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The European Dry Grassland Group (EDGG): stewarding Europe's most diverse habitat type

Abstract

The aim of this article is to introduce the dry grasslands of Europe and to report on the activities of the European Dry Grassland Group (EDGG), a network of dry grassland scientists and conservationists. Dry grasslands are defined here as herbaceous vegetation types, mostly dominated by grasses, that inhabit climatically or edaphically dry sites. They comprise zonal steppes, alpine dry grasslands above the timberline, azonal/extrazonal dry grasslands on sites where peculiarities of soil or relief prevent forest growth, and semi-natural dry grasslands, derived from centuries of low-intensity land use. For most taxonomic groups, dry grasslands host a proportion of Europe's biodiversity that by far exceeds their spatial distribution and some of them are the richest plant communities worldwide at spatial scales < 100 m². Today, both natural steppes and semi-natural dry grasslands of Europe are highly endangered through transformation into arable fields, afforestation, land use intensification and abandonment, eutrophication or biotic invasions. The EDGG, with more than 800 members from over 50 countries, acts by facilitating information exchange, cooperation and joint projects towards better understanding and more effective conservation of Europe's dry grasslands. To this end, EDGG organises annual conferences and research expeditions, publishes an online electronic Bulletin, edits Dry Grassland Special Features in international journals, and plays an active role in the science-policy interface.

Die *European Dry Grassland Group* (EDGG): Schutz und Erforschung des artenreichsten Habitattyps Europas

Zusammenfassung

Dieser Beitrag gibt eine Einführung zu den Trockenrasen Europas und berichtet über die Aktivitäten der *European Dry Grassland Group* (EDGG), einem Netzwerk von Wissenschaftlern und Naturschützern, die sich mit diesem Habitattyp beschäftigen. Wir definieren Trockenrasen als krautige, meist von Gräsern dominierte Pflanzengesellschaften, die klimatisch oder edaphisch trockene Standorte besiedeln. Sie umfassen damit zonale Steppen, alpine Grasländer oberhalb der Baumgrenze, azonale/extrazonale Trockenrasen, wo Besonderheiten von Boden oder Relief die Bewaldung verhindern, sowie halbnatürliche Grasländer, die durch Jahrhunderte extensiver Landwirtschaft entstanden sind. In den meisten taxonomischen Gruppen beherbergen Trockenrasen einen weit größeren Artenanteil als es ihrem Flächenanteil in Europa entspräche und einige von ihnen gehören zu den artenreichsten Pflanzengesellschaften weltweit, wenn man Flächengrößen unter 100 m² betrachtet. Heutzutage sind sowohl die natürlichen Steppen als auch die halbnatürlichen Grasländer Europas stark durch Umwandlung in Ackerland, Aufforstungen, Landnutzungsintensivierung oder -aufgabe, Eutrophierung sowie das Eindringen gebietsfremder Arten bedroht. Mit mehr als 800 Mitgliedern aus über 50 Ländern initiiert die EDGG Informationsaustausch, Zusammenarbeit und gemeinsame Projekte zwischen Trockenrasenspezialisten verschiedener Länder mit dem Ziel eines besseren Verständnisses und Schutzes dieses Lebensraumes. Dazu dienen insbesondere die jährlichen wissenschaftlichen Tagungen und Forschungsexpeditionen, die Publikation eines eigenen Online-Journals und von Sonderbänden internationaler wissenschaftlicher Zeitschriften sowie die aktive Einmischung an der Schnittstelle von Wissenschaft und Politik.

1 Dry grasslands of Europe

1.1 What are "dry grasslands"?

Dry grasslands – as we define them – are herbaceous vegetation types, mostly dominated by graminoids (families *Poaceae* and *Cyperaceae*) but sometimes also by annual or perennial forbs that inhabit climatically or edaphically dry sites. According to this broad definition, there are four main situations in Europe where dry grasslands occur:

– **Zonal steppes.** Natural steppes in lowland areas with temperate or Mediterranean climate that receive too little precipitation to sustain forest vegetation (less than 250 mm during the vegetation period or less than 450 mm per year; see Walter & Breckle 1986, Schultz 2000). Such typical lowland steppes are widely distributed in Ukraine, Russia, and Kazakhstan, with smaller occurrences in Bulgaria, Romania, Moldavia, Georgia, Armenia, and Azerbaijan (Unit M in Bohn et al. 2004). Additionally, forest steppes, i.e. mosaics of meadow steppes alternating with oak forests, are considered to be the natural vegetation in large parts of Hungary, in addition to some smaller areas in Serbia, European Turkey, and Sweden (islands of Öland and Gotland) (Unit L in Bohn et al. 2004).
– **Alpine (dry) grasslands.** These natural grasslands are found in European mountains above the timberline, i.e. where the vegetation period is too short to sustain forest growth (Unit B5 in Bohn et al. 2004). Depending on relief, hydrology, snow cover, and substrate, alpine grasslands constitute this unit together with alpine heathlands, fens, snowbed and scree vegetation (Ellenberg & Leuschner 2010).
– **Azonal/extrazonal dry grasslands.** On a small spatial scale, natural dry grasslands occur also in areas where the zonal vegetation is forest, but the particular situation of soil and/or relief does not allow tree growth. Typically, these are poorly developed, often shallow, well-drained, and sometimes unstable soils, as they can be found, for example, in coastal grey dunes or around rock outcrops (Ellenberg & Leuschner 2010, Klötzli et al. 2010).
– **Semi-natural (secondary) dry grasslands.** Such dry grasslands, which represent the dominant type in most European countries, grow in places where the natural vegetation would be (xerophilous) forest, but due to a protracted history of human land uses such as mowing (meadows), grazing (pastures), or a combination of these, has been replaced by grasslands (Poschlod et al. 2009, Ellenberg & Leuschner 2010, Klötzli et al. 2010). Also other human disturbances can lead to the creation of semi-natural grasslands, such as regeneration of former arable fields, mining (e.g. sand pits, stone quarries) or military training areas. The species pool of such secondary dry grasslands comprises species from the previous three groups of natural grasslands, which in some periods subsequent to the last glaciation were much more widespread in Europe (e.g. Pott 1995, Wilmanns 1997), but also from the undergrowth of xerophilous forests and from fen vegetation. Semi-natural dry grasslands consitute a major part of what has recently been termed High Nature Value (HNV) grassland (Veen et al. 2009, Oppermann et al. 2012).

1.2 Biodiversity

Dry grasslands have a crucial role in sustaining the biodiversity of Europe by harbouring many rare and endangered plant and animal species (Fig. 1). Despite not being natural in most places, grasslands in general make a very substantial contribution to the biodiversity of Europe. Hobohm & Bruchmann (2009) found that among the more than 6,000 vascular plants endemic to Europe, grassland species, at 18.1%, constitute the second largest group, after the rock-inhabiting species, and include nearly twice as many endemics as the group of species occurring primarily in forests (10.7%). Among the 2997 assessed vascular plants of Germany, 488 were prevalent in semi-natural dry grasslands, more than for any other of the 23 broad formations. This is despite the fact that this figure does not even include alpine grasslands nor xerothermic tall-herb formations, and moreover dry grasslands in Germany cover far less than 1% of the territory (Korneck et al. 1998). Whilst for Europe as a whole, no such analysis has been carried out, the proportions found in Germany should be reasonably indicative of those elsewhere. In some other taxa, the relevance of dry grasslands for biodiversity is even higher; for example, 63% of the butterfly species of Europe are associated with dry calcareous grasslands and steppes (WallisDeVries & van Swaay 2009). The huge biodiversity of dry grasslands across multiple taxa (invertebrates, vertebrates, bryophytes, lichens, vascular plants, fungi) is exemplified by Jongepierová (2008) for the White Carpathians (Czech Republic and Slovakia) and Wiesbauer (2008) for Lower Austria.
On global maps of biodiversity hotspots (Mittermeier et al. 2011) or of vascular plant species richness maxima (Barthlott et al. 2005), one does not usually does find temperate Europe and its dry grasslands. This is because such approaches typically look at large spatial scales only (e.g. 10,000 km² grain size in Barthlott et al. 2005). Both approaches typically identify global hotspots mainly in the wet tropical and Mediterranean biomes. However, which biome/habitat is most diverse, depends on the spatial scale (grain size) analysed. It has recently been demonstrated that only for grain sizes of 100 m² or more are tropical rainforests the habitat richest in vascular plants, whilst, when analysing smaller grain sizes, they are outcompeted by temperate grasslands, mainly semi-dry basiphilous grasslands of Europe (Dengler 2012, Wilson et al. 2012). The richest ever recorded

plant communities on spatial scales of 0.001 to 50 m² are found from the alvar grasslands of Öland (Sweden: van der Maarel & Sykes 1993) and Estonia (Kull & Zobel 1991), the semi-dry basiphilous grasslands of the White Carpathians (Czech Republic: Klimeš et al. 2001) and Transylvania (Dengler et al. 2012a). Whilst the diversity of vascular plants in European dry grasslands is relatively well documented, this is not the case for bryophytes and lichens, despite the general knowledge that they constitute a major component of biodiversity and play a role in important ecological processes. Studies quantifying and analysing bryophyte and lichen diversity jointly and comparatively with vascular plant diversity are rare and mostly restricted to Central and Northern Europe (Dengler 2005, Boch & Dengler 2006, Löbel et al. 2006), whilst they are virtually non-existent in other parts of Europe (but see the recent study from Romania: Dengler et al. 2012a).

Dry grasslands are very suitable as a model system for biodiversity analyses because: their small-scale species richness varies from low to extremely high; they span very wide latitudinal, altitudinal; and pH ranges; they occur both as natural and anthropogenic communities; they comprise not only vascular plants but also bryophytes, and lichens; and they typically grow in isolated patches. Particularly in the case of plant diversity, they allow comparative studies of vascular plants, bryophytes, and lichens, which, due to the ecological differences between these taxa, promise to provide a deeper understanding of biodiversity patterns and their underlying causes than single-taxon studies (e.g. Löbel et al. 2006). Many factors influence the diversity patterns found in dry grasslands, including climate, soil pH (e.g. Löbel et al. 2006), spatial heterogeneity (e.g. microrelief: Löbel et al. 2006), past and present land use (Dupré & Diekmann 2001), past and present landscape configuration (e.g.

A

B

C

D

Fig. 1:
Plate showing four typical rare species from European dry grasslands. A – *Preissia quadrata*, a liverwort growing in semi-dry and rocky grasslands on limestone and gypsum (Photo: J. Dengler, Lüneburg, Germany, JD125497); B – *Jurinea cyanoides*, a rare flowering plant of base-rich sand dunes in Central Europe (Photo: J. Dengler, Mainz, Germany, JD125271); C – *Eresus cinnaberinus* (male), a rare spider inhabiting dry sandy grasslands and heathlands (Photo: J. Dengler, Rheinhessen, Germany, JD125191); D – *Lacerta viridis* (male), a threatened lizard of Eastern European dry grasslands (Photo: J. Dengler, National Nature Park "Buz'ky Gard", Ukraine, JD112597)

Helm et al. 2006), habitat continuity (e.g. Hájková et al. 2011) and the regional species pool. Many of these factors have been studied, though often in isolation from each other and generally only in regional studies. Thus, whilst for some groups, such as vascular plants, we have a reasonable picture of diversity patterns across European dry grasslands, we are far from fully understanding the processes that create these patterns. This academic challenge might be exemplified by the question, why the semi-dry grasslands of the White Carpathians and some places in Transylvania are approximately twice as rich on the plot scale as ecologically similar communities in adjacent regions, which are still extraordinarily rich compared to other plant communities.

1.3 Classification

Europe hosts a huge variety of dry grassland types that differ in their species composition and structure depending on geographic position, soil (pH, nutrients, cohesion, rockiness, depth), microclimate and macroclimate, water balance (meso-xeric/semi-dry grasslands vs. xeric = dry grasslands s.str.) and land use (natural, pasture, meadow) (Fig. 2). Currently only one comprehensive overview of European vegetation types has been made in phytosociological terms (Rodwell et al. 2002; an updated and much more comprehensive new edition is in preparation by L. Mucina et al.). According to this system, dry grasslands s.l. mainly belong to the following classes:

– ***Festuco-Brometea***: dry grasslands and natural steppes of the submeridional to hemiboreal zone occurring on deep, base-rich and loamy soils.

– ***Koelerio-Corynephoretea*** (incl. *Sedo-Scleranthetea*, *Festuceta vaginatae*): dry grasslands and natural steppes of the submeridional to hemiboreal zone occurring on sandy or shallow skeletal soils.

– ***Trifolio-Geranietea sanguinei***: helio-thermophilous forest-edge and tall herb communities.

– ***Elyno-Seslerietea***: subalpine and alpine calcareous grasslands

– ***Carici rupestris-Kobresietea bellardii***: subalpine and alpine grasslands and dwarf-shrub heaths, tundra, and fjell vegetation on calcareous soils

– ***Juncetea trifidi***: subalpine and alpine pastures, rush heaths and fjell vegetation on acidic soils

– ***Stipo giganteae-Agrostietea castellanae***: Mediterranean-Iberoatlantic meso- to supramediterrane an perennial grasslands.

– ***Helianthemetea guttati***: Mediterranean low-grown swards dominated by annual grasses and herbs

– ***Thero-Brachypodietalia ramosi***: Mediterranean pseudo-steppes and related perennial grasslands

– ***Festucetea indigestae***: Iberian oromediterranean xerophilous grasslands on siliceous soils

– ***Festuco hystricis-Ononidetea striatae***: dry, basiphilous pastures of the meso- to oromediterranean belts of Southwest Europe

– ***Saginetea piliferae***: Cyrno-Sardean oromediterranean siliceous grasslands

– ***Daphno-Festucetea***: Greek and Aegaean oromediterranean calciphilous grasslands and phrygana

While the phytosociological typology constitutes the basis of the European habitat classifications as used in CORINE (Commission of the European Communities 1991), EUNIS (cf. Rodwell et al. 2002), and the Habitats Directive (European Commission 2007), it is in itself still rather inconsistent, as it is typically based on national overviews at best, with the same units being given different names in different countries. At least on a national scale, the first classifications of dry grassland (and other) vegetation types have now been published that are based on the consistent application of modern statistical methods, most notably the recent classifications of the Czech Republic (Chytrý 2007) and Slovakia (Janišová 2007).

In contrast, supranational or even continent-wide classifications are still rare. There have been some early attempts to develop a comprehensive European overview of certain dry grassland syntaxa by combining synoptic tables (i.e. constancy columns). Here, Royer's (1991) monumental classification of the class *Festuco-Brometea* throughout their Euro-Siberian range should be highlighted, particularly as it was accomplished prior to the advent of large vegetation databases and modern classification methods. More recently, Dengler (2003) and Dengler et al. (2006) published continent-wide

overviews of (some of) the high-rank syntaxa of the *Festuco-Brometea*, *Koelerio-Corynephoretea*, and *Trifolio-Geranietea sanguinei*, still based on constancy columns, but already with clear numerical criteria for the definition of diagnostic species. Dengler (2003) used these continent-wide classifications then to prepare so-called "synchorological maps", which display the distribution of high-rank syntaxa. In recent years, the first plot-based numerical classifications of major dry grassland syntaxa across country borders have been published: Dengler & Löbel (2006) for the *Alysso-Sedetalia* (*Koelerio-Corynephoretea*) in Northern and Central Europe, Illyés et al. (2008) for the *Brachypodietalia pinnati* (*Festuco-Brometea*) in Central Europe, and Dúbravková et al. (2010) for the *Festuco-Brometea* communities in the Western Carpathians and the Northern Pannonian Basin.

A B

C D

Fig. 2:
Plate showing a range of different dry grassland types in Europe. A – semi-dry basiphilous grassland in Transylvania (Romania) holding the world records of vascular plant species richness at 0.1 m² and 10 m² (*Cirsio-Brachypodion pinnati*, *Brachypodietalia pinnati*, *Festuco-Brometea*) (Photo: J. Dengler, JD092517); B – rocky grasslands over limestone in Transylvania, Romania (*Seslerion rigidae*, *Stipo pulcherrimae-Festucetalia pallentis*, *Festuco-Brometea*) (Photo: J. Dengler, JD093032); C – sand steppe community on dunes of the Lower Dnepr, Ukraine (*Festucion beckeri, Sedo acris-Festucetalia*, *Koelerio-Corynephoretea*) (Photo: J. Dengler, JD112841); D – grey dune vegetation in southern Sicily (Italy) dominated by annuals (*Alkanno-Maresion nanae*, *Malcolmietalia*, *Helianthemetea guttati*) (Photo: J. Dengler, JD120755).

1.3 Vulnerability, conservation, and management

Most European dry grassland communities are semi-natural habitats, which have developed over centuries or even millennia of traditional land use, such as mowing, grazing, temporary abandonment of arable fields, and/or other disturbance regimes (Pott 1995, Fischer & Wipf 2002, Poschlod & WallisDeVries 2002, Veen et al. 2009, Ellenberg & Leuschner 2010). However, as a result of economic and subsequent land-use changes during the last century (and in some regions even earlier), dry grasslands have become threatened in almost every part of Europe. While in some cases dry grasslands have been directly destroyed by construction or mining, the most serious threats are those affecting vast areas, namely agricultural intensification, land abandonment, and atmospheric nitrogen deposition.

Specifically in lowland areas, agricultural land use has become very intensive, as a result of which many grasslands have been ploughed up, and the diversity of the remaining grassland fragments has declined dramatically due to the intensive use of mineral fertilisers and pesticides, or due to over-seeding with competitive grass cultivars (Török et al. 2011). Contrastingly, in mountainous or otherwise marginal areas, because of the high implementation costs of extensive farming and grazing, large grassland areas have been abandoned (e.g. Stampfli & Zeiter 1999, Poschlod & WallisDeVries 2002, WallisDeVries et al. 2002, Vassilev et al. 2011, Valkó et al. 2012) or afforested (Ruprecht et al. 2009, Schrautzer et al. 2009), both with negative effects on the typical species composition and diversity.

The expansion of highly competitive species (both native and non-native ones) into grassland ecosystems represents another threat to grassland vegetation. Such changes are often enhanced by increased atmospheric nitrogen deposition, which changes the proportion of available nutrients in soils and promotes the dominance of tall herbs and competitive grasses (Willems et al. 1993, Bobbink et al. 1998), especially in the absence of management. A particular problem is the native tall grass *Calamagrostis epigejos*, which in many parts of Europe is invading dry grasslands, resulting in species poor monodominant stands, which has proven to be resistant to the tested realistic management regimes applied so far (Rebele 2000, Házi et al. 2011). In Eastern European post-socialist countries, during the last two decades, large areas of low production croplands (ploughed areas of former dry grasslands) have been privatised and subsequently abandoned, mostly because of the inadequate resources of the new owners (Török et al. 2011). Because of limited resources, lack of knowledge of traditional husbandry methods, and the poor availability of regional seed mixtures, most abandoned croplands have either been colonised by perennial invasive species or weeds, such as common milkweed *Asclepias syriaca* (Csontos et al. 2009), re-grassed with commercial seed mixtures (Lencová & Prach 2011), or afforested, mostly with non-native and sometimes invasive tree species, such as *Robinia pseudoacacia* (Matus et al. 2003). Perhaps even worse is the situation in the countries of the steppe biome, where most of the former zonal vegetation has been either transformed to arable fields or afforested, and only tiny fragments of the natural steppe vegetation survive today in Ukraine and the European part of Russia (e.g. Sudnik-Wójcikowska et al. 2011).

In consequence, a large proportion of the numerous typical dry grassland species are now seriously endangered. For example, an analysis of the German vascular plant flora, grouped into 24 major formations, has shown that the flora of semi-natural dry grasslands is the third-most threatened, after the vegetation of oligotrophic water bodies and oligotrophic mires (Korneck et al. 1998). Dry grasslands host 24.8% of all red-listed plants of Germany, while at the same time 43.5% of the dry grassland species are threatened. As a consequence of this dramatic decrease of dry grasslands both in terms of area and quality, dry grasslands now belong to the most endangered European habitats (Willems et al. 1993, Veen et al. 2009). Accordingly, most of Europe's dry grassland types are now listed as priority habitats under the Habitats Directive of the EU (European Commission 2007), e.g. 6120 (Xeric and calcareous grasslands), 6220 (Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*), 6240 (Sub-pannonic steppic grasslands) or 6280 (Nordic alvar and Precambrian calcareous flatrocks).

In order to initiate the protection and restoration of dry-grasslands of High Nature Value, the most urgent objectives of nature conservationists are: (i) to maintain existing levels of biodiversity in dry-grasslands by sustaining or re-implementing traditional management regimes, (ii) increase diversity in degraded or disturbed species poor grasslands based either on spontaneous succession or technical reclamation methods (Prach & Hobbs 2008); (iii) re-establish connectivity between isolated grassland fragments and provide buffer zones by creating supplementary diverse grasslands, preferably using regional diaspore sources. To achieve these objectives, both national and international coop-

eration is essential, to share evidence-based knowledge among scientists and site managers working with dry grasslands of Europe and elsewhere (Pullin et al. 2009). To this purpose, compilations of management and restoration guidelines specifically for dry grasslands have been published (e.g. Bakker 1989, Bakker & van Diggelen 2005, Silva et al. 2008, Kiehl 2009, Schwabe & Kratochwil 2009, Kiehl et al. 2010, Török et al. 2011, and the conference volume at hand), though there is still an urgent need for more information and better utilization of available information.

2 The European Dry Grassland Group (EDGG)

The European Dry Grassland Group (EDGG) was founded in 2008 to provide researchers and conservationists of many nationalities with a joint platform for exchange and cooperation.

2.1 Background and foundation

The European Dry Grassland Group (EDGG) is based on the amalgamation of two pre-existing groups, which now constitute subgroups within the EDGG: the *Arbeitsgruppe Trockenrasen* (German Working Group on Dry Grasslands) and the *Working Group on Dry Grasslands in the Nordic and Baltic Region*. The *Arbeitsgruppe Trockenrasen* was founded in 2004 within the joint *Arbeitskreis Syntaxonomie* of the *Floristisch-Soziologische Arbeitsgemeinschaft* and the *Reinhold-Tüxen-Gesellschaft*, two geobotanical societies of the German-speaking countries. The basic aim of the *Arbeitsgruppe Trockenrasen* was, and remains, the compilation of a comprehensive phytosociological database of dry grassland communities in Germany, and to use this database for a consistent classification of these communities. Additionally, the *Arbeitsgruppe Trockenrasen* has organised annual conferences (including excursions) on topics related to dry grasslands, since the year of its inception. The annual meetings of the *Arbeitsgruppe Trockenrasen* were bilingual (German and English) from the second year onwards, and they increasingly attracted colleagues from outside Germany. In addition, more and more people from outside Germany applied to become members of the *Arbeitsgruppe Trockenrasen*, despite the fact that its geographic focus was on Germany and communication was in German. Both these developments, combined with the fact that the 5th Dry Grassland Meeting was to be held in Kiel, on the Baltic Sea coast, gave rise to the idea of organising this meeting jointly with the *Working Group on Dry Grasslands in the Nordic and Baltic Region* and to adopt English as the conference language. The meeting in Kiel attracted also colleagues from outside the Nordic-Baltic and German regions. Altogether, the conference was attended by participants from nearly a dozen countries.

As the general feeling at the Kiel meeting was that also in the future, a framework for exchange on dry grassland research and conservation extending beyond national borders within Europe was desirable, it was decided at the closing session of the meeting to establish the European Dry Grassland Group (EDGG). This would serve as a platform/network at a continental level and take over the organisation of subsequent Dry Grassland Meetings, to be held at varying locations throughout Europe. Three colleagues from different European countries volunteered to serve as chairs of the EDGG for the first period: Jürgen Dengler, Monika Janišová, and Solvita Rūsiņa. In that way, the EDGG came into existence in autumn 2008, inheriting the combined memberships of the two predecessor groups. Shortly afterwards, the first *EDGG Bulletin* was published (see section 2.4), and in summer 2009, the EDGG members in a ballot voted for the unmistakable EDGG logo (Fig. 3).

2.2 Aims of the EDGG

The EDGG deals with all taxa associated with dry grasslands (invertebrates, vertebrates, vascular plants, bryophytes, lichens, fungi) and all topics related to these (taxonomy, community ecology, landscape ecology, conservation, restoration, management, agriculture, education, legislation and politics). Membership is open to all individuals who are interested in dry grasslands, irrespective of whether they represent universities, research institutions, administrations, NGOs, environmental consultancies or are just amateurs.

Fig. 3:
The logo of the European Dry Grassland Group, designed by Anna Kuzemko, Ukraine.
It symbolises the awns of *Stipa* caryopses, a typical xerophilous grass genus, represented by various species from the Iberian Peninsula to the Ural Mts. and from the Mediterranean to the hemiboreal zone.

The Bylaws of the EDGG (http://www.edgg.org/pdf/BylawsEDGG.pdf) state as our six main objectives:

– development and advancement of research on any aspect (vegetation, flora, fauna, soils, etc.) of western Palaearctic dry grasslands and steppes,
– education on dry grasslands,
– publication of research results on dry grasslands,
– facilitation of scientific and personal communication among scientists who are interested in Palaearctic dry grasslands,
– promotion of the appropriate application of dry grassland research for the good of society, particularly in environmental management and public decision making, and
– promotion of policies and legislation towards protection, proper management, and restoration of High Nature Value grasslands in general.

From this wording it is evident that while European dry grasslands are the core focus of the group, we also take an interest in and feel responsibility for dry grasslands and steppes in other parts of the Palaearctic ecozone (Northern Africa, North and Central Asia), as well as other High Nature Value grasslands (i.e. mesic and wet types).

2.3 Organisation and subgroups

The EDGG comprises a loose, informal network of people with a common interest in dry grasslands. In response to a rapidly growing membership and organizational involvement in a variety of activities (see sections 2.5 and 3), it became necessary to establish a number of formal structures. Accordingly, the EDGG, by means of a ballot of its members conducted in September 2011, adopted a set of Bylaws (http://www.edgg.org/pdf/BylawsEDGG.pdf). In accordance with these Bylaws, the EDGG is governed by an Executive Committee elected for a two year term of office and consisting of three to seven members. The Executive Committee has a non-hierarchical structure, i.e. all its members (co-chairs) have equal rights and decide internally on specific task assignments. At the time of publication, the authors of this contribution are serving as co-chairs of EDGG. The identities, responsibilities, and contact data of the Executive committee members can be found at http://www.edgg.org/about_us.htm.

In October 2009, the EDGG became an official Working Group of the *International Association for Vegetation Science* (IAVS; http://www.iavs.org), a global professional organisation of vegetation ecologists, with which we already previously had a close working relationship. This formal relationship brings a variety of benefits to the EDGG, including financial and organisational, while we remain fully open to non-botanists and non-members of IAVS. Furthermore, the EDGG became a supporting member of the *European Federation of Nature Conservation and Pastoralism* (EFNCP; http://www.efncp.org/), an organisation that works for the maintenance of the continent's traditional rural landscapes, with their High Nature Value grasslands. The EDGG also cooperates with other organisations that share its aims. As EDGG does not impose membership fees, we rely financially upon voluntary contributions from our members and funding from other organisations. So far, we have been able to obtain frequent financial support from the IAVS, *Floristisch-Soziologische Arbeitsgemeinschaft e. V.* (FlorSoz, Germany; http://www.tuexenia.de/), *Förderkreis Allgemeine Naturkunde Biologie e. V.* (FAN(B), Germany; http://www.fan-b.de/html/index.html), *Forum Plinianum* (Italy) and from local host organizations in conjunction with our conferences (see section 3.1).

The EDGG Bylaws stipulate the establishment of regional and topical subgroups (overview and contact information available at: http://www.edgg.org/subgroups.htm). Presently, there are four regional subgroups, into which all members from the respective countries, plus additional interested members from other regions, are allocated: *Arbeitsgruppe Trockenrasen* (Germany), *Working Group on Dry Grasslands in the Nordic and Baltic Region*, *Working Group on Mediterranean Dry Grasslands* (Med-DG) and *Southeast European Dry Grassland Group* (SEEDGG). The main focus of these regional subgroups is on the establishment of vegetation-plot databases of dry grasslands from the respective regions (see section 3.4). In 2011, the first topical subgroup was founded: *Grassland Conservation and Restoration*. Finally, there is a *Special Policy Committee* (SPC), which is appointed by the Executive Committee to assist it with activities in the science-policy interface (see section 3.6).

2.4 Homepage and Bulletin

From the outset, two major instruments have contributed to the visibility and effective communication of the EDGG: the homepage and the *EDGG Bulletin*. Both are available to both members and non-members alike. Furthermore, there is an EDGG mailing list, through which relevant information can be rapidly disseminated.
The EDGG web site (http://www.edgg.org; see Fig. 4) is managed by one of the EDGG chairs, presently Solvita Rūsiņa. It provides basic information on the history and organisation of the EDGG, contact information for the chairs and organizers of the subgroups, and information regarding past and future EDGG events, as well as relevant conferences of other organisations and information about dry grasslands. One page of the web site is devoted to members' publications. Here, one can find three types of publications: (i) all past volumes of the EDGG Bulletin, (ii) all open-access publications from the numerous EDGG-edited Special Features in various journals (see section 3.3) and a structured list of dry grassland-related publications of EDGG members (with either direct download option or e-mail contact information of the corresponding authors to facilitate the requesting of reprints).

The *Bulletin of the European Dry Grassland Group* (or *EDGG Bulletin* for short; ISSN 1868-2456) is an online journal sent to all EDGG members every three months (Fig. 5). One member of the EDGG Executive Committee, presently Monika Janišová, serves as Editor-in-Chief, assisted by the other chairs, and to which all EDGG members are invited to contribute news items, lists of their recent dry grassland publications, and photographs. In addition to e-mail distribution to members, the *EDGG Bulletin* is available as open access, both via the EDGG homepage (http://www.edgg.org/publications.htm) and on the server of the German National Library. To date, 16 issues of the *Bulletin* have been published, each containing approximately 30 full-colour pages. The *Bulletin* has a defined structure, including short reports and news from the EDGG, its subgroups and activities, *Forum* (announcements and requests from members to members), *Recent publications from our members*, *Book reviews*, and *Forthcoming events*. Longer contributions (reports, research articles, reviews and forum contributions) are placed in the middle part of the *Bulletin* and have the structure of scientific papers and are citable as such. Also the series *Remarkable dry grassland types/sites* (e.g. Hegedüšová 2009) and *Dry grasslands in European countries* (e.g. Burrascano et al. 2010) appear in this middle part.

Fig. 4:
Screenshot of the starting page of the EDGG web site (as of 12 November 2012).

Fig. 5:
Cover page of EDGG Bulletin No. 14.

2.5 Membership

Membership of the EDGG is free of charges and obligations, nor is membership of our mother organisation IAVS necessary. These facts, together with the many benefits we offer for our members, have probably contributed to the rapid development of our membership. Whilst at the time of inception in December 2008, we had 191 members, this figure has more than quadrupled now to 947 (as of 15 August 2013). These members come from a total of 58 different countries, including nearly all of the European countries, in addition to which we also have members from all other continents except Antarctica. In absolute terms, most of our members still come from Germany (223), followed by Greece (130), Poland (60), Italy (41), Ukraine (44), and Slovakia (38). In relative terms, i.e. members per 1 million inhabitants, the EDGG is best represented in Greece (11.9), Estonia (9.6), Slovakia (7.0), Luxembourg (6.6), and Slovenia (6.0).
We hope to continue our dynamic development and encourage all readers interested in dry grasslands and steppes, their flora and fauna, as well as their conservation and restoration, to join the EDGG. We particularly seek new members from currently underrepresented countries (Azerbaijan, Belarus, France, Iceland, Kazakhstan, Norway, Portugal, and Russia), zoologists, and mycologists, in addition to the already well-represented botanists, as well as also colleagues working in NGOs, conservation administrations and consultancies, in addition to the already well-represented researchers. Applications for membership and expressions of interest in joining the subgroups can be submitted by e-mail to juergen.dengler@uni-bayreuth.de.

Table 1:
Main topics, locations and participants of the European Dry Grassland Meetings an d their predecessors 2004–2013 as well as the forthcoming meeting 2014. The 3rd conference was cancelled. NA = not available.

Year	Meeting	Location	Motto	Participants	Countries
2004 (24–26 September)	1st Annual Conference of the *Arbeitsgruppe Trockenrasen*	Lüneburg (Germany)	*Dry grasslands as biodiversity hotspots*	31	1
2005 (26–28 August)	2nd Annual Conference of the *Arbeitsgruppe Trockenrasen*	Münster (Westf.) (Germany)	*Observation scales in dry grasslands*	33	3
2007 (6–8 September)	4th Annual Conference of the *Arbeitsgruppe Trockenrasen*	Freising (Germany)	*Restoration and spontaneous establishment of dry and semi-dry grasslands at traditional and urban-industrial sites*	49	2
2008 (28–30 August)	5th Dry Grassland Meeting	Kiel (Germany)	*Dry grasslands in a changing environment*	44	10
2009 (31 August – 2 September)	6th European Dry Grassland Meeting	Halle (Saale) (Germany)	*Dry grasslands – species interactions and distribution*	40	11
2010 (28 May – 1 June)	7th European Dry Grassland Meeting	Smolenice (Slovakia)	*Succession, restoration and management of dry grasslands*	100	20
2011 (13–17 June)	8th European Dry Grassland Meeting	Uman' (Ukraine)	*Dry grasslands of Europe: biodiversity, classification, conservation and management*	80	18
2012 (19–23 May)	9th European Dry Grassland Meeting	Prespa (Greece)	*Dry grasslands of Europe: grazing and ecosystem services*	120	25
2013 (24–31 May)	10th European Dry Grassland Meeting	Zamość (Poland)	*When theory meets practice: conservation and restoration of grasslands*	125	26
2014 (5-9 June)	11th European Dry Grassland Meeting	Tula (Russia)	*European steppes: ecology, anthropogenic transformation and restoration*	NA	NA

3.1 European Dry Grassland Meetings

The European Dry Grassland Meetings (EDGMs), the annual scientific conferences of the EDGG, are a scientific forum where ideas related to dry grasslands find fertile ground to develop. Since 2004, the Dry Grassland Meetings have offered a framework for exchanging ideas about dry grassland management, restoration and protection, discussing and disseminating results of research on dry grasslands, meeting colleagues with similar interests from a diverse range of countries, and for developing cooperation with colleagues old and new. From its inception as a small national event, the Dry Grassland Meetings soon gained size and became more and more international (Table 1). The topics change from year to year and are adapted in accordance with the specific objectives and wishes of the local organising committee. The EDGMs comprise both oral presentations (sometimes also with invited keynote speakers) and poster sessions. Furthermore, the General Assembly of the EDGG is held during the EDGM. Both the excursions to regionally representative dry grassland habitats in the surroundings of the venue and the "dry grassland party" have become popular elements of the EDGMs.

In 2012, the region of Prespa, in Northwest Greece was the venue for the 9th EDGM. This conference was organized in cooperation with the Hellenic Rangeland and Pasture Society (HERPAS). The conference was held in honour of Dr. Arne Strid, a living legend who has dedicated his life to the exploration and scientific description of the floristic elements of Greece and who has greatly contributed to our knowledge of the Greek rangeland flora. More than 120 people participated, and 307 authors from 28 countries presented 123 contributions (101 posters and 22 talks). The sessions focused on the impact of grazing on the biotic (such as grazing and plant/animal interactions, species composition) and abiotic environment (soil properties, land use changes), as well as ecology and management of dry grasslands (syntaxonomy, diversity) and societal aspects of dry grasslands (policy, economic evaluation, etc). During the three excursion days, participants had the opportunity to visit the limestone grasslands of Mt. Devas (Fig. 6), the sandy dry grasslands on the isthmus between the Lakes Micro and Macro Prespa, and the calcareous dry grasslands of Mt. Sfika. In addition to the usual programme, a meeting was also held between local stock-breeders, agronomists, and dry grassland specialists dealing with primary sector policy issues.

Fig. 6:
Participants of the excursion to Mt. Devas at the 9th European Dry Grassland Meeting in Prespa, Greece. (Photo: Y. Kazoglou, May 2012).

3.2 EDGG Research Expeditions

The EDGG Research Expeditions have become a tradition since 2009, when the first such expedition was conducted to Transylvania, Romania (Dengler et al. 2009). Subsequent expeditions were undertaken to other regions in East, Southeast, and South Europe, and in 2013, the 6th EDGG Research Expedition to the Altai Mountains will be the first EDGG event outside Europe (Table 2). The aim of these international expeditions is to collect high-quality data on plant species composition and the

diversity of dry grasslands and related communities in understudied regions of the Palaearctic. These data will be utilized for the production of joint publications in international journals, and to exchange knowledge (species determination, field sampling and analytical methods) among participants with different background.

The EDGG Expeditions use two complementary, highly standardised sampling approaches. To address scale-dependent plant diversity patterns, we apply a nested-plot design with areas of 0.0001, 0.001, 0.01, 0.1, 1, 10, and 100 m² (Fig. 7), in accordance with the suggestions of Dengler (2009). To contribute to consistent large-scale classification, additional vegetation relevés of 10-m² plots are sampled and combined with the two 10-m² subplots of the nested-plot series (Table 2). For each of the 10-m² plots, the percentage cover of all vascular plants, bryophytes, and lichens is recorded, environmental and structural variables are recorded in the field, and mixed soil samples of the rooting horizon are taken for laboratory analyses.

Table 2:
Study areas and participants of the EDGG Research Expeditions 2009–2013.

No.	Period	Research area	Altitudes [m a.s.l.]	Participants	Countries	Nested-plot series	10-m²-plots
1	14–26 July 2009	Transylvania (Romania)	321–670	6	3	20	63
2	10–25 July 2010	Central Podolia (Ukraine)	73–251	18	8	21	226
3	14–24 August 2011	NW Bulgarian mountains	633–1460	9	5	15	98
4	29 March – 5 April 2012	Sicily (Italy)	4–1200	14	5	21	67
5	15–23 May 2012	N Greece	1–1465	16	6	14	31
6	22 July – 1 August 2013	Khakassia (Russia)	300–700	14	7	39	133

The data of the 1st EDGG Research Expedition to Romania has already given rise to two publications in *Web of Science* journals. First, Dengler et al. (2012a) provided a detailed description and consistent classification of the *Festuco-Brometea* communities of the Transylvanian Plateau, including what is probably the first statistical determination of diagnostic species for Romanian grasslands and a nomenclatural revision of the syntaxa. The same data were also included in a global study of small-scale vascular plant diversity, in which it was shown that one semi-dry grassland stand near Cluj-Napoca is the richest ever recorded plant community at the scales of 0.1 m² (43 species) and 10 m² (98 species) (Wilson et al. 2012; see section 1.2 and Fig. 2A). Further publications from this and the subsequent EDGG Expedition are in preparation.

Fig. 7:
Surveying one corner of a nested biodiversity plot in Sciare di Mazara (Sicily, Italy) during the 4th EDGG Research Expedition. (Photo: J. Dengler, March 2012, JD120263).

3.3 EDGG Special Features

Since the first Dry Grassland Meeting, which was held in Lüneburg in 2004, the publication of Special Features or Special Issues on dry grassland related topics in national and international journals has become a core activity of the EDGG. These Special Features are guest-edited by international teams of EDGG-appointed dry grassland specialists. Seven of these Special Features have been published in *Tuexenia*, comprising 37 articles with a total of 660 pages (see overview in Galvánek et al. 2012). Additionally, there has been a complete Special Volume of the 2nd Dry Grassland Meeting (Bültmann et al. 2006), as well as Special Features in *Kieler Notizen zur Pflanzenkunde* (Dengler & Jandt 2004) and the *Web of Science* journal *Plant Biosystems* (Janišová et al. 2011). Presently, EDGG is editing no less than five Special Issues/Features: two on Palaearctic grassland diversity for the journals *Agriculture, Ecosystems and Environment* (Impact Factor 2012: 2.859) and *Biodiversity and Conservation* (2.264), one on large-scale grassland classification in *Applied Vegetation Science* (2.263; see Dengler et al. 2013), one on temperate dry grasslands in *Tuexenia* and one on Mediterranean dry grasslands in *Hacquetia*. Furthermore, a book with approximately 50 contributions from the 9th EDGM in Prespa has just been published (Vrahnakis et al. 2013). All these publication activities aim at increasing cooperation and the prominence of dry grassland research, and to this end they are accompanied by editorial syntheses.

3.4 Dry grassland databases

Since the foundation of the EDGG's predecessor, *Arbeitsgruppe Trockenrasen*, the establishment of vegetation-plot databases had been a major focus, as these are indispensible for consistent large-scale classifications (see section 1.3) also for a multitude of fundamental and applied ecological analyses (Dengler et al. 2011). Jandt et al. (2011), for example, have shown how the composition of German semi-dry basiphilous grasslands has changed over the last decades, under the influence of abandonment and air-borne eutrophication. While in Germany it has taken eight years for the national dry grassland database to reach fruition (Jandt et al. in this volume), the development in other parts of Europe has been faster. In addition to the large national vegetation databases comprising all vegetation types (overview in Dengler et al. 2011), there are the EDGG databases, those of the *Working Group on Dry Grasslands in the Nordic and Baltic Region* (Dengler & Rūsiņa 2012) and that of the EDGG Expeditions (Dengler et al. 2012b). Furthermore, EDGG members are presently assembling international dry grassland databases of the Pannonian-Carpathian-Pontic and the Balkan regions, to use these for the preparation of large-scale classifications (section 1.3).

3.5 EDGG Fellowships

The EDGG Fellowships are a new instrument intended to allow young dry grassland researchers (mainly from eastern Europe) to spend periods of a few weeks in the working group of an experienced EDGG member, with the aim of learning or improving analytical techniques and scientific writing for international journals. This is typically based on the cooperative utilization of data from EDGG Expeditions or from EDGG-related vegetation-plot databases. Thanks to the financial support of our mother organisation, the IAVS, in autumn 2012 the first two EDGG Fellows, Anna Kuzemko (Ukraine) and Hristo Pedashenko (Bulgaria), were able to stay for several weeks in the group of Jürgen Dengler at the University of Hamburg, Germany, to prepare data from the 2nd and 3rd EDGG Expeditions, respectively, for publication in the forthcoming Dry Grassland Special Feature in *Tuexenia* 33 (2013).

3.6 EDGG and politics

Protection, restoration, conservation, and appropriate management of European dry grasslands are essential activities to safeguard their biodiversity and long-term survival. To support the practical conservation of High Nature Value grasslands in Europe, the *Smolenice Grassland Declaration* (SGD) was adopted during the 7th EDGM held in Smolenice (Slovakia). After its publication through the EDGG media, it has achieved general acceptance and has been signed by 330 scientists, representatives of NGOs, ministries, politicians, farmers, and other people concerned about the conservation of dry grasslands from a total of 41 countries. The declaration can still be signed online

at http://www.botanik.uni-greifswald.de/574.html. The SGD clearly declares the importance of the natural resources provided by dry grasslands, the current status of the grasslands and the actions necessary for their conservation. To achieve the ultimate target of the SGD, i.e. the creation and adoption by the EU States of a Grassland Convention in Europe, the *Special Policy Committee* (SPC) was established within the EDGG in July 2011. Regarding the promotion of the SGD, the SPC has adopted the following step-by-step approach, (a) increase the influence of the SGD, (b) build a strong and comprehensive Convention on Grassland Conservation in Europe, (c) promote the Convention to EC organs, and (d) to put the Convention into effect, i.e. to incorporate the provisions of the Convention into national legislation and the establishment of "National Grassland Biodiversity Programmes". Since its establishment, the SPC has participated in several science-based policy activities. Of these, the Steppe Appeal was initiated with the principal aim of promoting the protection, restoration and sustainable development of the Ukrainian steppes. The Appeal has focused in particular on combating the afforestation of the Ukrainian steppes. To advance this objective, it was decided to send the Steppe Appeal to the Ukrainian authorities to press for political decisions and actions aimed at halting the afforestation programme. Also, in conjunction with the *European Forum for Nature Conservation and Pastoralism*, together with several national grassland societies of European countries, a campaign was initiated for the inclusion of all types of Mediterranean rangelands in the proposal for a Regulation of the European Parliament and of the Council for Establishing Rules for Direct Payments to Farmers under Support Schemes within the Framework of the Common Agricultural Policy (COM(2011) 625 final/2 – 2011/0280 (COD)). This action was motivated by the draft of the Regulation, which neglects to mention Mediterranean rangelands which, in addition to grasslands, may include shrublands, forest ranges, silvo-pastoral systems, and phryganic communities.

4 Epilogue

The EDGG is a lively group of scientists and practitioners who care about European dry grasslands. Building on established personal and institutional networks and our achievements from the five years since the inception of the EDGG, we are looking optimistically into the future. Beyond the continuation and continuous improvement of our activities, such as the EDGG Bulletin, the European Dry Grassland Meetings, the EDGG Research Expeditions and the EDGG-edited Special Features in international journals, we are aiming to achieve the following goals during the years to come:

– Establishment of a joint knowledge base on the conservation, management, and restoration of dry grasslands to assist local practitioners in their activities.

– Recognition and appreciation of the value of dry grasslands and their conservation needs by the general public and by policy makers in particular.

– Modification of the EU Common Agricultural Policy so that it effectively supports the maintenance of the diversity of dry grasslands and other valuable habitats in traditional agricultural landscapes, which are presently still negatively affected by some EU subsidy schemes.

– Establishment of common data standards and analytical methods for studying dry grassland biodiversity, to allow their easy integration into continental meta-analyses.

– Development of a plot-based, consistent vegetation classification of the dry grasslands of Europe. Such a unification and scientific foundation of habitat classifications is sorely needed to allow effective communication across national borders and standardized implementation of conservation legislation. In close collaboration with the European Vegetation Archive (EVA) of our sister working group, the European Vegetation Survey (EVS), the EDGG has the opportunity to develop the first such continent-wide classifications of diverse and widespread syntaxa.

– Ultimately, publication of a comprehensive textbook on all aspects of European dry grasslands jointly authored by EDGG members from multiple countries.

You are warmly welcome to join and support us in these efforts!

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