Issue 56 (March 2023)
ISSN 2627-9827 - DOI 10.21570/EDGG.PG.56

PALAEARCTIC GRASSLANDS

Journal of the Eurasian Dry Grassland Group

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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 https://edgg.org/publications/pg-journal 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, Forthcoming Events) 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).

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: Common reed (*Phragmites australis*) in winter, Switzerland. Photo: J. Dengler.

Editorial

Dear readers,

The first 2023 issue of Palaearctic Grasslands comes with the first signals of the near spring, and probably many of you already could enjoy daffodils and other early flowering bulbs. We really hope that these signals bring us joy and optimism after the past terrible year, with the still ongoing invasion of Ukraine and the terrible earthquakes in Turkey and Syria.

All our sympathy goes with the suffering people in these countries, those who lost their beloved ones, their houses and their livelihood. The natural disaster in Turkey and Syria finished and hopefully will not repeat, although its consequences will unfortunately last for long for the affected people. However, the war in Ukraine continues, and its end depends on humanity, not on nature. We really wish our next issue will be published in a peaceful and free Ukraine. In the meanwhile, our Ukrainian colleagues still need our help, and I am happy to announce that the EDGG Fund for Ukrainian scientists is receiving more donations, and EDGG will be able to fund more projects.

This issue also comes with a very nice research article on the soil seed bank of alpine meadows in Indian Himalayas. I hope this will encourage many of you to submit your own research articles to Palaearctic Grasslands, where studies based on small datasets, often by bachelor and master students, are particularly suitable.

Of course, this year EDGG will hold both a Field Workshop and a Eurasian Grassland Conference. In this issue you can find all the details about the promising Field Workshop in Italian inneralpine valleys, with the necessary information for registration.

Last, but not least, I would like to mention that all these activities held by EDGG are possible thanks to the willingness of the Field Workshop and Conference organizators, but specially to the work of the people in the Executive Committee. This year the term of duty of the current EC comes to an end, and new elections will be organized. EDGG needs young (or not so young) people, full of energy, willing to participate in this task. Those of you who think that could help, you can nominate yourselves or your colleagues to run for the elections.

I wish all of you a good entrance in the spring,

With best regards,
Idoia Biurrun

European green woodpecker (*Picus viridis*), searching for ants under the snow. Photo: J. Dengler.

News

Call for nominations to the EDGG Executive Committee 2023–2025

The term of duty of the current Executive Committee of the EDGG is coming to an end and we are herewith opening the nomination period for candidates for the next Executive Committee.

According to our Bylaws, the Executive Committee (EC) consists regularly of seven members with equal rights (i.e. no Chair or President). They are elected for 2-year renewable terms. After the election, the new EC members will jointly decide how to distribute their tasks among themselves. Among the main tasks are the coordination of the Eurasian Grassland conferences (EGC), the coordination of the EDGG Field Workshops, the Chief Editorship of *Palaearctic Grasslands*, the coordination of special features in international journals, our website, our membership database, the EDGG representation on social media, and relationship with IAVS and finances.

We now call upon you to nominate EDGG members as candidates for the next EC. This time there will be in any case a huge turnover in the EC, as two of its members have already resigned in the course of 2022 due to other professional and personal responsibilities (Alla Aleksanyan & Didem Ambarlı) and two others have announced not to run for another election (Anna Kuzemko & Iwona Dembicz). This means that there will be at least three new members in the next EC. We are looking for colleagues who are willing to contribute actively to the success of EDGG, to maintaining its diverse activities and implement new ideas. Ideally, the new EC should be again diverse with regard to gender, nationality, age and scientific background (e.g. zoologists and botanists). Our Bylaws require that at least one EC member is based outside Europe, i.e. either in Asia or North Africa.

Please, send your nomination(s) until 26 March 2023 to the Election Committee, consisting of Iwona Dembicz (i.dembicz@gmail.com) and Anna Kuzemko (anyameadow.ak@gmail.com). Self-nominations are particularly welcome! All nominated members will then be asked by the Election Committee whether they wish to stand for the election and to provide a short biosketch and a photo. The biosketch should be up to 150 words and say who you are, how you are related to EDGG (e.g. since when member or active) and what your aims and vision were if elected.

Once the feedback of the nominees has been received, all candidates with their photos and biosketches will be presented in an e-mail to the EDGG members, who then can vote over two weeks by means of an electronic voting system supervised by Iwona and Anna.

The outgoing EDGG Executive Committee:
Idoia Biurrun, Iwona Dembicz, Jürgen Dengler
Anna Kuzemko, Rocco Labadessa, Stephen Venn

***Rhytidiadelphus triquetrus*, a typical moss of mesoxeric, baserich grasslands, Switzerland. Photo: J. Dengler.**

EDGG Fund for Ukrainian Scientists: Funded projects and new call for donations

We would like to thank all donators for their generous donations since the last call. We are particularly grateful to the members of the Forest & Nature Lab of the Ghent University in Belgium who donated 400 EUR, which they collected in a silent auction during their Christmas party. Very nice idea!
Meanwhile three of our early grantees have completed their projects with quite impressive results, given the rather small support that EDGG could provide:

- **Oleksii Vasyliuk** – Dataset on the biodiversity of Zmiinyi (Snake) Island
- **Oleksii Marushchak** – Preservation of valuable data on the distribution of rare steppe lichens in the occupied territories of Ukraine
- **Maryna Zakharova** – Distribution of rare plants in the Niznyodnripro Sands nature reserve (Kherson and Mykolaiv regions, Ukraine)

Congratulation to all three! We plan to publish a scientific report on the outcomes of each of the projects in the next issue of *Palaearctic Grasslands* (No. 57).
Since there is again money available for grants, **Ukrainian EDGG members can send new proposals for grant projects** to the Chair of the Grant Committee (Jürgen Dengler). For details on the procedure, please see pp. 4–6 in *Palaearctic Grasslands* 54/55.
We already assigned one new grant: **Project #5: Maryna Zakharova – Analysis of the distribution of rare biotopes in arenas of the Lower Dnipro sands (Kherson and Mykolaiv regions, Ukraine)**.

However, this is not the end. Ukraine and the Ukrainian scientists are still suffering from the Russian invasion in their country. Therefore, EDGG wishes to keep its "Fund for Ukrainian Scientists" alive as long as the situation remains like that. **We invite you to support the Ukrainian grassland scientists by further donations**. Small donations are also welcome! It is very easy to make donations (see below).

If you wish that your name as donator is mentioned, please notify the chair of the Grant Committee (Jürgen Dengler).
You can make donations, big or small, to our fund either with credit card via our online form or by money transfer to IAVS' Dutch bank account. Please note that the money will go through the accounts of IAVS. Therefore, it is crucial that you indicate the purpose of your payment precisely as stated below because otherwise the money might not reach EDGG's Fund.

(A) With credit card via the online platform

- You can make your payment **here**
- Please indicate whether you wish your name as donator to be publicized or not
- Fees: **0.20 USD per transaction**

(B) With bank transfer to IAVS' Dutch bank account

- BIC/Swift code: **SNS BNL 2A**
- IBAN: **NL40 SNSB 0921 5290 23**
- Recipient: **INTERNATIONALE VERENIGING VOOR VEGETATIEKUNDE**
- Give the following subject line: **EDGG Donation Fund for Ukraine**
- If you agree with your name being listed as donator, please send an e-mail with your name and the date and amount of the donation to dr.juergen.dengler@gmail.com
- Fees: **0.07 EUR per transaction**

THANK YOU FOR YOUR SUPPORT OF UKRAINIAN SCIENTISTS IN NEED!

The Grant Committee
(***Idoia Biurrun, Iwona Dembicz, Jürgen Dengler, Rocco Labadessa, Stephen Venn***)
Contact: dr.juergen.dengler@gmail.com

Fields of ..... In Lugansk region, Ukraine. Photo: O. Vasyliuk.

Call for photos for *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 previous issues.

As with scientific articles, Photo Stories undergo a review process with a focus on the quality of the photographs. 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 the DOI of your article or of the whole issue (you can check all published issues);
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 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 the required information to Rocco (rocco.labadessa@gmail.com).

Deadline for photo submissions is **30 April 2023**.

Rocco Labadessa, Bari, Italy
rocco.labadessa@gmail.com

Call for Photo Competition *"The colour blue in grasslands"*

The theme of the Photo Competition is "**The colour blue in grasslands**". Blue is a very common colour on Earth. But when it comes to living organisms, blue is very rare. Less than one in ten plants have blue flowers and even fewer animals are blue. The rarity of blue in nature makes blue plants and animals all the more spectacular and special! Can you capture the blue colour in grassland species in a photograph?

You are invited to send up to three high-quality photographs within the competition theme (full size JPEG or TIFF images, at least 300 dpi) together with captions giving a short title or description and information on the subject (species name, date, place name). The Photo Jury (see imprint) will select the best photographs. The three best shots will be awarded with full space in the next issue, but we reserve the right to use other submitted materials for illustrative purposes in other parts of the issue. If you want to take part in the competition, please submit your photos together with required information to Edy (edy.fantinato@unive.it) by **30 April 2023**.

Edy Fantinato, Venice, Italy
edy.fantinato@unive.it

***Gentiana verna*, Swabian Alb, Germany.**
Photo: J. Dengler

EDGG Event

17th EDGG Field Workshop Inner Alpine dry valleys of the south-eastern Alps (Italy, Switzerland, 1-11 June 2023): Call for participation

Background

Since 2009, when J. Dengler first proposed a new sampling methodology, that has been revised and improved from year to year (detailed in Dengler et al. 2016), field workshops have been an important activity for the EDGG.

The multiple scale approach that characterizes the workshop, aims to collect standardized high-quality biodiversity data together with structural data. The approach has already been applied to a series of studies and can be utilized for further research. All data are entered into the GrassPlot database (Dengler et al. 2018). The data collected during this Field Workshop will result in a joint scientific publication from all the participants.

Topic and aims of the Field Workshop

As Braun-Blanquet stated in his monograph on the xerothermic vegetation (1961), it is possible to distinguish 13 inner-Alpine xerothermic "islands" from the Durance valley (France) in the Southwest, to Carinthia and Styria (Austria) in the East. With regard to the eastern Alps, the 11th EDGG Field Workshop has already investigated the three most important areas of Austria (small areas of Carinthia and Styria, Puster and upper Drau valley and the Inn valley in Tyrol); while Switzerland, including the Engadine, the valleys of Central Grisons (Rhine and tributaries) and the Valais (Rhone valley), were the target of the 12th EDGG Field Workshop.

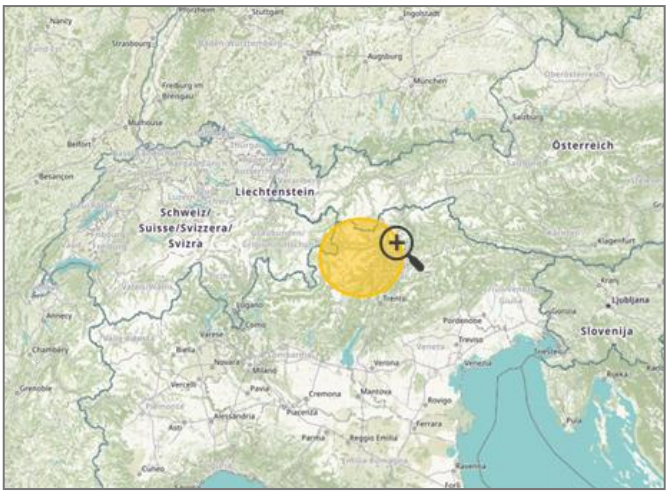
The 17th EDGG Field Workshop aims at filling the gaps for the Eastern Alps. This workshop will collect data from the moderately dry valleys of the Eisack/Isarco and Adige/Etsch valley, to the Valtellina, Val di Sole and Valcamonica, and the most extreme dry valley system of the Eastern Alps: the Vinschgau/Venosta valley and Val Müstair in Switzerland.

Fauna, flora and vegetation

The average annual precipitation in these climatically extreme valleys is usually between 450 and 700 mm, combined with high solar insolation.

The east-west orientation of the Vinschgau valley and its geographic position, result in an annual precipitation of below 500 mm in some localities. Since the end of the last Ice Age this exceptional environment has resulted in the development of a very species rich thermophilic flora, adapted to conditions that are otherwise absent or rarely found in the

Landscape in the Matsch/Mazia Valley, South Tyrol, Italy. Photo: A. Hilpold.



Field Workshop area: overview map

Alps. Among these species, there are many typical taxa of the steppe-like grasslands of Central and Eastern Europe, isolated from the main distribution range, and thus at the westernmost limit of their range. Some taxa have even formed endemic genetic lineages or subspecies (Kirschner et al. 2020). This diverse steppe-like element is enriched with widespread Central European dry grassland species and some (sub-) Mediterranean species adapted to summer drought.

Nowadays, the biotic communities of dry grasslands are considered to be particularly worthy of protection throughout Europe and are partially protected in the European network Natura 2000. Nevertheless, many valuable areas are still excluded from protected areas and are therefore not subject to adequate protection and management.

Itinerary for the Field Workshop

The EDGG 17th Field Workshop 2023 will take place in the Italian south-eastern Alps, namely in the Autonomous Province of Bolzano/Bozen (Region Trentino-Alto Adige), Valtellina (Region Lombardy) and in the Val Müstair/Münstertal (Switzerland). We will focus on various types of grazed dry meadows and will also visit some semi-dry hay meadows. The Workshop is organized by three local bodies, namely the Institute for Alpine Environment - Eurac Research, the Free University of Bozen-Bolzano and the Museum of Nature South Tyrol.

Travelling days to and from Bolzano/Bozen: Thursday 1st and Sunday 11th of June 2023.

Field days: From Friday 2nd of June until Saturday 10th of June 2023.

Travel schedule: We will spend the first three days of the Workshop in the wider Bolzano/Bozen area: The Eisack/Isarco Valley between Bolzano/Bozen and Bressanone/Brixen, the Adige/Etsch Valley between Merano/Meran and Bolzano/Bozen, and the lowlands between Bolzano/Bozen and Trento, which are moderately continental with a strong Mediterranean influence. Dry grasslands here are mostly restricted to small-scale specific sites.

Then we will drive to the Vinschgau/Venosta Valley, the driest valley in the Eastern Alps, where we will spend four days. We will make a detour to Val Müstair (CH) – geographically a side valley of the Vinschgau. If there are issues for individuals entering Switzerland, the groups can be divided, and one group will stay in Vinschgau.

The remaining days of the excursion will be spent in the moderately dry valleys of Valtellina, Valcamonica (both Lombardy) and Val di Sole (Trentino).

Thu 1st	Travelling day to Bolzano/Bozen. Icebreaker event at the Museum of Nature at 6 p.m. (Bindergasse 1, 39100 Bolzano/Bozen)
Fri 2nd	Fieldwork Adige/Etsch Valley (Castelfeder hill), introduction to the vegetation of the area
Sat 3rd	Fieldwork Adige/Etsch Valley and Eisack/Isarco Valley
Sun 4th	Fieldwork Adige/Etsch Valley around Merano; change accommodation to the upper Vinschgau/Venosta valley
Mon 5th	Fieldwork Vinschgau/Val Venosta and Val Müstair
Tue 6th	Fieldwork Vinschgau/Val Venosta and Val Müstair
Wed 7th	Fieldwork Vinschgau/Val Venosta and Val Müstair
Thu 8th	Fieldwork Vinschgau/Val Venosta and Val Müstair, journey to Valtellina
Fri 9th	Fieldwork Valtellina
Sat 10th	Fieldwork Val Camonica and Val di Sole, journey back to Bolzano/Bozen
Sun 11th	Travelling day from Bolzano/Bozen

Accommodation

We will stay at three different places, one close to Bolzano/Bozen, one around Mals/Malles and one in Valtellina.

We have booked the following three accommodations:

- Bolzano area: Pension Lichtenburg, Nals/Nalles (breakfast, lunch package and dinner);
- Mals area: Hotel Iris, Mals/Malles (breakfast, lunch package and dinner);
- Valtellina: Garni Le Corti, Grosotto (breakfast, lunch package and dinner) .

We plan to travel to the sites in two 9-seat minibuses. In addition, scientists and students from South Tyrol will join to help with logistics and the fieldwork using their own cars.

Fees

The fees comprise travelling during the field workshops, accommodation, breakfast, dinners and pocket lunch for all days.

The fees for full participation are:

- 800 € for senior scientists (more than 33 years) who are not members of IAVS
- 750 € for senior scientists (more than 33 years) who are members of IAVS
- 750 € for young scientists (up to 32 years) as well as unemployed persons who are not member of IAVS
- 700 € for young scientists (up to 32 years) as well as unemployed persons who are member of IAVS
- 0 € (i.e. no participation fee) for any Ukrainian participant (whether living in Ukraine or a refugee abroad) who is IAVS member at the time of application (it is possible also to apply additionally for travel grants to/from Bolzano).

We search for people with good knowledge of vascular plants, bryophytes and/or lichens. Beyond botanists and lichenologists, EDGG Field Workshops are also open to experts of other taxonomic groups (e.g. insects, spiders, snails, fungi, bacteria) who intend to conduct standardised sampling on the same plots. If interested, please get into contact with the local organisers and the Field Workshop Coordinators to discuss options.

Applications

In general only EDGG members can participate in EDGG Field Workshops, but if non-members apply this will be considered as an application for free membership of the EDGG. To apply for participation in the Field Workshop, please send a brief motivation letter (for details see below) to Iwona Dembicz (i.dembicz@gmail.com) and Idoia Biurrun (idoia.biurrun@ehu.es), including experience of vegetation surveys, in an email entitled "EDGG Field Workshop" **by 10 April 2023**.

Confirmation of participation and feedback on travel grant applications will be given as soon as possible after this deadline, likely around the 5th April.

All applicants, except those who have already participated in four or more Field Workshops, have to submit **a motivation letter** (250 words maximum), explaining why they are interested in participation and how they would contribute to both a successful Field Workshop and successful outcomes afterwards.

The motivation letter is the most important criterion, if there are more applicants than places, or more applicants for travel grants than available money.

When applying for participation, in addition to your motivation letter please include in your e-mail the following information:

- Name
- Age
- Professional status (e.g. PhD Student, Postdoc, Professor, Unemployed)
- Affiliation
- Address
- Mobile phone (we need to be able to contact you, e.g. when you get lost in the field)
- Dietary requirements (no/vegetarian/other: please specify)
- If you are not an EDGG member yet, you need to agree explicitly to join EDGG (for free)
- Travel grant application (Yes/No)

Dry grasslands in Vinschgau, South Tyrol, Italy. Photo: A. Hilpold.

Travel grants

Any participant (Ukrainians and non-Ukrainians) can apply for a travel grant from IAVS if three conditions are met: (a) the person is an IAVS member at the time of application; (b) there is a compelling motivation letter and (c) the person agrees to take responsibility for part of the data handling after the FW (e.g. plant determination, soil analysis or digitization of plot data). The distribution of funding is decided by an *ad hoc* committee consisting of members from the local organizers and of the EDGG EC. Grants are paid to the grantees after the event by IAVS on provision of the relevant receipts.

Recipients of IAVS travel grants are expected to actively contribute not only during the Workshop, but during data preparation and processing (determination of collected herbarium specimens, data entering and cleaning, or analyses of soil samples etc.).

If you wish to apply for a travel grant, please provide the following additional information together with your standard application:

- IAVS member in 2023 (Yes/No)
- Ukrainian citizenship (Yes/No)
- Details of whether you have already applied, or plan to apply, for another IAVS travel grant (e.g. IAVS Symposium, EVS conference or Eurasian Grassland Conference)
- Indication whether you are willing to organize a future Field Workshop (give target region and potential years)
- Motivation letter (see above)
- Approximate travel costs from your home to the starting point of the Field Workshop and back
- Details of other funding that you receive (e.g. from your institution)?
- Could you participate if you do not get a travel grant?

References

Braun-Blanquet, J. 1961. *Die inneralpine Trockenvegetation*. Fischer, Stuttgart, DE.

Dengler, J., Boch, S., Filibeck, G., Chiarucci, A., Dembicz, I., Guarino, R., Henneberg, B., Janišová, M., Marcenò, C., (…) & Biurrun, I. 2016. Assessing plant diversity and composition in grasslands across spatial scales: the standardised EDGG sampling methodology. *Bulletin of the Eurasian Grassland Group* 32: 13–30.

Dengler, J., Wagner, V., Dembicz, I., García-Mijangos, I., Naqinezhad, A., Boch, S., Chiarucci, A., Conradi, T., Filibeck, G., (…) & Biurrun, I. 2018. GrassPlot – a database of multi-scale plant diversity in Palaearctic grasslands. *Phytocoenologia* 48: 331–347.

Kirschner, P., Záveská, E., Gamisch, A., Hilpold, A., Trucchi, E., Paun, O., Sanmartín, I., Schlick-Steiner, B.C., Frajman, B. , (…) & Schönswetter, P. 2020. Long-term isolation of European steppe outposts boosts the biome's conservation value. *Nature Communications* 11: e 1968.

Local organizers:

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Lisa Angelini, Bolzano, Italy
lisa.angelini@eurac.edu

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Camilla Wellstein, Bolzano, Italy
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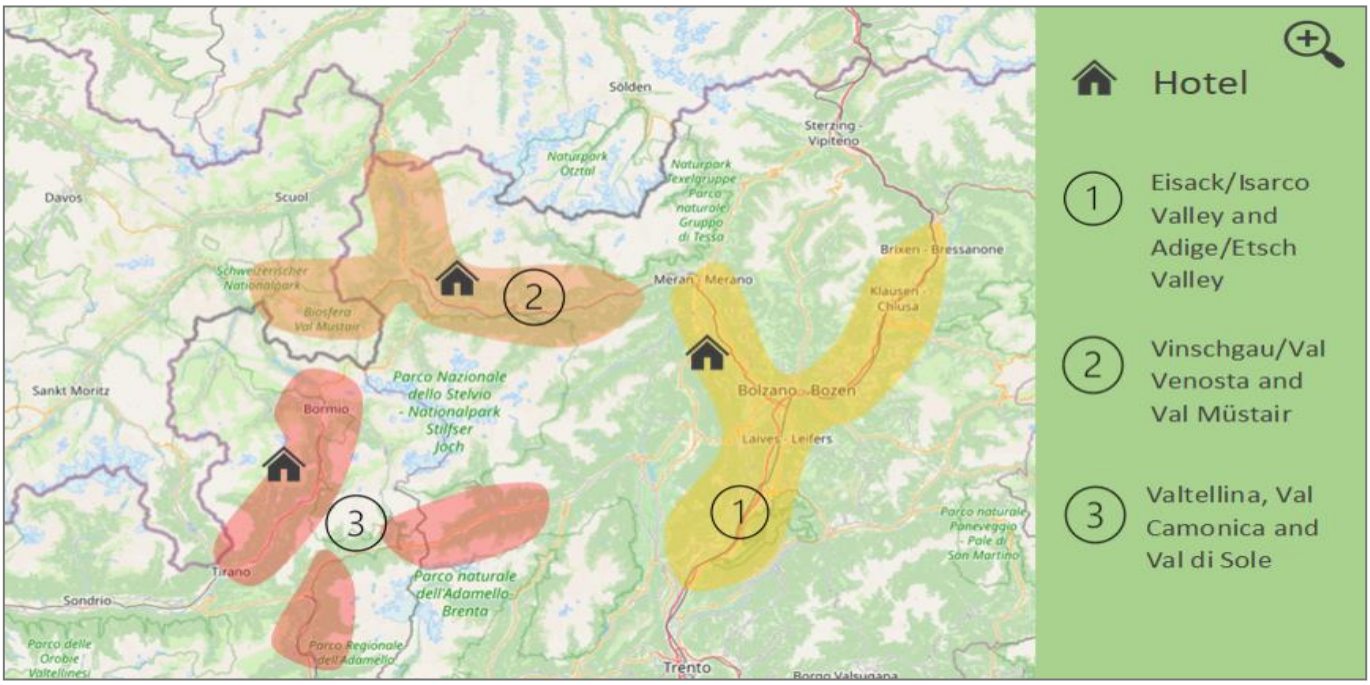
Thomas Wilhalm, Bolzano, Italy
thomas.wilhalm@naturmuseum.it

EDGG Field Workshop Coordinators:

Iwona Dembicz, Warsaw, Poland
i.dembicz@gmail.com

Idoia Biurrun, Bilbao, Spain
idoia.biurrun@ehu.es



Field workshop area: detailed trip map.

EDGG Publication

Updated call: 7th EDGG Special Feature in *Hacquetia*: Fauna, flora, vegetation and conservation of Asian grasslands

This is the second and updated call for the submission of manuscripts for the EDGG-edited Special Feature in *Hacquetia* 2023. This special feature will be dedicated to papers dealing with Asian grasslands. We welcome manuscripts about natural and semi-natural grasslands, on all taxa and from any region in Asia. Both original research papers and review papers focusing on topics such as ecology, botany, zoology, conservation biology, restoration ecology, taxonomy, syntaxonomy, ethnoecology, rangeland management of Asian grasslands are welcome. Presenters at the Asian Grassland Conference are especially welcome to submit papers related to their presentations, but the SF is open not only to participants of the AGC, but any scientist dealing with grasslands in Asia.

Hacquetia is the international journal of the Biological Branch of the Slovenian Academy of Sciences. It appears in two issues per year, both in print and online. Through offering longer articles, diamond open access publication and free reproduction of colour figures, it is a very attractive publication venue. Hacquetia is included in the Web of Science Core Collection and Emerging Sources Citation Index (ESCI), and the journal is also indexed in the Scopus and BIOSIS literature databases.

This Special Feature will be the 7th EDGG-edited article collection in *Hacquetia,* following the six successful issues in 2014/1, 2015/1, 2016/2, 2018/1, 2019/2 and 2021/1. This Special Feature is planned to be published as the first issue of 2024, to be published approximately in January 2024, with about 150–250 pages reserved for our articles.

Procedure and deadlines

If you plan to contribute, you are invited to **send an abstract** to the Chair of Guest Editors, Orsolya Valkó, prior to manuscript submission **until 20th March 2023**. Based on these abstracts, the guest editor team will decide which papers to invite and will inform the authors by 30th March 2023.

The **deadline for full-text submission is 31st May 2023** and manuscripts will undergo the normal peer-review process. If you are interested in contributing a manuscript for this comprehensive Special Feature, then please contact the chief of the guest editor team (Orsolya Valkó, valkoorsi@gmail.com) and submit your manuscript directly to her. Manuscripts will be checked by the editorial board and suitable manuscripts will undergo the normal peer-review process. For detailed author guidelines please consult the earlier issues of the Journal or contact the chief of the guest editors directly.

Guest Editor Team:
Orsolya Valkó, Budapest, Hungary
Yun Jäschke, Görlitz, Germany
Alireza Naqinezhad, Babolsar, Iran
Rocco Labadessa, Bari, Italy
Stephen Venn, Helsinki, Finland

Contact for questions and submission of manuscripts:
Orsolya Valkó (valkoorsi@gmail.com)
Chair of the Guest Editors

Brayo pamiricae-Stipetum glareosae **in Murgab, E Pamir, Tajikistan. Photo: A. Nowak.**

Announcements

GrassVeg.DE, EDGG's German grassland vegetation database, is seeking support

GrassVeg.DE is a vegetation-plot database maintained by an EDGG-affiliated consortium and a member of the European Vegetation Archive (EVA) and the global database sPlot. It aims to (1) mobilize vegetation-plot data of grasslands and other open habitats (heathlands, mires, coastal communities, alpine communities, ruderal communities) in Germany, and to (2) provide data for national, continental or global analyses of vegetation classification, community ecology, macroecology or global change biology (Dengler et al. 2017, 2018; Pätsch & Dengler 2022; see also EDGG Regional Databases). GrassVeg.DE is working on making a more significant fraction of valuable vegetation plots available for international, collaborative research that is not yet available in digitized format elsewhere.

GrassVeg.DE has started digitizing the historical plots of grasslands and other open habitats from articles published in *Tuexenia*. This ambitious work is thankfully done by our colleague and EDDG member Iuliia Vasheniak and financed through a scholarship. However, we expect in *Tuexenia* alone several tens of thousands of valuable plots that have not been digitized yet. In parallel, we also received quite some datasets of vegetation plots from German colleagues, from which we already managed to implement parts in the last GrassVeg.DE update in 2022. However, implementing all these data to GrassVeg.DE is quite some work for only the two custodians and one scholar. Thus, we call for help mainly in two ways:

- If you are familiar with Turboveg and would be willing to invest half a day or a day per month in those parts of the digitisation that need German language knowledge, please contact Ricarda. Such helpers, we can offer membership in the GrassVeg.DE Consortium and co-authorship in future publications.
- If you want to help to ensure Iuliia's payment for a longer period, you can make a donation to the EDGG Fund for Ukrainian Scientists (see Biurrun et al. 2022) and then inform Jürgen, so that this money is specifically devoted to the digitisation work by Iuliia.

References

Biurrun, I., Dembicz, I., Dengler, J., Labadessa, R. & Venn, S. 2022. EDGG Fund for Ukrainian Scientists – Funded projects and new call for donations. *Palaearctic Grasslands* 54–55: 4–6.

Dengler, J., Becker, T., Conradi, T., Dolnik, C., Heindl-Tenhunen, B., Jensen, K., Kaufmann, J., Klotz, M., Kurzböck, C., (…) & Went, J. 2017. GrassVeg.DE – die neue kollaborative Vegetationsdatenbank für alle Offenlandhabitate Deutschlands. *Tuexenia* 37: 447–455.

Dengler, J., Becker, T., Heinken, T., Kurzböck, C.M. & Pätsch, R. 2018. News from GrassVeg.DE, the German grassland vegetation database. *Palaearctic Grasslands* 38: 26–29.

Pätsch, R. & Dengler, J. 2022. GrassVeg.DE: call for vegetation-plot data of grasslands and other open habitats in Germany. *Palaearctic Grasslands* 52: 26–26.

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Early spring aspect of a mesoxeric basiphilous grassland on the Swabian Alb, Germany. Photo: J. Dengler.

Vegetation Classification and Survey (VCS): start of the fourth year and call for contributions

In 2020, our mother organisation IAVS, launched its third international journal, *Vegetation Classification and Survey* (VCS), to complement *Journal of Vegetation Science* (JVS) and *Applied Vegetation Science* (AVS). VCS is a gold open access journal devoted to vegetation classification at any spatial and organisational scale as well as ecoinformatics in vegetation science. It is published online only by the Bulgarian publisher Pensoft, specialised in open access books and journals in organismal biology, ecology and conservation. Thanks to Pensoft, VCS has a quite functional and attractive journal website (Fig. 1).

The first years of a new journal are always challenging because only after some years of good work journals become included in the Web of Science and get an Impact Factor. The challenge is even bigger for an open access journal where authors normally have to pay article processing charges (APCs) for their articles. This latter impediment luckily was removed by IAVS through covering the full APCs of all contributions by IAVS members during the initial phases. Despite the challenges, VCS is doing remarkably well. The publication numbers since the first year were constantly above 20 papers annually, and thus VCS did not experience the significant reduction of articles that most other ecological journals are seeing (Dengler et al. 2023a). Since early 2022, VCS is included in the largest bibliometric database of the world, Scopus, and now is displayed with a monthly updated CiteScore Tracker (Scopus' equivalent to the Impact Factor) on the Scopus journal page. Thanks to the good performance, we are optimistic that in the middle of 2023, VCS will also be included in the Web of Science.

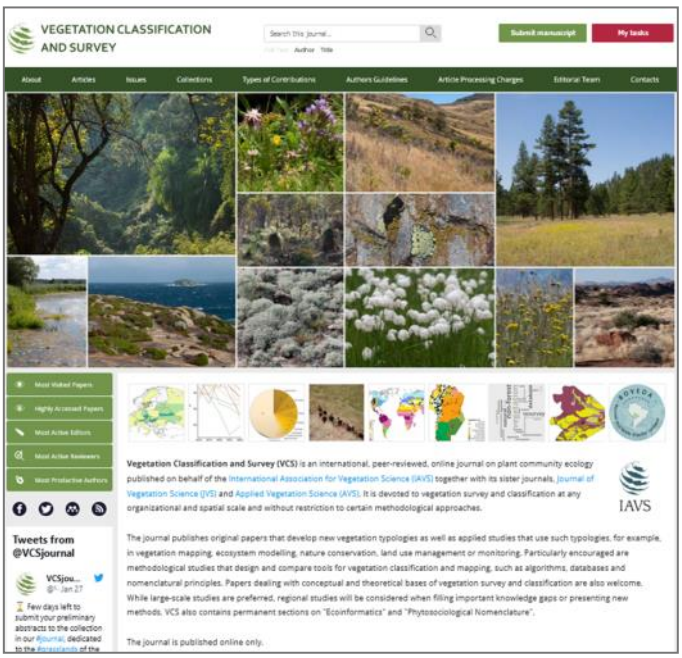

Fig. 1. Homepage of Vegetation Classification and Survey.

The third volume of VCS comprises 296 pages. There was one Editors' Choice paper per quarter and at the end of the year, the Chief Editors selected one of these for the Editors' Award 2022. Nicely, this paper by Changcheng Liu and colleagues deals with Palaearctic grasslands, or specifically with the plot-based classification of all the *Stipa*-dominated steppes in China (Liu et al. 2022) (Fig. 2). As usual, motifs from the Award paper were then used to illustrate the cover of the volume (Fig. 3).

During the turn from the third to the fourth volume, VCS published two synthetic articles that likely will be useful for many vegetation ecologists and macroecologists. First, Loidi et al. (2022) proposed a new definition and delimitation of the terrestrial biomes of the world. Based on bioclimate, they distinguish nine biomes and 20 subbiomes, whose distribution is shown by detailed maps. For further background information, see the blog post. Then, Dengler et al. (2023b) published the most comprehensive ecological indicator value system for Europe so far, called EIVE 1.0.

They mathematically derived a consensus system of 31 regional systems. As a result, they provide niche position and niche width on interval scales from 0 to 10 for five niche

Fig. 2. The recipient of the VCS Editors' Award for 2022, Changcheng Liu, during vegetation survey in an alpine meadow on the Tibetan Plateau. Photo: Y. He.

dimensions and nearly 15,000 vascular plant taxa. You can find more background information in the blog post.

VCS closely cooperates with many of the IAVS Working Groups and Regional Sections (see VCS collections). There is Permanent Section "Phytosociological Nomenclature" together with IAVS' Group on Phytosociological Nomenclature (GPN). The Eurasian Dry Grassland Group (EDGG) completed its first Special Collection on "Classification of grasslands and other open vegetation types in the Palaearctic" (Nowak et al. 2022). Also in 2022, a Special Collection together with IAVS' Working Group on Vegetation Classification (WGVC) on "The 'International Vegetation Classification' initiative: case studies, syntheses, and perspectives on ecosystem diversity around the globe" was finished. Currently, IAVS' Regional Sections of Africa and Latin America and the Caribbean started two Special Collections on "African vegetation studies" and "Neotropical vegetation". Most recently, EDGG, together with the new Regional Section for Asia opened a Special Collection on "Grasslands of Asia".

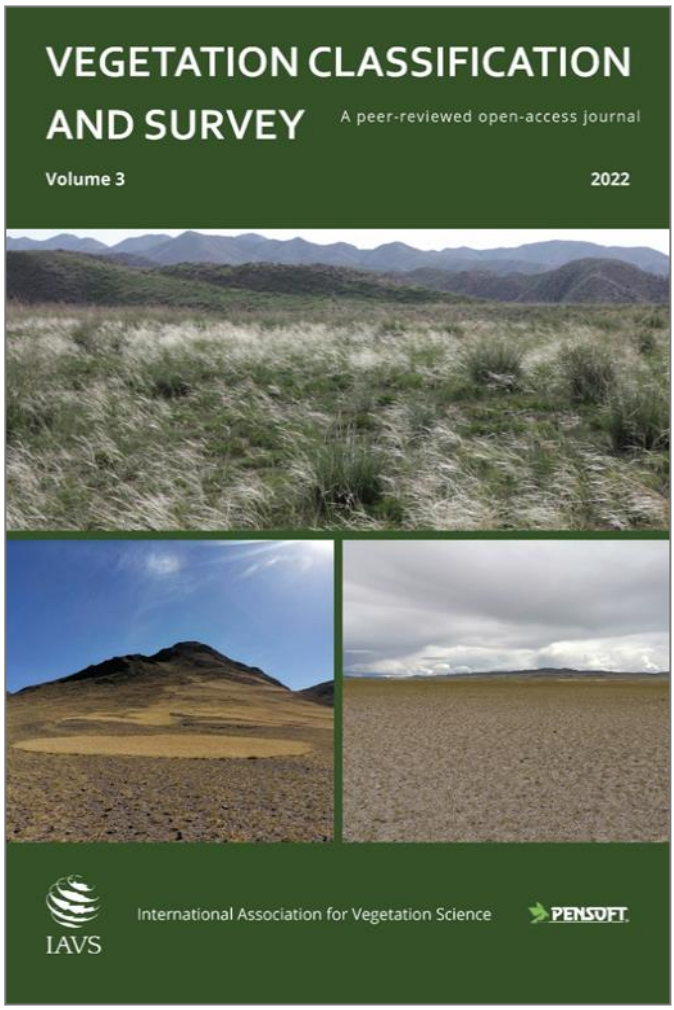

Fig. 3. Cover of volume 3 of *Vegetation Classification and Survey* with motifs from Chinese *Stipa* steppes.

In conclusion, VCS is an attractive publication venue, supporting a multitude of different article types from classical research papers, through methodological studies, forum papers, reviews and syntheses and various types of reports, including Long and Short Database Reports in cooperation with the Global Index of Vegetation-Plot Databases (GIVD). All papers are full colour, and they can be longer than standard papers in other journals if this is justified by the content, e.g. in comprehensive classification studies. Different from AVS and JVS, VCS uses double-blind peer review (to avoid biases in review outcomes based on the reputation, affiliation, age and gender of the authors) and provides linguistic editing free of charge for all accepted articles that do not have a native speaker in their author team (to remove publication impediments for authors whose English is not brilliant). We thus would like to invite you:

- to check the published articles at vcs.pensoft and cite them where appropriate,
- to submit own good papers from our scope to VCS (for submissions until 30 June 2023, IAVS members benefit from full exemption from APCs),
- to consider proposing a Special Collection, for example from or subgroup of IAVS or in conjunction with one of the conferences of IAVS, EVS and EDGG in 2023
- to apply to become a member of our Editorial Review Board, particularly if you are based outside Europe, you are young and/or female (see call at VegSciBlog).

References

Dengler, J., Biurrun, I., Jansen, F. & Willner, W. 2023a. Vegetation Classification and Survey in the third year. *Vegetation Classification and Survey* 4: 1–6. doi.org/10.3897/VCS.100394

Dengler, J., Jansen, F., Chusova, O., Hüllbusch, E., Nobis, M.P., Van Meerbeek, K., Axmanová, I., Bruun, H.H., Chytrý, M., … & Gillet, F. 2023b. Ecological Indicator Values for Europe (EIVE) 1.0. *Vegetation Classification and Survey* 4: 7–29. doi.org/10.3897/VCS.98324

Liu, C., Qiao, X., Guo, K., Zhao, L. & Pan, Q. 2022. Vegetation classification of *Stipa* steppes in China, with reference to the International Vegetation Classification. *Vegetation Classification and Survey* 3: 121–144. doi.org/10.3897/VCS.72875

Loidi, J., Navarro-Sánchez, G. & Vynokurov, D. 2022. Climatic definitions of the world's terrestrial biomes. *Vegetation Classification and Survey* 3: 231–271. doi.org/10.3897/VCS.86102

Nowak, A., Biurrun, I., Janišová, M. & Dengler, J. 2022. Classification of grasslands and other open vegetation types in the Palaearctic – Introduction to the Special Collection. *Vegetation Classification and Survey* 3: 149–159. doi.org/10.3897/VCS.87068

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DOI: 10.21570/EDGG.PG.56.15-24

Research Article

Soil seed bank potential of Himalayan alpine meadows – A case study of anthropogenically disturbed Tungnath treeline

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Palaearctic Grasslands 56 (2023): 15-24

Abstract: Many alpine plants disperse dormant seeds at maturity towards the end of the growing season, characterised by cooler temperatures preventing immediate seed germination. The seeds then accumulate in the soil and germinate in the next growing season, or remain buried until favourable conditions occur. Since soil seed bank potential depends on species-specific (intrinsic) and site-specific (extrinsic) characteristics, it is worth to ask: can anthropogenically disturbed Himalayan alpine meadows form a soil seed bank? Two hundred and sixty soil cores were sampled down to 10 cm depth in two layers from alpine meadows parallel to the Tungnath treeline in Uttarakhand State of India. Sampling was carried out in autumn (after seed dispersal) and spring (before seed germination) and incubated under *ex situ* (net house) and *in situ* (on-site field) conditions for seedling emergence. Overall, 2,141 seeds/m^2 of 13 species were recorded from *in situ* incubated samples. Seed density and species number substantially decreased with increasing soil depth. The upper layer (0-5 cm) had a mean density of 3,586 seeds/m^2, while the lower layer (5-10 cm) had 697 seeds/m^2, respectively. The study revealed that anthropogenically disturbed Himalayan alpine meadows have low soil seed bank potential compared to alpine meadows of other mountain systems. High disturbance pressure like grazing and high human footfalls probably damaged the reproductive phase of plant life and led to low seed production, hence the low seed inputs in the soil. Some methodological issues in studying soil seed banks of alpine plants were also discussed.

Keywords: alpine meadow; Bugyal; Garhwal Himalaya; grassland; seed ecology; soil seed bank; treeline.

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

Submitted: 18 October 2022; first decision: 30 November 2022; accepted: 24 December 2022

Scientific Editor: Jalil Noroozi

Linguistic Editor: Magdalena Firganek-Fulcher

Introduction

The soil seed bank is the natural reservoir of viable seed, present within the soil of most ecosystems, often in the dormant stage (Roberts 1981). It consists of new seeds shed only recently and older seeds that have persisted in the soil for several years (Zobel et al. 2007). The persistence of the seed bank plays a crucial role in population dynamics since it enables the plant to spread germination over time by remaining viable and avoiding germination under unfavourable environmental conditions (Bakker et al. 1996; Saatkamp et al. 2011; Ooi 2012; Long et al. 2015; Mašková et al. 2022). The capacity of seeds to retain their viability in the soil allows species to survive episodes of disturbance and destruction (Thompson 2000).

In an ecosystem, soil seed banks often have high temporal and spatial variability, with conspicuous changes in seed density and species composition (Perera 2005; Ma et al. 2010; Konsam et al. 2020). Temporal variability is represented by the longevity of seed buried in the soil as transient, short-term persistent, and long-term persistent seed bank (Thompson & Fenner 1992). In contrast, spatial variability is represented by the distribution of viable seeds horizontally and vertically in the soil. The horizontal distribution shows how far the seed has been dispersed from its parents, while the vertical distribution shows how deep the seed is buried within the soil profile. The temporal and spatial variability of a soil seed bank largely depends on several species-specific biotic characteristics. Such as seed production per ramet, seed morphology, seed dispersal syndrome, seed longevity, degree of seed dormancy and germination niche width. It also depends upon post-dispersal site-specific abiotic environmental factors, for example, soil substrate type, soil compaction, soil moisture, soil nutrient status, the amplitude of light and temperature fluctuation at or below the soil surface (Poschlod et al. 2013; Abedi et al. 2014; Baskin & Baskin 2014; Saatkamp et al. 2014; Long et al. 2015; Mašková et al. 2022). Additionally, other habitat-specific characteristics such as surrounding vegetation or canopy cover (Rice 1989; Godefroid et al. 2006), level of disturbance such as grazing (Ma et al. 2010; Erfanzadeh et al.

2016), fire (Konsam et al. 2020), flooding (Hölzel & Otte 2004), etc. also influence the seed persistence potential.

Seeds of many alpine plant species are dormant at maturity. They do not germinate immediately after dispersal (Baskin & Baskin 2014) but instead require frequent cold stratification to break dormancy followed by warm temperature to germinate (Fernández-Pascual et al. 2021). As a result, they remain viable in a transient soil seed bank and release their dormancy through winter chilling and begin to germinate in the following growing season or enter deep in persistent soil seed bank if they fail to germinate during the first growing season, where they can remain dormant and viable for years (Molau & Larsson 2000; Baskin & Baskin 2014).

Four major transition stages in the sexual regeneration pathway of plant species influence their life-history. These stages are seed production, seed accumulation in the seed bank, seed germination, and the survival and growth of seedlings into adult plants (Welling et al. 2004). During favourable years, seed production from alpine vegetation is usually high, but its accumulation in the seed bank generally remains low (Molau & Larson 2000). Additionally, alpine plant seed germination and seedling survival are constrained by several other factors, such as competition with established vegetation, seed predation, low temperatures, frost, and soil drought (Chambers 1995; Kiviniemi 1999). The dispersal of seeds through zoochory is supposed to contribute to the spatial distribution of alpine plants (Rosbakh et al. 2022), which can also contribute to forming soil seed banks along ecological gradients.

Several studies conducted in recent years in different mountainous habitats around the world have revealed the presence of a considerable number of seeds in the soil seed banks of alpine vegetation (Ma et al. 2010; Venn & Morgan 2010; Li et al. 2012; Loydi et al. 2012; Hoyle et al. 2013; Wang et al. 2013). However, the recruitment of plant individuals through seed germination is often almost negligible in the alpine zones (Thompson 1978; Bell & Bliss 1980; Archibold 1981) as cold and unsuitable environments constrain biomass and seed production with the short growing season (Onipchenko et al. 1998; An et al. 2020). The alpine soil seed bank is often neglected because of the general view that sexual reproduction becomes less important with increasing latitude or altitude (Thompson 1978; but see Bliss 1958). Instead, vegetative means of propagation appear to be a better survival strategy and a dominant mode of reproduction to sustain alpine plant populations under harsh *in situ* conditions (Grime 1979; Onipchenko et al. 1998; An et al. 2020). Furthermore, alpine soil seed bank studies have to

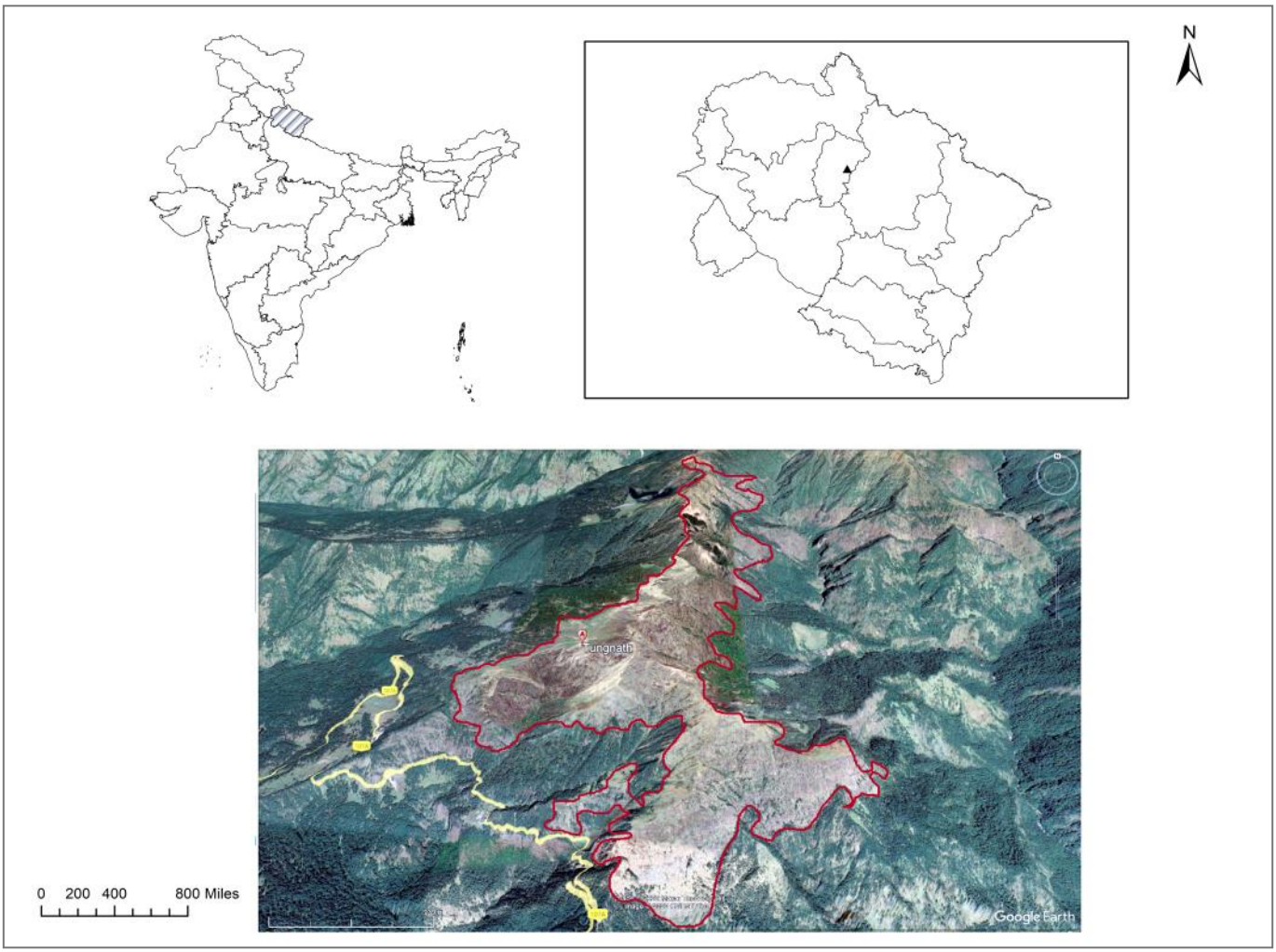

Fig. 1. Location map of Tungnath treeline area.

address some key methodological issues. Such as when (autumn vs. spring) soil samples should be collected and where (*in situ* vs. *ex situ*) these samples should be incubated to meet the most appropriate environments for alpine seed germination and seedling establishment since they have a particular seed germination niche (Mondoni et al. 2011; Baskin & Baskin 2014; Satyanti 2017; Fernandez-Pascual et al. 2021).

Considering the mentioned challenges, that the alpine soil seed banks face and knowing that the Tungnath treeline zone is one of the highly disturbed Himalayan landscapes, particularly stressed by the high pressure of human influx (Singh et al. 2018) and extensive grazing (Nautiyal et al. 2004), we hypothesized that the local alpine meadow plants have low potential to form a viable soil seed bank. Moreover, we believe that such disturbance factors prevent plants from reaching the complete regenerative stage required to produce enough seeds, which eventually limits seed input to the soil. Although it is well known that the alpine meadows of the Indian Himalayan Region represent diverse ecological plant communities, we know little about their natural regeneration from seeds. In this study, the specific question we asked was: Do anthropogenically disturbed Himalayan alpine meadows have the potential to form a soil seed bank?

Study Area

Tungnath treeline (30°29'22" N, 79°12'47" E) is located in Kedarnath Wildlife Sanctuary, Uttarakhand (India) and covers a large area of upper catchments of river Alaknanda (Fig. 1). Like other substantially depressed western Himalayan treelines with a long history of anthropogenic pressure (Singh et al. 2019), the Tungnath treeline has one of the worst disturbed alpine meadows due to the high pressure of the religious, eco, and adventure tourism (Singh et al. 2018). Anthropogenic activities also attract high movement of domestic grazing animals, causing habitat destruction and changes in vegetation composition (Nautiyal et al. 2004). Around the Tungnath treeline, the monthly minimum and maximum temperatures of the coldest and warmest months range from -2.0°C to 20.3°C. The mean annual temperature is 10.7°C and the mean annual precipitation 1,932 mm (extracted from The Global Vegetation Project, Fleri et al. 2021) (Fig. 2). A floristic inventory of the study area (Rai et al. 2017), revealed that about 226 species belonging to 54 families and 158 genera grow there. Among them, the most dominating functional group was forbs (190 species), followed by shrubs (22 species), grasses (5 species, *Danthonia cachemyriana, D. schneideri, Festuca rubra, F. valesiaca, Poa alpina*), sedges (4 species), trees (3 species, *Abies spectabilis*, *Quercus semecarpifolia*, *Rhododendron campanulatum*), and climbers (2 species). Closer scrutiny of the phenological stage revealed that the most prominent flowering season in the study area was summer (58.7% flowering species), followed by the monsoon period (33.7%), with the monsoon (79.4%) as the peak fruiting season, followed by autumn (15.7%).

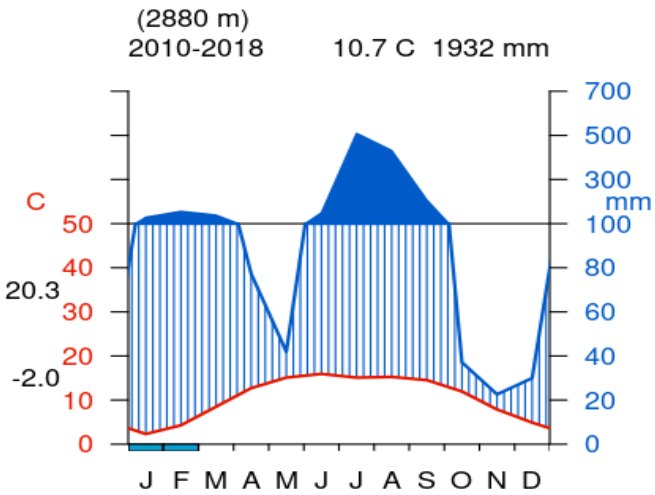

Fig. 2. The Walter and Leith Climate Diagram (2010 to 2018) of the Tungnath treeline retrieved from the Global Vegetation Project (Fleri et al. 2021).

Fig. 3. A tracking route trespassing Tungnath treeline located at around 3,000-3,300 m a.s.l. *Abies spectabilis* trees are seen in the background with the krummholz formation of *Rhododendron campanulatum* in the foreground. Photo: S.S. Phartyal.

Fig. 4. Soil cores exhumed for soil seed bank experimentation from the 2 m × 2 m plots located along treeline around 3,000-3,300 m a.s.l. The trees seen in the background are *Abies spectabilis* and *Rhododendron campanulatum*. Photo: S.S. Phartyal.

Methods

Soil sampling, incubation, and seedling emergence

Thirteen 2 m × 2 m plots were selected on grassy slopes just above the treeline (Figs. 3, 4) extending from one end to another (near the Tungnath temple; Fig. 5). These 13 plots were marked permanently using iron nails for repeated soil sampling. In autumn 2017, soil samples were collected from each of 13 plots both horizontally and vertically using ten separate cores of 5 cm diameter and 10 cm depth (Fig. 4). After that, each core was sub-divided into two layers of 0-5 cm and 5-10 cm and stored separately into two zip lock bags. However, ten cores of each soil layer were mixed for every plot to make a bulk sample of 0-5 cm and 5-10 cm for each plot. In general, we collected 260 soil cores representing 26 soil samples with two soil layers from 13 plots as replications covering a total of 0.255 m^2 of soil surface.

All soil samples were transported to the Department of Forestry and Natural Resources, HNB Garhwal University, Srinagar (520 m a.s.l.), and allowed to air dry for 48-72 hours under a ceiling fan at room temperature before processing for further experimentation. After drying, soil samples were sieved initially through a 1.0 cm mesh screen to remove rocks, twigs, and leaves, after that, through a fine sieve (0.21 mm mesh size) to concentrate soil samples by reducing the excess amount of sand and clay as per universally adopted methodology for soil seed bank studies (Ter Heerdt et al. 1996). Finally, the concentrated soil samples were spread over a sterile potting medium in plastic trays and placed in net-house benches for seedling emergence (Fig. 6). Four control trays filled with only sterilized potting soil were also placed randomly on the benches to assess contamination from local seed rain. However, no alpine plant species have emerged from this autumn sample even after six months of incubation.

Soil samples were collected again in the spring of 2018 and transported to the Pothibasa Experimental Station (2,200 m a.s.l.) of the High-Altitude Plant Physiology Research Centre

Fig. 5. Tungnath Temple, located (3,680 m a.s.l.) just above the treeline on a slopy alpine meadow, is one of the highest Lord Shiva temples in the world and is visited by thousands of devotees every day for pilgrimage during the growing season. Flowers from nearby alpine plants are an offering to Lord Shiva. Photo: S.S. Phartyal.

Fig. 6. Incubation of soil samples for seedling emergence under *ex situ* (net house) conditions at low altitude (520 m a.s.l.) climate in Srinagar-Garhwal.

Fig. 7. Incubation of soil samples for seedling emergence under *in situ* (open field) conditions at high altitude (3,600 m a.s.l.) climate at Tungnath treeline experimental station.

(HAPPRC) of the University after initial processing as described above. Again, no alpine plant species emerged from spring samples. Finally, soil samples were collected again in the fall of 2018 and overwintered under *in situ* outdoor alpine environments in Tungnath at HAPPRC Experimental Station (3,600 m a.s.l.) to facilitate the dormancy release of the buried seeds. For this round of soil sampling, the same process was adopted to collect and prepare samples for incubation, except concentrating them through a fine mesh of 0.21 mm size as suggested by Ter Heerdt et al. (1996). All the trays were placed on an elevated platform and covered by a fine net to minimize seed inputs from neighbouring plants. After the snow melted in spring, the trays were watered as and when necessary, and the number of emerging seedlings was counted and classified as dicot and monocot plants (Fig. 7). Since the majority of the emerged plants failed to survive until flowering, the identification to the genus and species level was problematic.

Statistical analysis

The mean and standard deviations for the seed density and the number of species were calculated based on the seedlings that emerged from the soil samples. Since the data did not meet the assumption of normality and homogeneity, a non-parametric Mann-Whitney U test was used for comparison. All statistical analyses were carried out using SPSS 21.

Results

Soil seed bank density and species life-form composition

A total of 1,093 alpine plant seedlings emerged from the soil samples collected in autumn 2018 and were kept for seedling emergence under *in situ* environmental conditions at HAPPRC Experimental Station, Tungnath. These 1,093 seedlings emerged corresponded to an overall mean seed density of 2,141 seeds/m^2 at 10 cm of soil depth. Altogether, 13 species were recorded in the soil seed bank from both soil layers, of which 10 were dicot and three were monocot plants (Table 1).

Table 1. Overview of the soil seed banks of the alpine plants of Tungnath treeline.

Parameters	Seed Density (m^2)	Number of species
Overall	2,141	13
Dicot Plant	1,581	10
Monocot Plant	560	03

Spatial distribution of the soil seed banks

Depth distribution of soil seed bank density showed spatial variations as emerged seedling number decreased with increasing soil depth. There was a distinct variation in the depth distribution of the dicot and monocot species between the soil layers (Fig. 8). The upper soil layer of 0-5 cm had a mean seed density of 3,586 ± 1,056 with a median density of 3,719, while the lower soil layer of 5-10 cm had a mean seed density of 697 ± 655 with a median density of 509. Similarly, a high number of species (5 ± 1) was recorded from the upper layer compared to the lower layer of soil (2 ± 1). The above-decreasing trends in seed density and species numbers were also found to differ significantly ($p < 0.001$) between the upper and lower layer (Fig. 8).

Furthermore, a layer-wise comparison of the soil seed bank density and species numbers was significantly ($p < 0.001$) higher in the upper layer compared to the lower layer for dicot plants (Fig. 9). The upper soil layer retained 2,806 ± 869 seeds of dicot and 779 ± 884 seeds of monocot plants. Contrary to this, the lower layer retained only 356 ± 243 seeds of dicot and 340 ± 664 seeds of monocot plants, respectively.

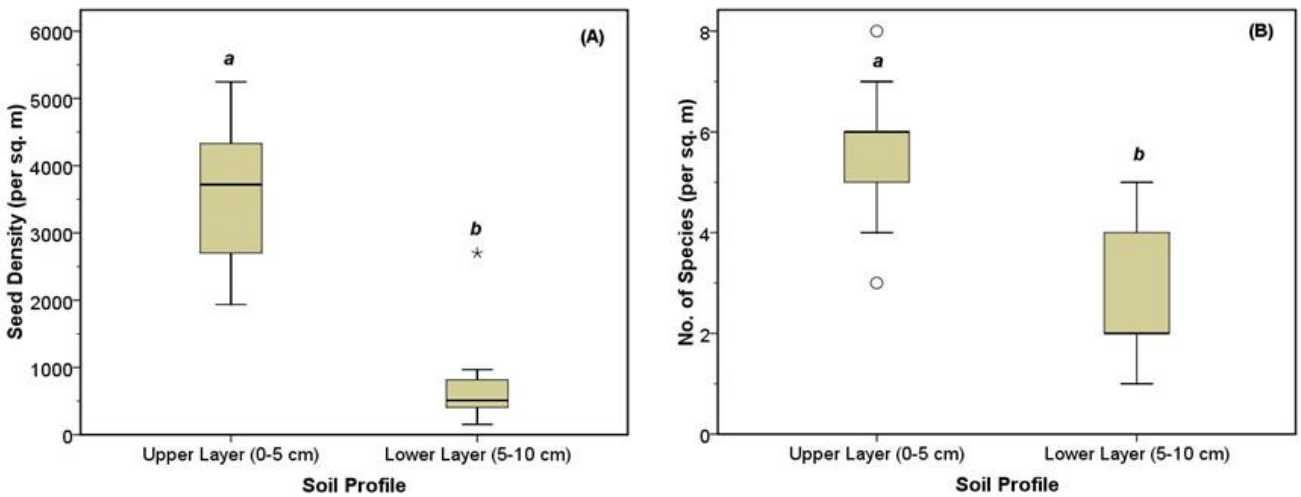

Fig. 8. Box plots showing the median, quartiles, outliers (o), and extremes (*) of (A) soil seed bank density and (B) the number of species per unit area of soil surface of Tungnath treeline. Different letters above box plots refer to statistically significant (U = 3.00, n = 13, *p* < 0.001) differences regarding the soil depth.

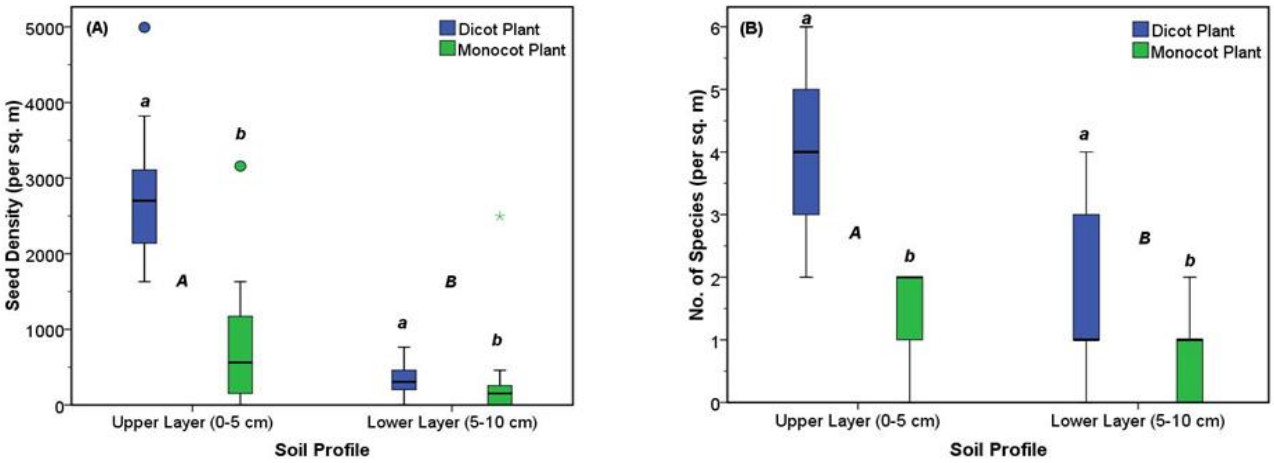

Fig. 9. Box plots showing median, quartiles, outliers (o), and extremes (*) of (A) soil seed bank density, and (B) species of dicot and monocot plants per unit area of soil surface of Tungnath treeline. The letters in 'lowercase' represent subsets of dicot and monocot plants in the corresponding soil layers, while the letters in 'uppercase' represent subsets between soil layers ($p < 0.001$).

Discussion

The present study showed that the anthropogenically disturbed alpine meadow of the Tungnath treeline has considerably low soil seed bank potential, as only 1,093 viable seeds were found, representing 13 plant species. In general, the mean density of 2,141 seeds/m^2 is very low compared to the density of the worldwide seed bank for alpine vegetation. For example, Ma et al. (2010) and Klug-Pümpel & Scharfetter-Lehrl (2008) reported a density of 3,069-6,105 and 6,000-34,000 seeds/m^2 in their respective research. However, studies from other parts of the world also reported low soil seed bank density of alpine plants, as in the present study. For example, Welling et al. (2004), McGraw & Vavrek (1989), and Molau & Larsson (2000) reported seed bank densities of 99-1,109, 0-3,367, and 0-4,080 seeds/m^2, respectively. Several factors could be responsible for the low number of seeds at such sites. In many alpine species, the evolution of highly-specific germination requirements (cold stratification, light, and warm regimes) delays the germination of autumn-dispersed seeds until spring (Hoyle et al. 2015; Jaganathan et al. 2015). Thus, the interplay of factors, including dormancy, specific alternating temperature requirement to germinate, and light or dark requirements for seedling emergence, offers triple safety measures against the harsh alpine climate; without these controls, seeds are more likely to have asynchronous germination, thereby posing a severe risk of seedling mortality (Billings & Bliss 1959; Fenner & Thompson 2005; Rosbakh & Poschlod 2015). In close agreement with this, Hoyle et al. (2015) reported three germination strategies adopted by Australian alpine seeds as an immediate, staggered and postponed germinator. Species with nondormant seeds germinate immediately after natural dispersal in autumn, dormant seeds postpone germination until spring to overcome harsh winter temperatures, while species with a staggered strategy have seeds that germinate both before and after winter (Hoyle et al. 2015; Satyanti 2017).

In addition to a complex suite of responses to varying environmental cues, it has been suggested that not all the seeds of a particular species may respond uniformly to germination cues stimulated by seasonal temperature cycles in alpine environments; thus, carry-over of a proportion of seeds to next year is expected to maximize species fitness (Meyer & Kitchen 1994; Meyer et al. 1995). Carry-over mechanisms are common in unpredictable conditions because the risk of germination is spread to different years (Jaganathan et al. 2015), like in *Carex frigida*, an alpine species in which low germination in the growing season tends to favour carry-over mechanisms (Schütz 2002). In the present study, the incubation of soil samples of autumn 2017 and spring 2018 under *ex situ* conditions failed to initiate seedling emergence, meaning it is unfavourable to fit the specific germination strategies of buried seeds. It may be that these soil samples contain a majority of dormant seeds which follow a postponed germination strategy and required a long period of cold winter temperature to overcome dormancy, similar to several Australian alpine species (Hoyle et al. 2015; Satyanti 2017). So, it seems that incubating them directly under *ex situ* net house conditions at a relatively warmer and constant temperature without overwintering was a wrong methodological approach. The soil samples might need to be kept under the dark condition at a low temperature (~ 4°C) in the refrigerator to cold, moist stratified for 3-4 months and then moved to a sequence of warmer temperatures of spring and summer. This approach can simulate the *in situ* natural climate as done by Godefroid et al. (2011) to evaluate the soil seed bank potential of western European temperate species from the city forest of Brussels, Belgium. The emergence of seedlings from autumn 2018 samples continuously exposed to the natural climate under *in situ* field conditions supports the above argument.

The majority (~80%) of the alpine plants at our study site dispersed seeds during the monsoon rather than in the fall. Therefore, there is a possibility that seeds buried in the soil

samples collected in fall 2017 and spring 2018 may already have lost viability before being kept for incubation under *ex situ* environmental conditions. Mondoni et al. (2011) reported that the seeds of Italian alpine plants are short-lived in storage compared with those of lowland populations/related taxa. They argued that alpine regions are characterised by a short growing season and cool temperatures. There is a possibility that the late maturation (or desiccation) seed development phase remains short, so seed immaturity and short longevity become inevitable. Since the Tungnath treeline also experiences a short growing season, there may be a possibility that the seeds of alpine plants that grow there may be short-lived. However, this does not seem to be entirely correct; we explored the seed desiccation information of 27 species from our study site in the Kew Seed Information Database, which reveals that the majority (22) of them disperse desiccation-tolerant seeds (Royal Botanic Gardens Kew 2020). The production of desiccation-tolerant seeds further suggested that rather than seed dormancy or short seed longevity, seed production (seed inputs in soil) may be the leading cause of low soil seed bank density in our study site. The possibly immense pressure of grazing and human intervention in this highly disturbed treeline may hardly allow alpine plants to reach full reproductive age, disperse and accumulate seeds in the soil. During the field visit, we observed very few individual plants with fruiting bodies as we failed to harvest enough mature seeds for other experiments. It is a general notation that in stressful alpine ecosystems, clonality provides plants with a reproductive insurance and to some extent, clonality is one of the essential features of plants adapted to cold environments (Klimešová & Doležal 2011; Wu et al. 2011). Since the Tungnath treeline is under high anthropic pressure (Figs. 10, 11), species that grow there (Fig. 12) may have developed clonal means of regeneration as an alternative survival strategy. Therefore, more in-depth studies are needed to disentangle the impact of disturbances on the regeneration (asexual vs. sexual) ecology of alpine meadow plants.

Our results show that a low soil seed bank density in a deeper soil depth indicates the inability of seeds to penetrate downward with increasing soil depth. This finding is consistent with what has already been found in other studies (e.g. Bossuyt et al. 2002; Olano et al. 2002). Furthermore, in the present study, a layer-wise comparison revealed a significant spatial variation in soil seed bank composition as in various other studies on soil seed bank reserve in alpine or high-subalpine grasslands (Archibold 1981; Roach 1983; Morin & Payette 1988; McGraw & Vavrek 1989; Chambers 1993; Ingersoll & Wilson 1993; Semenova & Onipchenko 1994).

Fig. 10. Heavy grazing pressure of domestic herbivores in the meadow of Tungnath treeline at 3,330 m a.s.l. Photo: S.S. Phartyal.

Fig. 11. Daily upward and downward migration (2,998 m a.s.l.) of domestic herbivores from the Tungnath treeline. Photo: S.S. Phartyal.

Conclusion

Our study concludes that Tungnath, a highly disturbed treeline, has low soil seed bank potential, as most plant species growing there may not be able to reach their reproductive age to produce enough seeds to rejuvenate the soil seed bank. This study also reveals, that to investigate the seed persistence potential of alpine vegetation, soil samples should be collected from undisturbed sites and incubated in *situ* to meet the near-natural conditions or under *ex situ* conditions where the seasonal sequence of the alpine environment must be maintained.

Author contributions

S.S.P. planned the research, S.C. and S.S.P. conducted the field sampling and experiments. S.S.P. performed the statistical analyses and led the writing, while all authors helped with manuscript revision and gave final approval for publication.

Acknowledgments

This work was supported by G.B. Pant National Institute of Himalayan Environment, India, under the Integrated Eco-Development Research Programme (IERP) for the Indian Himalayan Region research project to S.S.P. [Grant Number: GBPI/IERP/16-17/21/177].

References

Abedi, M., Bartelheimer, M. & Poschlod, P. 2014. Effects of substrate type, moisture and its interactions on soil seed survival of three *Rumex* species. *Plant and Soil* 374: 485–495.

An, H., Zhao, Y. & Ma, M. 2020. Precipitation controls seed bank size and its role in alpine meadow community regeneration with increasing altitude. *Global Change Biology* 26: 5767–5777.

Archibold, H.O.W. 1981. A comparison of seed reserves in arctic, subarctic and alpine soils. *Canadian Field Naturalist* 98: 337–344.

Bakker, J.P., Poschlod, P., Strykstra, R.J., Bekker, R.M. & Thompson, K. 1996. Seed bank and seed dispersal: important topics in restoration ecology. *Acta Botanica Neerlandica* 45: 461–490.

Baskin, C.C. & Baskin, J.M. 2014. *Seeds: Ecology, Biogeography, and Evolution of Dormancy and Germination*. 2nd ed. Academic Press, San Diego, US.

Bell, K.L. & Bliss, L.C. 1980. Plant reproduction in a high Arctic environment. *Arctic and Alpine Research* 12: 1–10.

Billings, W.D. & Bliss, L.C. 1959. An alpine snow bank environment and its effects on vegetation, plant development, and productivity. *Ecology* 40: 388–397.

Fig. 12. Some of the typical plants of Tungnath treeline (a) *Primula denticulata*, (b) *P. nana*, (c) *Oxygraphis polypetala* and (d) *Bistorta milletii*. Photos: S.S. Phartyal.

Bliss, L.C. 1958. Seed germination in arctic and alpine species. *Arctic* 11: 180–188.

Bossuyt, B., Heyn, M. & Hermy, M. 2002. Seed bank and vegetation composition of forest stands of varying age in central Belgium: consequences for regeneration of ancient forest vegetation. *Plant Ecology* 162: 33–48.

Chambers, J.C. 1993. Seed and vegetation dynamics in an alpine herb field: effects of disturbance type. *Canadian Journal of Botany* 71: 471–485.

Chambers, J.C. 1995. Disturbance, life history strategies, and seed fates in alpine herb field communities. *American Journal of Botany* 82: 421–433.

Erfanzadeh, R., Kamali, P., Ghelichnia, H. & Pétillon, J. 2016. Effect of grazing removal on aboveground vegetation and soil seed bank composition in sub-alpine grasslands of northern Iran. *Plant Ecology & Diversity* 9: 309–320.

Fenner, M. & Thompson, K. 2005. *The Ecology of Seeds*. Cambridge Univ. Press, Cambridge, UK.

Fernández-Pascual, E., Carta, A., Mondoni, A., Cavieres, L.A., Rosbakh, S., Venn, S.E., Satyanti, A., Guja, L., Briceño, V.F., (…) & Jiménez-Alfaro, B. 2021. The seed germination spectrum of alpine plants: a global meta-analysis. *New Phytologist* 229: 3573–3586.

Fleri, J.R., Wessel, S.A., Atkins, D.H., Case, N.W., Albeke, S.E. & Laughlin, D.C. 2021. Global Vegetation Project: An Interactive Online Map of Open-Access Vegetation Photos. *Vegetation Classification and Survey* 2: 41–45. URL: https://pathfinder.arcc.uwyo.edu:3838/content/4/?row_input=299d6b3b-bfcb-4444-bbdc-72be4d68ae50 [accessed 12 December 2022].

Godefroid, S., Phartyal, S.S. & Koedam, N. 2006. Depth distribution and composition of seed banks under different tree layers in a managed temperate forest ecosystem. *Acta Oecologica* 29: 283–292.

Godefroid, S., Phartyal, S.S. & Koedam, N. 2011. Natural versus artificial cold-stratification: which one allows better estimates of soil seed banks in a forest ecosystem? *Current Science* 101: 215–218.

Grime, J.P. 1979. *Plant strategies and vegetation processes*. John Wiley and Sons, Toronto, CA.

Hölzel, N. & Otte, A. 2004. Assessing soil seed bank persistence in flood-meadows: The search for reliable traits. *Journal of Vegetation Science* 15: 93–100.

Hoyle, G.L., Venn, S.E., Steadman, K.J., Good, R.B., McAuliffe, E.J., Williams, E.R. & Nicotra, A.B. 2013. Soil warming increases plant species richness but decreases germination from the alpine soil seed bank. *Global Change Biology* 19: 1549–1561.

Hoyle, G.L., Steadman, K.J., Good, R.B., McIntosh, E.J., Galea, L.M. & Nicotra, A.B. 2015. Seed germination strategies: an evolutionary trajectory independent of vegetative functional traits. *Frontiers in Plant Science* 6: e731.

Ingersoll, C.A. & Wilson, M.V. 1993. Buried propagule bank of a high subalpine site: microsite variation and comparisons with aboveground vegetation. *Canadian Journal of Botany* 71: 712–717.

Jaganathan, G.K., Dalrymple, S.E. & Liu, B. 2015. Towards an understanding of factors controlling seed bank composition and longevity in the alpine environment. *The Botanical Review* 81: 70–103.

Kiviniemi, K. 1999. *Evolution of seed attributes, dispersal and population dynamics of plants, with special emphasis on fragmented habitats*. Ph.D. thesis, Stockholm University, Stockholm, SE.

Klimešová, J. & Doležal, J. 2011. Are clonal plants more frequent in cold environments than elsewhere? *Plant Ecology & Diversity* 4: 373–378.

Klug-Pümpel, B. & Scharfetter-Lehrl, G. 2008. Soil diaspore reserves above the timberline in the Austrian Alps. *Flora - Morphology, Distribution, Functional Ecology of Plants* 203: 292–303.

Konsam, B., Phartyal, S.S. & Todaria, N.P. 2020. Impact of forest fire on soil seed bank composition in Himalayan Chir Pine Forest. *Journal of Plant Ecology* 13: 177–184.

Li, Y.Y., Dong, S.K., Wen, L., Wang, X.X. & Wu, Y. 2012. Soil seed banks in degraded and revegetated grasslands in the alpine region of the Qinghai-Tibetan Plateau. *Ecological Engineering* 49: 77–83.

Long, R.L., Gorecki, M.J., Renton, M., Scott, J.K., Colville, L., Goggin, D.E., Commander, L.E., Westcott, D.A., Cherry, H. & Finch-Savage, W.E. 2015. The ecophysiology of seed persistence: a mechanistic view of the journey to germination or demise. *Biological Reviews* 90: 31–59.

Loydi, A., Zalba, S.M. & Distel, R.A. 2012. Viable seed banks under grazing and exclosure conditions in montane mesic grasslands of Argentina. *Acta Oecologica* 43: 8–15.

Ma, M., Zhou, X. & Du, G. 2010. Role of soil seed bank along a disturbance gradient in an alpine meadow on the Tibet plateau. *Flora - Morphology, Distribution, Functional Ecology of Plants* 205: 128–134.

Mašková, T., Phartyal, S.S., Abedi, M., Bartelheimer, M. & Poschlod, P. 2022. Soil moisture level and substrate type determine long-term seed lifespan in a soil seed bank. *Plant and Soil* 477: 475–485.

McGraw, J.B. & Vavrek, M.C. 1989. The role of buried viable seeds in arctic and alpine plant communities. In: Leck, M.A., Parker, V.T. & Simpson, R.L. (eds.) *Ecology of soil seed banks*, pp. 91–105. Academic Press, San Diego, US.

Meyer, S. & Kitchen, S.G. 1994. Life history variation in blue flax (*Linum perenne*: Linaceae): seed germination phenology. *American Journal of Botany* 81: 528–535.

Meyer, S., Kitchen, S. & Carlson, S. 1995. Seed germination timing patterns in intermountain *Penstemon* (Scrophulariaceae). *American Journal of Botany* 82: 377–389.

Molau, U. & Larsson, E.L. 2000. Seed rain and seed bank along an alpine altitudinal gradient in Swedish Lapland. *Canadian Journal of Botany* 78: 728–747.

Mondoni, A., Probert, R.J., Rossi, G., Vegini, E. & Hay, F.R. 2011. Seeds of alpine plants are short lived: implications for long-term conservation. *Annals of Botany* 107: 171–179.

Morin, H. & Payette, S. 1988. Buried seed populations in the montane, subalpine and alpine belts of Mont Jacques-Cartier, Quebec. *Canadian Journal of Botany* 66: 101–107.

Nautiyal, M.C., Nautiyal, B.P. & Prakash, V. 2004. Effect of grazing and climatic changes on alpine vegetation of Tungnath, Garhwal Himalaya, India. *The Environmentalist* 24: 125–134.

Olano, J.M., Caballero, I. & Laskurain, N.A. 2002. Seed bank spatial pattern in a temperate secondary forest. *Journal of Vegetation Science* 13: 775–784.

Onipchenko, V.G., Semenova, G.V. & van der Maarel, E. 1998. Population strategies in severe environments: alpine plants in the northwestern Caucasus. *Journal of Vegetation Science* 9: 27–40.

Ooi, M.K.J. 2012. Seed bank persistence and climate change. *Seed Science Research* 22(S1): S53–S60.

Perera, G.A.D. 2005. Spatial heterogeneity of the soil seed bank in the tropical semi-deciduous forest at Wasgomuwa National Park, Sri Lanka. *Tropical Ecology* 46: 79–89.

Poschlod, P., Abedi, M., Bartelheimer, M., Drobnik, J., Rosbakh, S. & Saatkamp, A. 2013. Seed ecology and assembly rules in plant communities. In: van der Maarel, E. & Franklin, J. (eds.) *Vegetation Ecology*, 2nd ed., pp. 164–202. Wiley-Blackwell, Chichester, UK.

Rai, I.D., Singh, G. & Rawat, G.S. 2017. *Plants of Kedarnath Wildlife Sanctuary, Western Himalaya: A Field Guide*. Bishen Singh Mahendra Pal Singh, Dehradun, IN.

Rice, K.J. 1989. Impacts of seed banks on grassland community structure and population dynamics. In: Leck, M.A., Parker, V.T. & Simpson, R.L. (eds.) *Ecology of Soil Seed Banks*, pp. 212–230. Academic Press, San Diego, US.

Roach, D.A. 1983. Buried seed and standing vegetation in two adjacent tundra habitats, northern Alaska. *Oecologia* 60: 359–364.

Roberts, H.A. 1981. Seed banks in soils. *Advances in Applied Biology* 6: 1–56.

Rosbakh, S. & Poschlod, P. 2015. Initial temperature of seed germination as related to species occurrence along a temperature gradient. *Functional Ecology* 29: 5–14.

Rosbakh, S., Chalmandrier, L., Phartyal, S. & Poschlod, P. 2022. Inferring community assembly processes from functional seed trait variation along elevation gradient. *Journal of Ecology* 110: 2374–2387.

Royal Botanic Gardens Kew. 2020. *Seed Information Database (SID). Version 7.1.* URL: http://data.kew.org/sid/ [accessed 13 Jan 2020].

Saatkamp, A., Affre, L., Dutoit, T. & Poschlod, P. 2011. Germination traits explain soil seed persistence across species: the case of Mediterranean annual plants in cereal fields. *Annals of Botany* 107: 415–426.

Saatkamp, A., Poschlod, P. & Venable, D.L. 2014. The functional role of soil seed banks in natural communities. In: Gallagher, R.S. (ed.) *Seeds: the ecology of regeneration in plant communities*, pp. 263–295. CABI, Wallingford, UK.

Satyanti, A. 2017. *A multi-scale exploration of the drivers and implications of germination strategy in Australian alpine plants*. Ph.D. thesis, Australian National University, Canberra, AU.

Schütz, W. 2002. Dormancy characteristics and germination timing in two alpine *Carex* species. *Basic and Applied Ecology* 3: 125–134.

Semenova, G.V. & Onipchenko, V.G. 1994. Soil seed banks. In: Onipchenko, V.G. & Blinnikov, M.S. (eds.) *Experimental investigation of alpine plant communities in the Northwestern Caucasus*, pp. 69–82. Veröffentlichungen des Geobotanischen Institutes der ETH, Stiftung Rübel, Zürich, CH.

Singh, R.D., Tewari, P., Dhaila, P. & Tamta, K.K. 2018. Diversifying livelihood options of timberline resource dependent communities in Uttarakhand Himalayas: Conservation and development implications. *Tropical Ecology* 59: 327–338.

Singh, S.P., Sharma, S. & Dhyani, P.P. 2019. Himalayan arc and treeline: distribution, climate change responses and ecosystem properties. *Biodiversity and Conservation* 28: 1997–2016.

Ter Heerdt, G.N.J., Verweij, G.L., Bekker, R.M. & Bakker, J.P. 1996. An improved method for seed-bank analysis: seedling emergence after removing the soil by sieving. *Functional Ecology* 110: 144–151.

Thompson, K. 1978. The occurrence of buried viable seeds in relation to environmental gradients. *Journal of Biogeography* 5: 425–430.

Thompson, K. 2000. The functional ecology of seed banks. In: Fenner, M. (ed.) *Seeds: The ecology of regeneration in plant communities*, 2nd ed., pp. 215–235. CAB International, Wallingford, UK.

Thompson, K. & Fenner, M. 1992. The functional ecology of seed banks. In: Fenner, M. (ed.) *Seeds: The Ecology of Regeneration in Plant Communities*, pp. 231–258. CAB International, Wallingford, UK.

Venn, S.E. & Morgan, J.W. 2010. Soil seedbank composition and dynamics across alpine summits in south-eastern Australia. *Australian Journal of Botany* 58: 349–362.

Wang, N., Jiao, J.Y., Du, H.D., Wang, D.L., Jia, Y.F. & Chen, Y. 2013. The role of local species pool, soil seed bank and seedling pool in natural vegetation restoration on abandoned slope land. *Ecological Engineering* 52: 28–36.

Welling, P., Tolvanen, A. & Laine, K. 2004. The Alpine Soil Seed Bank in Relation to Field Seedlings and Standing Vegetation in Subarctic Finland. *Arctic, Antarctic, and Alpine Research* 36: 229–238.

Wu, G.L., Li, W., Li, X.P. & Shi, Z.H. 2011. Grazing as a mediator for maintenance of offspring diversity: sexual and clonal recruitment in alpine grassland communities. *Flora - Morphology, Distribution, Functional Ecology of Plants* 206: 241–245.

Zobel, M., Kalamees, R., Püssa, K., Roosaluste, E. & Moora, M. 2007. Soil seed bank and vegetation in mixed coniferous forest stands with different disturbance regimes. *Forest Ecology and Management* 250: 71–76.

Photo Competition

Best Shots on "Grassland Lichens"

Here are the winners of the EDGG Photo Competition within the topic "Grassland Lichens".

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:

***Toninia sedifolia* (bluish) and *Fulgensia bracteata* (yellow) in a limestone grassland of the Pyrenees, Spain. Photo: Jürgen Dengler.**

Reviews from the Jury:

"Lichens intermingled with mosses in a colourful composition"

"How wonderful are the lichens in this picture, they perfectly represent the microcosm that can be found in grasslands"

"This photo quite successfully represents the quirkiness of forms and the variety of different species. Their distinctive features are displayed"

2nd place

***Xanthoparmelia camtschadalis* (Ach.) Hale, halophytic steppe of Kinburnska Kosa peninsula, Ukraine. 3 May 2007. Photo: Alexander Khodosovtsev .**

Reviews from the Jury:
"The vascular plants nicely frame the lichen at the centre of the photo"

"The harshness of the lichen shape forms a beautiful contrast to the gentler forms of the vascular plants"

"The photo looks quite aesthetic, which is not easy to achieve with such objects, the representation of different surfaces of the thallus creates an unusual effect"

3rd place

Seirophora lacunosa **(P. Rupr.) Froden, halophytic steppe of Kinburnska Kosa peninsula, Ukraine. 3 May 2007. Photo: Alexander Khodosovtsev .**

Reviews from the Jury:

"Beatuful grey variant of Seirophora lacunosa, which due to its increasingly fragmented habitat (gypsum and inland steppes), has been now proposed to be included in the IUCN Red List"

"This photo well displays the unusual structure of the lichen, and the arrangement of branches in various planes, in addition, it is clearly visible that this species is representative of Grasslands"

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 and Ecology

Dengler, J., Biurrun, I., Jansen, F. & Willner, W. 2023. Vegetation Classification and Survey in the third year. *Vegetation Classification and Survey* 4: 1–6.

Dengler, J., Jansen, F., Chusova, O., Hüllbusch, E., Nobis, M.P., Van Meerbeek, K., Axmanová, I., Bruun, H.H., Chytrý, M., Guarino, R., Karrer, G., Moeys, K., Raus, T., Steinbauer, M.J., Tichý, L., Tyler, T., Batsatsashvili, K., Bita-Nicolae, C., Didukh, Y., Diekmann, M., Englisch, T., Fernandez Pascual, E., Frank, D., Graf, U., Hájek, M., Jelaska, S.D., Jiménez-Alfaro, B., Julve, P., Nakhutsrishvili, G., Ozinga, W.A., Ruprecht, E.-K., Šilc, U., Theurillat, J.-P., Gillet, F. 2023. Ecological Indicator Values for Europe (EIVE) 1.0. *Vegetation Classification and Survey* 4: 7–29.

Kambach, S., Sabatini, F.M., Attorre, F., Biurrun, I., Boenisch, G., Bonari, G., Čarni, A., Carranza, M., Chiarucci, A., Chytrý, M., **Dengler, J.**, (…) & Bruelheide, H. 2023. Climate-trait relationships exhibit strong habitat specificity in plant communities across Europe. *Nature Communications* 14: Article 712.

Klotz, M., Schaller, J., Feldhaar, H., **Dengler, J.**, Gebauer, G., Aas, G., Weissflog, A. & Engelbrecht, B. 2022. Plasticity of plant silicon and nitrogen concentrations in response to water regimes varies across temperate grassland species. *Functional Ecology* 36: 3211–3222.

Lewoń, R., Pirożnikow, E., & Dyderski, M. K. 2022. Specyfika muraw kserotermicznych Suwalskiego Parku Krajobrazowego. [Specificity of xerothermic grasslands of the Suwałki Landscape Park]. *Parki Narodowe i Rezerwaty Przyrody* 41(1): 15–30.

Midolo, G., Herben, T., Axmanová, I., Marcenò, C., Pätsch, R., Bruelheide, H., Karger, D.N., Acic, S., Bergamini, A., Bergmeier, E., Biurrun, I., Bonari, G., Carni, A., Chiarucci. A., De Sanctis, M., Demina, O., (…), **Dengler, J.**, (…) & Chytrý, M. 2023. Disturbance indicator values for European plants. *Global Ecology and Biogeography* 32: 24–34.

Tichý, L, Axmanová, I., **Dengler, J.**, Guarino, R., Jansen, F., Midolo, G., Nobis, M.P., Van Meerbeek, K., Aćić, S., (…) & Chytrý, M. 2023. Ellenberg-type indicator values for European vascular plant species. *Journal of Vegetation Science* 34: e13168.

Conservation and Restoration

Reutimann, P., Billeter, R. & **Dengler, J.** 2023. Effects of grazing versus mowing on the vegetation of wet grasslands in the Northern Pre-Alps, Switzerland. *Applied Vegetation Science* 26: e12706.

Tarantino, C., Aquilino, A., **Labadessa, R.**, & Adamo, M. 2023. Time series of land cover and SDG 15.1.2 indicator can allow the evaluation of grassland protection actions: the case of Murgia Alta protected area. *Remote Sensing* 15(2): 505.

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Winter blooms of *Bellis annua* in Taranto, Puglia, Italy. Photo: R. Labadessa.

Forthcoming Events

3rd EDGG Talk Grasslands Winter 2022-2023
17 March 2023, Zoom meeting
Website: https://edgg.org/index.php/talks

31st Conference of the European Vegetation Survey
21-25 May 2023, Roma, Italy
Website: https://www.evs2023rome.it

EDGG Field Workshop 2023
2-10 June 2023, Vinschgau, Alto Adige, Italy
See details in this issue, on pp. 7-10

SIB-2023 Island Biology: Ecological and evolutionary processes on real and habitat islands
3-7 July 2023, Lipari, Aeolian Archipelago, Italy
Conference website: https://sib-2023.sciencesconf.org/

65th Annual Symposium of IAVS
4-8 September 2023, Coffs Harbour, Australia
Conference website: https://iavsaustralia2023.com

Eurasian Dry Grassland Conference 2023
25-28 September 2023, Szarvas, Hungary

***Serapias orientalis* subsp. *apulica,* Monopoli, Italy. Photo: R. Labadessa.**

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 6 March 2023, it had 1410 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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Details of the flower of *Pulsatilla vulgaris*, Swabian Alb, Germany. Photo: J. Dengler.