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Traditional land use, management and biodiversity of European semi-natural grasslands – Editorial to the 15th EDGG Special Feature

Traditionelle Landnutzung, Management und Biodiversität von halb-natürlichem Grasland in Europa – Vorwort zur 15. EDGG-Sonderausgabe

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Zusammenfassung

Seit 15 Jahren geben Mitglieder der Eurasian *Dry Grassland Group* (EDGG) und deren Vorgängerorganisationen Grasland-Sonderausgaben (*Special Features*) in *Tuexenia* heraus. Das diesjährige *Special Feature* mit dem Titel *Traditionelle Landnutzung, Management und Biodiversität von halbnatürlichem Grasland in Europa* umfasst acht Artikel, die viele Aspekte der Graslandforschung beleuchten und verschiedene Organismengruppen miteinbeziehen: JANIŠOVÁ et al. (2020a) untersuchten den Einfluss verschiedener traditioneller Landnutzungsformen auf den Artenreichtum des extensiven Graslands im Apuseni-Gebirge in Westrumänien. LABADESSA et al. (2020) verglichen die Artenzusammensetzung von beweidetem und unbeweidetem Grasland im Rahmen eines Renaturierungsprojektes in Südostitalien. PÁPAY et al. (2020) untersuchten den Einfluss der Gehölzdeckung auf die Artenzusammensetzung des halbnatürlichen Graslands im Mátra-Gebirge in Nordungarn und inwieweit wilde Huftiere die Verbuschung eindämmen können. DAYNEKO et al. (2020) beschrieben den Einfluss antiker Siedlungen aus skythischer und sarmathianischer Zeit auf die Biodiversität von Steppenhabitaten im Dnipro-Becken in der Südukraine. ZANIEWSKI et al. (2020) untersuchten, ob Störungen durch Geländefahrzeuge die Sukzession von Binnendünen in Zentralpolen aufhalten und dadurch die ehemalige Landnutzung ersetzen können, um die Kryptogamendiversität zu erhalten. JANIŠOVÁ et al. (2020b) charakterisierten Diversitätsmuster von *Carex humilis*-dominierten Felsensteppen in vier biogeographischen Regionen des östlichen Mitteleuropas entlang eines Höhengradienten

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über 1240 m. BÜCHLER et al. (2020) gingen der Frage nach, inwieweit der Naturschutzwert von *Mesobromion*-Halbtrockenrasen im Kanton Zürich in der Schweiz auf unterschiedliche Standortbedingungen zurückgeführt werden kann. CANCELLIERI et al. (2020) gaben einen Überblick über die Pflanzengesellschaften und die ökologischen Bedingungen der Trockenrasen des Nationalparks Abruzzen, Latium und Molise in Mittelitalien. Insgesamt haben 47 Autoren aus zehn Ländern zur 15. Grasland-Sonderausgabe beigetragen.

1. Introduction

The Eurasian Dry Grassland Group (EDGG; http://www.edgg.org) is a network of researchers and conservationists interested in the phytosociology, ecology, conservation and restoration of Palaearctic natural and semi-natural grasslands (VENN et al. 2018, DENGLER et al. 2019). The main aims of the EDGG are to facilitate research and scientific discussions on any aspect of Palaearctic grasslands by organising conferences and field workshops, to support the publication of grassland research, to establish grassland vegetation-plot databases (e.g. GrassPlot; DENGLER et al. 2018, BIURRUN et al. 2019) and to promote policies and legislation towards the protection, adequate management, and restoration of Palaearctic grasslands.

This Special Feature entitled "Traditional land use, management and biodiversity of European semi-natural grasslands" marks the 15th anniversary of the EDGG and continues a long tradition of grassland-related publications in *Tuexenia*. This Feature is also part of a series of Special Features organized by the EDGG (e.g. BECKER et al. 2016, JANIŠOVÁ et al. 2016, TÖRÖK et al. 2016, VALKÓ et al. 2016, 2018, 2019; DEÁK et al. 2017, 2018, 2019), which aim to disseminate results of grassland research to scientists and practitioners by highlighting the importance of biodiversity for ecosystem functioning and human well-being. By releasing these Features, the EDGG also aims to facilitate the implementation of scientific findings in grassland conservation and policy.

2. Biodiversity decline in European semi-natural grasslands

Grasslands in Europe harbour a high diversity of taxa, including many endemic species (BOCH et al. 2020a, TÖRÖK et al. 2020). They provide important ecosystem functions and services, including production-oriented provisioning (e.g. forage production and quality) and regulating (e.g. pest and pathogen control, pollination) and cultural services (e.g. aesthetic and recreational values; MANNING et al. 2018, ROUNSEVELL et al. 2018, BENGTSSON et al. 2019). However, these services can have conflicting land-use objectives (DE GROOT 2006, ALLAN et al. 2015).

Despite the ecological significance of grasslands globally, in Europe they are among the terrestrial habitats most negatively impacted by humans and are subject to strong long-term declines in habitat extent and quality. These trends have resulted in a high proportion of threatened grassland habitat types and species and declining species richness (BOCH et al. 2020a, DENGLER et al. 2020, TÖRÖK et al. 2020).

Overall, these patterns reflect a largely non-sustainable land use. The major direct drivers of grassland threats (DENGLER et al. 2020) encompass habitat degradation and destruction (ROUNSEVELL et al. 2018), which are driven by land-use intensification (e.g. ALLAN et al. 2014), abandonment of traditional land-use regimes (VALKÓ et al. 2018, BOCH et al. 2019a, b, 2020b), large-scale conversion of semi-natural grasslands to arable fields, and

eutrophication (DENGLER et al. 2020). Scientific evidence shows that maintaining biodiversity of multiple taxa, especially rare species, is key to reaching the goals of stable and well-functioning ecosystems (ZAVALETA et al. 2010, SOLIVERES et al. 2016a, b). For instance, ALLAN et al. (2015) found land-use intensification to have strong direct and indirect effects (via biodiversity loss and changes to functional composition) on ecosystem multifunctionality. They showed that, even in a pure production-oriented land-use scenario, ecological restoration might offset the negative effects of intensification and promote a wider range of services, especially cultural ones. However, their findings also suggest that the long-term provision of a wide range of grassland ecosystem functions and services requires a reduction of land-use intensity on a large-scale.

Despite the well-known threats to grasslands, European policy has yet to rethink and develop appropriate tools to reverse these trends rather than subsidize agricultural productivity. In order to maintain and restore ecosystem multifunctionality and grassland sustainability, it is essential that European agricultural policy becomes more directed towards increasing sustainable agriculture (ROUNSEVELL et al. 2018, GUBLER et al. 2020).

Over the last two decades, scientific networks have spurred grassland research in Europe. As a consequence, our understanding of ecological functioning and services in grasslands has increased considerably. However, there are still many ecological aspects of grasslands that we do not understand. These include the relationship between biodiversity and environmental gradients, the importance of past land use, and the efficacy of management and restoration measures. The contributions in this Special Feature aim to at least partially fill this gap.

3. Contributions to the 15th EDGG Special Feature

The present Special Feature comprises 8 articles by 47 authors from 10 countries. The contributions highlight different aspects of grassland research and focus on several study organisms and scales:

JANIŠOVÁ et al. (2020a) studied relationships between traditional farming systems and recent plant diversity in grasslands of the alliances *Arrhenatherion*, *Cirsio-Brachypodion*, *Cynosurion*, *Deschampsion* and *Violion caninae* in the Apuseni Mts in western Romania. Traditional farming is still practiced and well preserved in this region, including mowing for haymaking, grazing by cow, sheep, goat, pig and goose, and ploughing (each with or without manuring). The authors recorded plant diversity in nested plot series and conducted interviews with local farmers. Interestingly, species richness was highest in meadows that had formerly been used as cropland, with the last ploughing having occurred about 10–15 years ago. Meanwhile permanent pastures, for example, were less diverse. In addition, species richness increased with heterogeneity in recent management. This inspiring study shows how a combination of multiple traditional farming practices applied in rotation may support high plant diversity in a heterogeneous landscape with sustainable low-intensity farming.

In a study from southeast Italy, LABADESSA et al. (2020) showed that sheep grazing can accelerate the establishment of semi-natural grasslands on new soil surfaces. The authors focused their study on a former landfill, where soil had been prepared but propagules were not actively added. The site was located adjacent to an existing semi-natural grassland, which served as a potential seed source and reference area. Over a period of 3 years, the authors tracked vegetation composition in an area grazed by sheep (17 plots), an ungrazed area (6 plots), and an adjacent reference grassland (10 plots). They calculated relative

response indices to contrast trends in grazed and ungrazed areas with those in the adjacent reference grassland. Compared with ungrazed plots, grazed plots became more similar to the reference grasslands in terms of species composition and structure. The cover of epizoochoric species increased in grazed plots and became more similar to the reference grasslands, which indicates that sheep served as propagule dispersal vectors. The authors concluded that when seed sources are available in the vicinity, grazing can be a cost-effective, efficient and sustainable tool in grassland restoration, even during the early establishment phase.

PÁPAY et al. (2020) investigated the effect of shrub cover on plant species composition and wild ungulates' preference for woody species in semi-natural grassland patches of the Mátra Mountains, Northern Hungary. They found that increasing shrub cover significantly decreased the cover and species richness of grassland specialists, and increased weed cover. The effect of shrub cover was also evident in changes in mean ecological indicator values. A high shrub cover increased the abundance-weighted nutrient and water scores and decreased the naturalness value. Wild ungulates had an important role in the suppression of many shrub species. Although wild ungulate grazing alone was not found to be a feasible tool for suppressing shrubs, its combination with cattle grazing could support the maintenance of semi-natural grassland vegetation in mountainous areas.

DAYNEKO et al. (2020) studied the role of ancient settlements (i.e. remnants of settlements built in the Scythian and Sarmatian periods) of the Lower Dnipro basin (Southern Ukraine) in maintaining steppe biodiversity. They aimed to determine the local and landscape factors affecting vascular plant richness patterns in the area of ancient settlements and to explore the conservation importance of these sites. They found that sites of ancient settlements maintain a large number of native, steppe and non-synanthropic plants and thus have a high conservation value. A microhabitat variety index, as a measure of habitat heterogeneity, appeared to be the most significant, positive predictor of total species richness, followed by the area of the site and the degree of afforestation and steppe cover around the earthworks. The study demonstrated that ancient settlements sites are surprisingly species-rich and comprise valuable enclaves of the steppe flora. Their high proportion of steppe and non-synanthropic plants is comparable to that of nature reserves and kurgans.

ZANIEWSKI et al. (2020) investigated whether off-road activities might reduce secondary succession and thereby replace formerly abandoned traditional agricultural and forestry land-use regimes to maintain the cryptogam diversity of inland dunes in Central Poland. While the highest off-road intensity led to a transformation of the habitat into its initial stage with active dune processes, succession caused a development to pine forest in undisturbed patches. The authors concluded that diverse and spatially complex off-road activities might increase habitat heterogeneity and thus promote the coexistence of different cryptogam groups in inland dunes.

JANIŠOVÁ et al. (2020b) investigated diversity patterns in 540 plots from rocky steppes dominated by *Carex humilis* along an elevation gradient (from 140 to 1350 m a.s.l.) and in four biogeographic regions (Northwestern Pannonian Basin, Western Carpathians, Transdanubian Mountains and Transylvanian Basin). The compositional variation of these grasslands was best explained by geographic distance, but to a certain degree also by environmental variables, such as geological bedrock type and climate. Compared with higher-elevation sites, low-elevation steppe grasslands were characterized by a higher beta and gamma diversity, as well as a higher proportion of therophytes, large-range species and steppe specialists.

In contrast, the proportion of alpine species and of generalist species increased with elevation. Nevertheless, rocky steppes from various elevation belts and biogeographic regions shared a set of species with a similar ecology and distribution. The authors concluded that a detailed analysis of biogeographic patterns based on phytosociological data can provide valuable insight into the structure of a particular vegetation type.

BÜCHLER et al. (2020) asked whether the variation in conservation value of semi-dry grasslands (alliance *Mesobromion*) in the canton of Zurich, Switzerland can be attributed to differences in site conditions. They used four different metrics for conservation value, namely vascular plant species richness in 1 m², evenness, forb/graminoid ratio and an ad-hoc-developed conservation value score, in which typical and threatened species are assigned positive values and invasive species negative ones. There were pronounced differences between these metrics, with partly opposite results for species richness and conservation value score in the studied grasslands. Generally, the more valuable dry grasslands tended to grow on steeper slopes with lower nutrient status. Counterintuitively, the more valuable grasslands had a high litter cover, which might indicate that they are currently anthropogenically underused, meaning that their future value will be threatened if no measures are taken to reduce the standing and dead biomass from time to time.

CANCELLIERI et al. (2020) provided an overview of the dry grasslands of the Abruzzo, Lazio and Molise National Park (Italy) by analysing a dataset of 87 relevés with a homogeneous size of 4 m². They concluded that semi-natural dry grasslands in the study area are arranged into four easily distinguishable, high-ranking floristic-ecological groups belonging to four vegetation classes: *Molinio-Arrhenatheretea*, *Nardetea strictae*, *Festuco hystricis-Ononidetea striatae* and *Festuco-Brometea*. Both climatic (especially precipitation) and edaphic (especially bedrock and soil reaction) gradients acted as drivers of vegetation composition patterns. Species richness was higher in sites which were more affected by summer drought and/or nutrient scarcity. Community-means of Italy's specific ecological indicator values accurately reflected the environmental variables in grasslands.

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