overrides the effects of restoration methods in propagule-rich landscapes. *Ecological Applications* 32: e02463.

Methodology, classification, databases

García-Mijangos, I., Berastegi, A., Biurrun, I., Dembicz, I., Janišová, M., Kuzemko, A., Vynokurov, D., Ambarlı, D., Etayo, J., Filibeck, G., Jandt, U., Natcheva, R., Yildiz, O. & **Dengler, J.** 2021. Grasslands of Navarre (Spain), focusing on the *Festuco-Brometea*: classification, hierarchical expert system and characterisation. *Vegetation Classification and Survey* 2: 195–231.

Dengler, J., Biurrun, I., Jansen, F. & Willner, W. 2022. Vegetation Classification and Survey: development and diversification. *Vegetation Classification and Survey* 3: 1–5.

Seiler, H., Küry, D., Billeter, R. & **Dengler, J.** 2021. Regional typology of spring vegetation in Parc Ela (Grisons, Switzerland). *Vegetation Classification and Survey* 2: 257–274.

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Alpine grassland with *Cirsium spinossisimum* and view on the Morteratsch Glacier, Upper Engadine, Switzerland. Photo: J. Dengler.

Forthcoming Events

Asian Grassland Conference
19-21 April 2022, Virtual event
Conference website: https://edgg.org/AGC

Symposium on the inner-Alpine dry meadows of the Terra Raetica
6 May 2022, Schlanders/Silandro, Italy
Symposium website: https://www.natura.museum/de/trockenrasentagung/

30th Conference of the European Vegetation Survey
9-13 May 2022, Bratislava, Slovakia
Conference website: https://evs2022.sav.sk/

International Biogeography Society Biennial Conference
2-6 June 2022, Vancouver, Canada
Conference website: https://www.biogeography.org/meetings/vancouver-2022/

29th European Grassland Federation general meeting
26-30 June 2022, Caen, France
Conference website: https://egf2022.symposium.inrae.fr/

64th Annual Symposium of IAVS 2022
27 June – 1 July 2022, Madrid, Spain
Symposium website: https://iavsmadrid2022.com

26th International Congress of Entomology
17-22 July 2022, Helsinki, Finland
Conference website: https://ice2020helsinki.fi/

International Society for Behavioral Ecology Congress 2022
28 July – 2 August 2022, Stockholm, Sweden
Conference website: https://www.isbe2022.com/

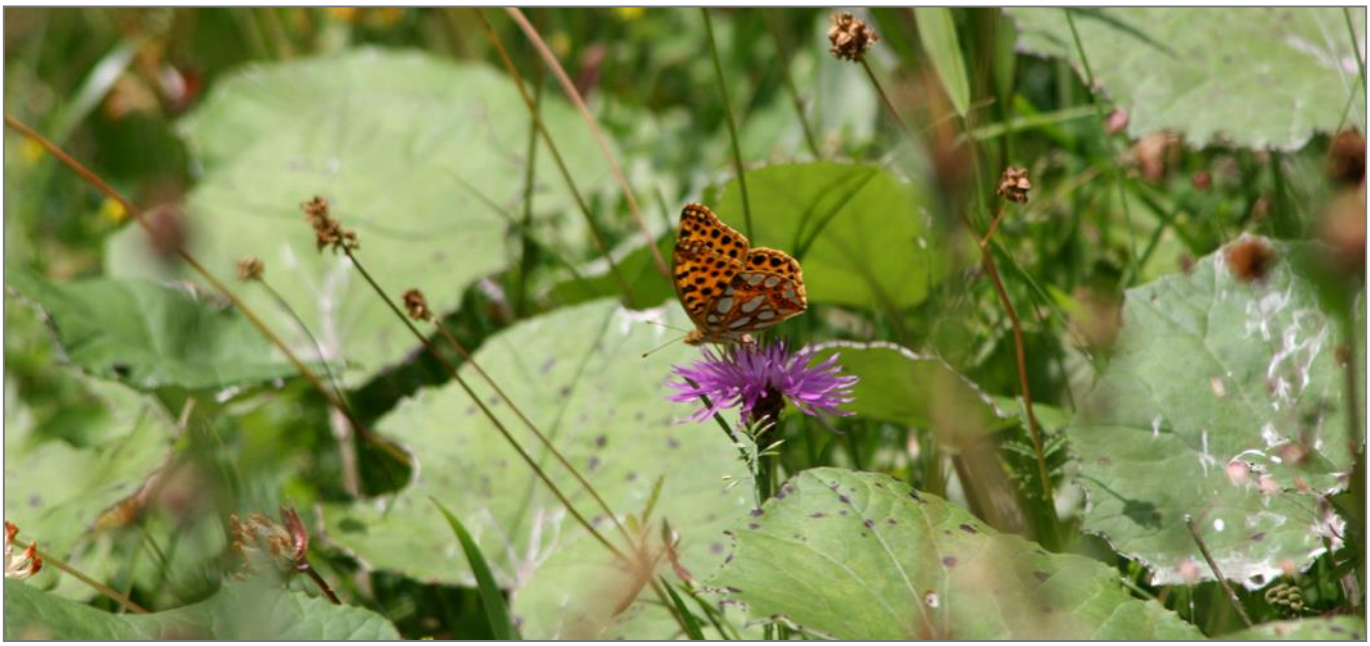
Congress of the European Society for Evolutionary Biology
14-19 August 2022, Prague, Czech Republic
Conference website: https://www.eseb2022.cz/

European Congress of Conservation Biology
22-26 August 2022, Prague, Czech Republic
Conference website: https://www.eccb2022.eu/

Conference on Mediterranean Ecosystems
5-9 September 2022, online and South Africa
Conference website: https://medecos2020.org/

17th Eurasian Grassland Conference of the EDGG
12-18 September 2022, Tolosa, Spain
Conference website: http://edgg.org/egc2022
See details in this issue, on pp. 7-21.

12th International Conference on Biological Invasions
13-16 September 2022, Tartu, Estonia
Conference website: https://www.neobiota.eu/conferences/



***Issoria lathonia* in Balmberg, Solothurn, Switzerland. Photo: M. Buchler.**

EDGG on the web:
http://www.edgg.org

The Eurasian Dry Grassland Group (EDGG), founded in 2008, is a working group of the International Association for Vegetation Science (IAVS) and member of the European Forum on Nature Conservation and Pastoralism (EFNCP). On 22 February 2022, it had 1375 members from 65 countries.

The **Eurasian Dry Grassland Group (EDGG)** is a network of researchers and conservationists interested in any type of Palaearctic natural and semi-natural grasslands. It is an official Working Group of IAVS (http://www.iavs.org) but one can join our group without being an IAVS member. We live from the activities of our members. Everybody can join the EDGG without any fee or other obligation.

The EDGG covers all aspects related to grasslands, in particular: plants - animals - fungi - microbia - soils - taxonomy - phylogeography - ecophysiology - population biology - species' interactions - vegetation ecology - syntaxonomy - landscape ecology - biodiversity - land use history - agriculture - nature conservation - restoration - environmental legislation - environmental education.

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***Potentilla tabernaemontani* in Ticino, Switzerland. Photo: J. Dengler.**