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Dry grasslands of NW Bulgarian mountains: first insights into diversity, ecology and syntaxonomy

Trockenrasen in den Gebirgen Nordwest-Bulgariens: erste Einblicke in Diversität, Ökologie und Syntaxonomie

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Abstract

We present the data of the 3rd research expedition of the European Dry Grasslands Group (EDGG), which was conducted in 2011 in two contrasting areas in NW Bulgarian mountains. The aim was to collect plot data for comparing Bulgarian dry grasslands with those of other parts of Europe in terms of syntaxonomy and biodiversity. We sampled 15 nested-plot series (0.0001–100 m²) and 68 normal plots (10 m²) covering the full variety of dry grassland types occurring in the Vratsa area (Balkan Mts.) and the Koprivshtitsa area (Sredna Gora Mt.). In the plots all vascular plants, terricolous non-vascular plants and a set of soil and other environmental parameters were determined. By applying modified TWINSPAN, we distinguished 10 floristically well characterised vegetation types at the association level. After comparison with the regional and European literature, we propose to place them within three classes and five orders: *Festuco-Brometea* with the orders *Stipo pulcherrimae-Festucetalia pallentis* (xerophilous dry grasslands of base-rich rocks; alliance *Saturejion montanae*), *Brachypodietalia pinnati* (meso-xeric, basiphilous grasslands; alliances *Cirsio-Brachypodion pinnati* and *Chyrsopogono grylli-Danthonion calycinae*), *Calluno-Ulicetea* with the order *Nardetalia stricae* (lowland to montane *Nardus* swards; alliance *Violion caninae*), and *Koelerio-Corynephoretea* with the orders *Sedo-Scleranthetalia* (open communities of skeleton-rich, acidic soils; alliance unclear) and *Trifolio arvensis-Festucetalia ovinae* (closed, meso-xeric, acidophilous grasslands; alliance *Armerio rumelicae-Potentillion*). The *Violion caninae* with the association *Festuco rubrae-Genistelletum sagittalis* is reported from Bulgaria for the first time, while the two occurring *Koelerio-Corynephoretea* communities are described as new associations (*Cetrario aculeatae-Plantaginetum radicatae*, *Plantagini radicatae-Agrostietum capillaris*). According to DCA the main floristic gradient was largely determined by soil conditions, differentiating the *Festuco-Brometea* communities on soils with high pH and high humus content from the *Koelerio-Corynephoretea* communities on acidic, humus-poor soils, while the

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Calluno-Ulicetea stands are the connecting link. At 10 m² *Festuco-Brometea* and *Calluno-Ulicetea* stands were richer in species across all investigated taxa and in vascular plants than *Koelerio-Corynephoretea* stands; the latter were richest in lichen species, while bryophyte richness did not differ significantly among syntaxa. Among the Bulgarian classes, the species-area relationships tended to be steepest in the *Festuco-Brometea* (i.e. highest beta diversity), but both alpha and beta diversity clearly fell behind the *Festuco-Brometea* communities in the Transylvanian Plateau, Romania, located less than 500 km north of the study region. Overall, our study contributes to a more adequate placement of the Bulgarian dry grasslands in the European syntaxonomic system and provides valuable data for large-scale analyses of biodiversity patterns.

Keywords: bryophyte, *Calluno-Ulicetea*, conservation, European Dry Grassland Group (EDGG), *Festuco-Brometea,* high nature value grassland, *Koelerio-Corynephoretea*, lichen, nomenclatural revision, species richness, vascular plant, vegetation classification

Erweiterte deutsche Zusammenfassung am Ende des Textes

1. Introduction

The Balkan Peninsula, as south-east corner of the European continent, is well known for its rich flora and well-preserved vegetation. GRIFFITHS et al. (2004) describe this area as glacial refuge for animal and plant species and as a crossroad for faunal and floral exchange between Central Europe and Asia Minor. Overall, biodiversity in the region is considered to be among the highest in Europe (POLUNIN 1980). According to an older count, the flora of the peninsula comprises 6,530 native vascular plant species, which would be about 62% of the European flora (POLUNIN 1980), but new records and taxonomic revisions during the last three decades certainly have increased the absolute number. The extremely high level of endemism in the Balkans compared to other parts of Europe is probably the most outstanding feature across numerous taxa (GRIFFITHS et al. 2004). For example, among the vascular plants, nearly one quarter is endemic to the peninsula (POLUNIN 1980). Moreover, in Bulgaria, which covers the north-eastern part of the Balkan Peninsula, semi-natural grasslands of high nature value (HNV grasslands) persisted until today to an extent that exceeds most other European countries (MESHINEV et al. 2005, 2009, BEAUFOY et al. 2012, STEFANOVA & KAZAKOVA 2012). However, as in many places of Europe and particularly the post-communist countries, there is a rapid decline in area and quality of these valuable habitats (e.g. VASSILEV et al. 2011).

While the first relevés following the Braun-Blanquet approach (BRAUN-BLANQUET 1965) in Bulgaria were collected in the first half of the 20th century (e.g. RUSKOV 1935, HRISTOV 1944, STEFANOV & STOYANOV 1949), classification was not a topic at that time. First attempts to classify vegetation were made in the 1950s, using the dominance approach (see review by APOSTOLOVA et al. 2012). There were also occasional studies by foreign geobotanists (e.g. HORVAT et al. 1937, SOÓ 1955, MUCINA & KOLBEK 1989), who applied the Braun-Blanquet approach, but their work received little popularity within Bulgaria at that time. In the synthesis of the Balkan vegetation by HORVAT et al. (1974), Bulgaria was represented by a single relevé. Similarly, in the overview of European high-rank syntaxa (RODWELL et al. 2002), the country was largely neglected because of the lack of comprehensive data. Until 1990 Bulgaria remained scientifically isolated as the only country in the region that exclusively applied the dominance approach. However, after the fall of the Iron Curtain and stimulated by the requirement of applying European standards in habitat classification

and site protection (e.g. NATURA 2000 network), the number of vegetation classification studies following the Braun-Blanquet approach rapidly increased (e.g. MUCINA at al. 1990, ROUSSAKOVA 2000, HÁJEK et al. 2008, TZONEV et al. 2009, ELIÁŠ et al. 2013).

Due to the abundance of rare and endemic species (VASSILEV 2012), dry grasslands have always been in the focus of the scientific interest of Bulgarian botanists. Some researchers determined limestone terrains in the continental part of the Balkan Peninsula as "Mediterranean oases", hosting a large number of Mediterranean species (STOYANOV 1922, 1935, YORDANOV 1924, URUMOV 1935). Later VELCHEV (1962, 1971) classified communities using dominant species and characterised them according to their economic significance, whereas recently numerical classification methods have been applied and more attention has been paid to the conservation value of these grasslands (TZONEV et al. 2006, PEDASHENKO et al. 2009, 2010, TODOROVA & TZONEV 2010, VASSILEV 2012, VASSILEV et al. 2012a). However, most of the recent studies deal with few vegetation types in small geographic areas, often describing single new associations. Concerning the grassland vegetation, the first attempt to place the Bulgarian syntaxa in a European system (TZONEV et al. 2009) remained unsatisfactory in many respects mainly due to a lack of available large-scale syntheses. Already in 1991 ROYER had produced a monumental synthesis of the class *Festuco-Brometea* (basiphilous dry grasslands) in its entire range from Western Europe to Central Asia, but Bulgaria was hardly mentioned in his work, and the synthesis is also outdated in various respects. While the Bulgarian Vegetation Database (APOSTOLOVA et al. 2012) now contains a significant amount of relevés from *Festuco-Brometea* and other dry grassland classes, in the huge majority of these, bryophytes and lichens have not been treated, despite the knowledge that they generally have diagnostic value and ecological significance in dry grassland communities (BERG & DENGLER 2005, DENGLER 2005).

Dry grasslands are particularly suitable study objects for understanding biodiversity patterns as they have a very wide ecological and geographical amplitude, i.e., they are present in nearly all European regions except the Far North, distributed from the sea coast to the alpine zone and from extremely acidic to very base-rich soil conditions (DENGLER 2005). In addition to a sometimes extreme richness in vascular plants (WILSON et al. 2012), they also host significant numbers of bryophyte and lichen species (DENGLER 2005, BOCH & DENGLER 2006, LÖBEL & DENGLER 2008, JESCHKE 2012) and thus represent an ideal system for testing whether these three taxonomic groups with strongly divergent ecological properties also show different diversity-environment relationships (e.g. LÖBEL et al. 2006). Further, diversity patterns and their relationship to environmental drivers might also strongly depend on spatial scale, and species-area relationships (SARs) might reveal interesting insights into community organisation (e.g. DUPRÉ & DIEKMANN 2001, DENGLER & BOCH 2008).

In order to collect "high-quality" data on plant species composition and diversity of dry grasslands and related communities in different regions of the Palaearctic ecozone, the *European Dry Grassland Group* (EDGG; www.edgg.org) organises annual research expeditions since 2009 (VRAHNAKIS et al. 2013). With "high-quality" we refer to (1) full recording of all terricolous taxa including bryophytes and lichens, (2) uniform plot size, (3) accurate GPS coordinates (that allow repeated sampling in the future) and (4) a set of environmental variables measured in the plot. The EDGG expeditions aim at better understanding of scale-dependent plant diversity patterns and contributing to consistent large-scale classification of dry grassland syntaxa. The 1st EDGG Research Expedition was carried out in Transylvania

(Romania) in 2009, which resulted in a new classification scheme based on modern phytosociological methods (DENGLER et al. 2012a) and the documentation of the richest ever recorded plant community at the scale of 0.1 m^2 and 10 m^2 (WILSON et al. 2012).

The still poor data on the vegetation of Bulgarian dry grasslands and the complete lack of comparable biodiversity data from the region were the main motivation for the EDGG to direct its third international research expedition to this country in 2011. The expedition was carried out in two previously unstudied areas, the western part of the Balkan Mts. and the valley between the Balkan Mts. and Sredna Gora Mt., in order to compare sites with different geology, altitude and communities. The main aims were: (1) Delimitation of the major plant community types of dry grasslands and identification of their diagnostic species with modern statistical methods. (2) Placement of these community types in a supraregional classification scheme. (3) Insights into the role of environmental factors in shaping the floristic composition of the studied communities. (4) Documentation and comprehension of the plant diversity patterns of vascular plants, bryophytes and lichens in these vegetation types at various spatial scales.

2. Study areas

2.1 Location and delimitation

The study was conducted in two contrasting areas of northwestern Bulgaria belonging to the districts of Sofia, Plovdiv and Vratsa (Fig. 1). The first study area (Vratsa) is located in the western part of the Balkan Range (Stara planina), while the second (Koprivshtitsa) comprises the valley between the Balkan Range and Sredna gora Mt., including foothills of both ridges. The studied grasslands in both areas belong to the NATURA 2000 network, specifically to four Sites of Community Interest (SCIs): Vrachanski Balkan (BG0000166), Sredna gora (BG0001389), Tsentralen Balkan (BG0000494) and Tsentralen Balkan buffer (BG0001493). In addition, the Vratsa area is located in the Vrachanski Balkan Nature Park and its reserve Vrachanski karst (IUCN category I). Parts of the Koprivshtitsa area belong to the second biggest national park in Bulgaria, Tsentralen Balkan (IUCN category II), with one of the largest natural pristine European beech (*Fagus sylvatica*) forests.

2.2 Physical geography

The two areas were chosen to cover territories with contrasting abiotic conditions such as soil, altitude and climate. In essence, Vratsa is a high-altitude limestone area, while Koprivshtitsa is located at lower altitudes on acidic bedrock (Table 1).

The climate of both areas is temperate to continental and characterised by warm summers and cold winters, resulting in a wide annual temperature amplitude. The precipitation maximum occurs in May and June and its minimum in January and February (VELEV 2002). Two main geomorphological units can be distinguished in both areas: the Balkan Mountain System, which is the most distinct mountain range in Bulgaria, crossing the whole country from west to east, and the Transitional Zone with alternating lower mountain ridges and depressions (STEFANOV 2002). Mountain karst (ANGELOVA 2003) is the most common type of bedrock in Vratsa area, which is very specific and is set in marble, marbled limestones, dolomites and limestones of different ages, predominantly Mesozoic (BENDEREV et al. 2005, MIHAYLOVA et al. 2009). Koprivshtitsa area is characterised by gneiss and granite. The soils

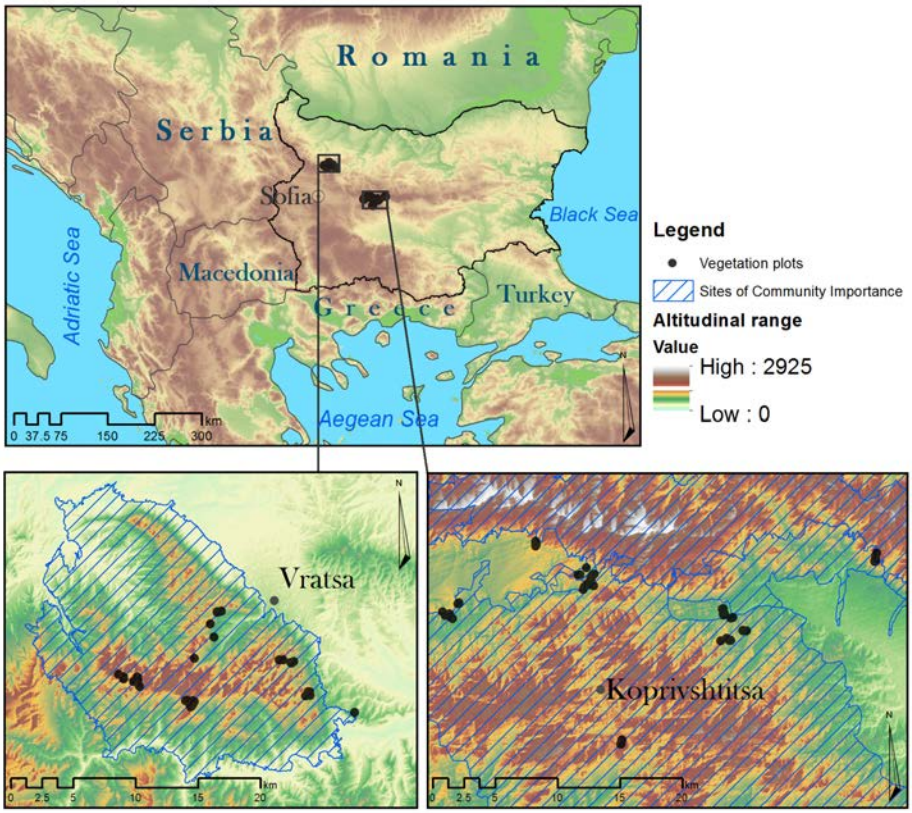

Fig. 1. Location of the two study regions within Bulgaria and distribution of the analysed 98 vegetation plots within these (note that due to geographic proximity not all relevés are visible as separate symbols).

Abb. 1. Lage der zwei Untersuchungsgebiete innerhalb Bulgariens und räumliche Verteilung der 98 Aufnahmeflächen innerhalb derselben (wegen der geografischen Nähe sind nicht alle Aufnahmen als separate Punkte erkennbar).

of Vratsa Mt. are a mosaic of Lithic Leptosols, the most shallow soil type occurring in Bulgaria, and Rendzic Leptosols, comprising more than 40% carbonates, while the area of Koprivshtitsa is covered predominantly by Dystric Cambisols (NINOV 2002).

2.3 Landscape and vegetation

Chorologically the study areas are considered as part of the Balkan province of the sub-Mediterranean subregion of the Macaronesian-Mediterranean floristic region (MEUSEL & JÄGER 1992). The potential natural vegetation in the Vratsa area is mostly comprised of East Moesian sessile oak-hornbeam forests (*Carpinus betulus*, *Quercus dalechampii*) with *Corydalis solida* subsp. *slivenensis* (Mapping unit F67) and Moesian, partly thermophilous beech forests (*Fagus sylvatica* subsp. *moesiaca*) with *Corylus colurna* and *Hypericum umbellatum*, partly with *Acer hyrcanum* subsp. *intermedium* (Mapping unit F152) (BOHN et al. 2004). In Koprivshtitsa two additional categories are present: East Moesian Balkan oak bitter

Table 1. Overview of the sampling intensity and the main environmental features of the study areas.

Tabelle 1. Übersicht der Aufnahmezahlen und wichtigsten Umweltbedingungen der beiden Untersuchungsgebiete.

Parameter	Vratsa	Koprivshtitsa
Number of 10-m² normal plots	40	58
Number of 100-m² biodiversity plots	6	9
Study area (km²)	135	310
Altitude range (m a.s.l.)	970–1400	630–1200
Mean annual temperature (°C)	6.0	7.8
Mean temperature of warmest quarter (°C)	15.0	17.0
Mean Temperature of coldest quarter (°C)	-3.0	-1.9
Annual precipitation (mm)	722	670
Dominant soil types	Lithic and Rendzic Leptosols	Dystric Cambisols
Bedrock	Carbonate	Silicate

oak forests (*Quercus cerris*, *Q. frainetto*) with *Carpinus orientalis* and *Fraxinus ornus* (G22) and Thracian oriental hornbeam-downy oak forests (*Quercus pubescens*, *Carpinus orientalis*) with *Acer tataricum*, partly with *Juniperus oxycedrus* and *Pistacia terebinthus* (G59; BOHN et al. 2004).

The two studied areas have traditionally been grazed. According to locals hundreds of flocks have grazed the pastures in the mountains in the past. The closure of the border with Greece in the middle of the 19th century led to the disappearance of specific husbandry practices of the ethnic group of Karakachans and a substantial reduction of livestock within the area. In consequence of the socio-economic changes following 1989, the use of mountain pastures decreased even more due to further reduction of cattle and sheep numbers (YANKOV 2001, MESHINEV & APOSTOLOVA 2007). Partially the mountain grasslands are also used as hay meadows (Fig. 2).

Fig. 2. Extensively used hay meadows at Milanovo, near Vratsa (Photo: M. Janišová).

Abb. 2. Extensive Wiesenwirtschaft in Milanovo oberhalb Vratsa (Foto: M. Janišová).

3. Methods

3.1 Vegetation sampling

From 14 to 24 August 2011, the field sampling was carried out by the nine participants of the 3rd EDGG Research Expedition. We tried to cover the whole range of different dry grassland types (*Festuco-Brometea*, *Koelerio-Corynephoretea*, dry *Nardetalia strictae*) present in the two areas.

We applied two complementary sampling schemes: (i) nested-plot series (n = 15) with plots of 0.0001, 0.001, 0.01, 1, 10 and 100 m^2, where all plot sizes except the largest one were replicated in two opposite corners (DENGLER 2009b), and (ii) additional 10-m^2 plots ("normal plots"; n = 68). In both cases all plots were square-shaped and placed in stands that were visually homogeneous in terms of topography, vegetation structure and floristic composition of all terricolous taxa estimated in % (for more details, see DENGLER et al. 2012a).

The taxonomy of vascular plants follows *Flora Europaea* (TUTIN et al. 1968–1993) or *Atlas Florae Europaeae* (JALAS & SUOMINEN 1994, JALAS et al. 1996, 1999, KURTTO et al. 2004–2010), depending on which of the treatments in the two series was the more recent. For mosses we adopted HILL et al. (2006), for liverworts GROLLE & LONG (2000) and for lichens SANTESSON et al. (2004). We accepted a few additions and deviations from these checklists such as definition of additional aggregates (see Tables 2 and 3). Prior to the numerical classification and ordination, we "standardised" the taxonomic information and joined layers in our relevé data following the principles outlined in DENGLER et al. (2012a), based on the recommendations of JANSEN & DENGLER (2010). The full original information is available in Tables 5 and 6 in the supplement, where it is also transparent which entries had been joined or removed.

Table 2. Supraspecific taxa used in the paper in addition to those defined in the given checklists.

Tabelle 2. Supraspezifische Taxa, die in dieser Publikation zusätzlich zu den in den angegebenen Referenzlisten definierten Aggregaten genutzt werden.

Group	Taxon	Reference	Included species from Bulgaria
Vascular plants	*Centaurea jacea* agg.	TUTIN et al. (1976: as sect. *Jacea* + sect. *Fimbriatae*)	*C. jacea, C. pannonica, C. rocheliana, C. subjacea*
	Centaurea phrygia agg.	EHRENDORFER (1973)	*C. phrygia, C. stenolepis*
	Festuca ser. *Valesiacae*	PAWŁUS (1985), DENGLER (1996)	*F. callieri, F. dalmatica, F. illyrica, F. pseudovina, F. rupicola, F. stojanovii*
	Genista tinctoria agg.	TUTIN et al. (1968: as *Genista* sect. *Genista*)	*G. depressa* (see Table 3), *G. januensis, G. lydia, G. tinctoria*
	Quercus petraea agg.	*ad hoc* definition	*Q. dalechampii, Q. petraea, Q. polycarpa*
Bryophytes	*Racomitrium canescens* agg.	NYHLOLM (1998: as *R.* sect. *Canescentia*)	*R. canescens, R. elongatum, R. ericoides*
	Schistidium apocarpum agg.	NYHOLM (1998: as *Apocarpum* group)	33 species, of which many might also occur in Bulgaria (see NYHOLM 1998)
	Syntrichia ruralis agg.	*ad hoc* definition	*S. calcicola, S. montana, S. norvegica, S. ruralis*
Lichens	*Cladonia cervicornis* agg.	WIRTH (1995: as *C. cervicornis*)	*C. cervicornis, C. pulvinata, C. verticillata*
	Cladonia pyxidata agg.	WIRTH (1995: as *C. pyxidata*)	*C. chlorophaea, C. cryptochlorophaea, C. grayi, C. merochlorophaea, C. monomorpha, C. novochlorophaea, C. pocillum, C. pyxidata*

Table 3. Additional taxa of vascular plants used in this publication that are not accepted in the given checklists.

Tabelle 3. Zusätzliche Taxa, die in dieser Publikation Verwendung finden, aber in den angeführten taxonomischen Referenzlisten nicht akzeptiert sind.

Taxon	Author citation	Reference	Treatment in checklist
Dactylis glomerata subsp. *glomerata*	–	TUTIN et al. (1980) [*vide* taxon]	no infraspecific taxa formally accepted
Festuca stojanovii	(Acht.) Foggi & Petrova	FOGGI & MÜLLER (2009)	not mentioned, likely included in *F. dalmatica*
Genista depressa	Bieb.	JORDANOV (1976)	included in *G. tinctoria*
Lilium jankae	A. Kerner	TUTIN et al. (1980) [*vide* taxon]	listed under *L. carniolicum* without definitive decision about synonymy or validity as separate species

All relevés and nested plots used in this article have been stored in and are available from the *Database Species-Area Relationships in Palaearctic Grasslands* (DENGLER et al. 2012b; GIVD ID EU-00-003) and the normal plots additionally in the *Bulgarian Vegetation Database* (APOSTOLOVA et al. 2012; EU-BG-001) and the Balkan Dry Grassland Database (VASSILEV et al. 2012b; EU-00-013). Further details on these databases are available from the *Global Index of Vegetation-Plot Databases* (GIVD; http://www.givd.info; see DENGLER et al. 2011), where they are registered under the given IDs.

3.2 Environmental parameters

In all 10-m² plots (n = 98, normal plots and plots from nested-plot series), we estimated the cover of the shrub, herb and cryptogam layer as well as that of litter, superficially visible stones and rocks and open soil. We further recorded coordinates and altitude with a GPS as well as aspect and slope with an inclinometer. The latter two parameters were used to calculate the heat load index according to OLSSON et al. (2009), which is a relative measure that takes the highest positive values on steep southwest-facing slopes, zero in level areas and negative values on northeast-facing slopes. Microrelief was measured as maximum vertical deviation from an imaginary plane through the plot. We classified present land use roughly into the categories mown, grazed and not used, based on our knowledge of the sites and visible signs in the plots.

Furthermore, we took a mixed sample of the uppermost 10 cm of soil. Samples were air-dried at room temperature and sieved to < 2 mm. We measured pH and conductivity (determined in a solution of 10 g soil in 25 ml distilled water with a standard glass electrode) and soil organic content (by loss on ignition at 550 °C for 16 hours) (see SCHLICHTING et al. 1995). In addition, we determined soil texture with the HORIBA LA-950V2 Particle Size Distribution Analyzer (HORIBA INSTRUMENTS 2010).

3.3 Vegetation classification

Vegetation classification was performed on basis of the 98 relevés of the 10-m² plots. We applied the modified version of TWINSPAN (Two-Way Indicator Species Analysis; HILL 1979) proposed by ROLEČEK et al. (2009) and implemented in JUICE (TICHÝ 2002). We used four pseudospecies cut levels (0%, 2%, 5% and 10%), a minimum group size of six and total inertia as heterogeneity measure, while we tried cluster numbers up to 15.

As the TWINSPAN analysis showed that the three-cluster resolution corresponded closely to phytosociological classes known from the literature ("class clusters") and the ten-cluster resolution was the lowest resolution with floristically well-defined units ("association-level clusters"), we used these two TWINSPAN resolutions as starting point for further refinement. We calculated phi coefficients of association (CHYTRÝ et al. 2002) for these units using standardisation to equal cluster size at the 10-cluster level (DENGLER et al. 2012a, LUTHER-MOSEBACH et al. 2012) to avoid undue effects of widely

differing numbers of included relevés (see TICHÝ & CHYTRÝ 2006). Normally it is not sensible to translate the outcome of a numerical analysis directly into a syntaxonomic classification, in particular when the major syntaxonomic groups are represented by very unequal numbers of relevés (e.g. LUTHER-MOSEBACH et al. 2012; WILLNER et al. 2013). Therefore, in the next step, we tried to interpret the lists of diagnostic species in ecological terms and to match the units of the original TWINSPAN classification with existing large-scale syntaxonomic classifications. When there was an apparent mismatch, we re-arranged the association-level units among the branches without changing the membership of relevés to these basic units.

For each re-arrangement we checked the "validity" by re-calculating phi values and assessing the number and ecological meaning of the derived groups of diagnostic taxa. Having reached what we considered the optimal solution for the dataset under present knowledge of syntaxonomy in surrounding areas, we again determined diagnostic species at all hierarchical levels. We considered species as highly diagnostic when phi was > 0.50 and as diagnostic when phi was > 0.25 (see CHYTRÝ 2007), provided the concentration was significant according to Fisher's exact test at $\alpha = 0.05$. When a species was diagnostic for several nested syntaxa according to this definition, it was normally assigned to the level where it reached the highest phi value. However, when the alternatives were assignment as diagnostic for one superior syntaxon or for several inferior syntaxa we chose the first. We considered as "transgressive" those diagnostic species that had a higher phi value at a lower rank but were also diagnostic at a higher rank, provided they had positive phi values in more than half of the associations of the higher unit. Finally, as phi values *per se* measure only the prevalence of a species within the whole data set but not the differentiation to the floristically similar units, we accepted species as diagnostic for one syntaxon only if the phi value there was at least 0.1 higher than in any other syntaxon of the same rank (LUTHER-MOSEBACH et al. 2012). Note that the term "diagnostic species" refers to the regional context and contains both differential and character species.

Finally, we compared our units to previously described phytosociological associations, alliances and orders, which involved an extensive search for original literature and check for validity and legitimacy of names according to the *International Code of Phytosociological Nomenclature* (WEBER et al. 2000; further ICPN). However, as there is a comprehensive classification study of all Central Balkan dry grassland associations in preparation (K. Vassilev et al. in prep.), we refrained from formally describing new syntaxa above association level. The nomenclatural revision (including some typifications) of the considered syntaxa is presented in Appendices 1 and S1. Authorities of the more thoroughly treated syntaxa (the accepted ones and some representing alternative views) can be found in Section 4.1 and Appendix S1, while for all other syntaxa. we give them in the text at first mentioning unless they appear together with a bibliographic reference to the protologue.

3.4 Other statistical analyses

We carried out a detrended correspondence analysis (DCA) of the 10-m² plots with log-transformed percent cover values in CANOCO 4.5 (TER BRAAK & ŠMILAUER 2002) using down-weighting of rare species (TER BRAAK & ŠMILAUER 2002). Environmental factors and vegetation parameters were projected *post hoc* to this ordination diagram to assist with interpretation.

We tested for differences in environmental and vegetation parameters among the three distinguished classes and the ten associations with one-way analyses of variance (ANOVAs) carried out in STATISTICA 9 (STATSOFT INC. 2009). We tested whether the prerequisites of the ANOVA models (normal distribution, equal variance) were sufficiently met by visually inspecting the distribution of the residuals (QUINN & KEOUGH 2002). In addition, we used Tukey's HSD *post hoc* test at $\alpha = 0.05$ to identify significant differences among groups of syntaxa.

Further, we used the nested-plot data for a coarse analysis of species-area relationships (SARs). We did this with the power-law function applied with linear regression to $\log_{10}$-transformed area and richness data as proposed by DENGLER (2009a; for details see DENGLER et al. 2012a).

In the association descriptions (Section 4.4), we characterise the communities within the context of this work, using standardised terminology in relation to the mean value found in all our stands. For example, we classified species richness on 10 m² (where the overall mean was 38) as follows: 18–27 species: very species-poor; 28–37: moderately species-poor; 38–47: moderately species-rich and 48–57: very species-rich.

4. Vegetation classification

4.1 Proposed syntaxonomic scheme

In the following we present the syntaxonomic view of the data on which we base our further presentation, while various aspects are still tentative. Reasons for the applied scheme and alternative solutions are discussed in Sections 4.2 and 4.3. The synoptic table (Table 4 in the supplement) is based on this scheme.

Class 1: *Festuco-Brometea* Br.-Bl. & Tx. ex Klika & Hadač 1944
- Order: *Stipo pulcherrimae-Festucetalia pallentis* Pop 1968
  - Alliance 1.1: *Saturejion montanae* Horvat et al. 1974
    - Association 1.1.1: *Dianthus petraeus-Sesleria latifolia*-[*Saturejion montanae*] community
    - Association 1.1.2: *Achillea clypeolata-Festuca stojanovii*-[*Saturejion montanae*] community
    - Association 1.1.3: *Satureja pilosa-Phleum phleoides*-[*Saturejion montanae*] community
- Order: *Brachypodietalia pinnati* Korneck 1974
  - Alliance 1.2: *Cirsio-Brachypodion pinnati* Hadač & Klika in Klika & Hadač 1944
    - Association 1.2.1: *Ferulago campestris-Agrostis capillaris*-[*Cirsio-Brachypodion*] community
    - Association 1.2.2: *Tanacetum corymbosum-Sesleria latifolia*-[*Cirsio-Brachypodion*] community
    - Association 1.2.3: *Abietinella abietina-Sanguisorba minor*-[*Cirsio-Brachypodion*] community
  - Alliance 1.3: *Chrysopogono grylli-Danthonion calycinae* Kojić 1959
    - Association 1.3.1: *Agrostio capillaris-Chrysopogonetum grylli* Kojić 1959

Class 2: *Calluno-Ulicetea* Br.-Bl. & Tx. ex Klika & Hadač 1944
- Order: *Nardetalia strictae* Preising 1950
  - Alliance 2.1: *Violion caninae* Schwickerath 1944
    - Association 2.1.1: *Festuco rubrae-Genistelletum sagittalis* Issler 1929

Class 3: *Koelerio-Corynephoretea* Klika in Klika & Novák 1941
- Order: *Sedo-Scleranthetalia* Br.-Bl. 1955
  - Alliance 3.1: ??? (see discussion in Section 4.3.3)
    - Association 3.1.1: *Cetrario aculeatae-Plantaginetum subulatae* Pedashenko et al. 2013 (see Appendix 1)
- Order: *Trifolio arvensis-Festucetalia ovinae* Moravec 1967
  - Alliance 3.2: *Armerio rumelicae-Potentillion* Micevski 1978
    - Association 3.2.1: *Plantagini subulatae-Agrostietum capillaris* Pedashenko et al. 2013 (see Appendix 1)

4.2 Interpreting the numerical analyses in terms of syntaxonomy

At the 10-cluster resolution, modified TWINSPAN yielded units that were floristically well characterised and therefore seem to warrant the rank of association (Fig. 3). Already the 11-cluster resolution (which split the unit 3.2.1 into two subunits; not shown) resulted in poorly characterised units, i.e. where many relevés were assigned to one of these subunits without a single diagnostic species present, and from the 12-cluster resolution onwards, additionally "chaining" occurred. Therefore we accepted the 10 clusters of the numerical analysis as association-level units.

When interpreting the cluster tree (Fig. 3), it turned out that at the higher levels, it was dominated by geographic differentiation which may or may not parallel ecological differences. For example, the highest division corresponded exactly to the two study areas, clusters 1–5 comprising only relevés from Vratsa and clusters 6–10 only relevés from Koprivshtitsa. At the level of three clusters, there was a rough correspondence to phytosociological classes, with unit A (Clusters 1–5) comprising exclusively *Festuco-Brometea* communities, unit B (Clusters 6 and 7) being mainly *Calluno-Ulicetea* communities and unit C (Clusters 8–10) mainly *Koelerio-Corynephoretea* communities.

At closer look, however, Cluster 7, while having some similarities to Cluster 6, lacks all the more narrowly distributed *Calluno-Ulicetea* species and is instead characterised by widespread species of meso-xeric, nutrient-poor pastures from the classes *Festuco-Brometea*,

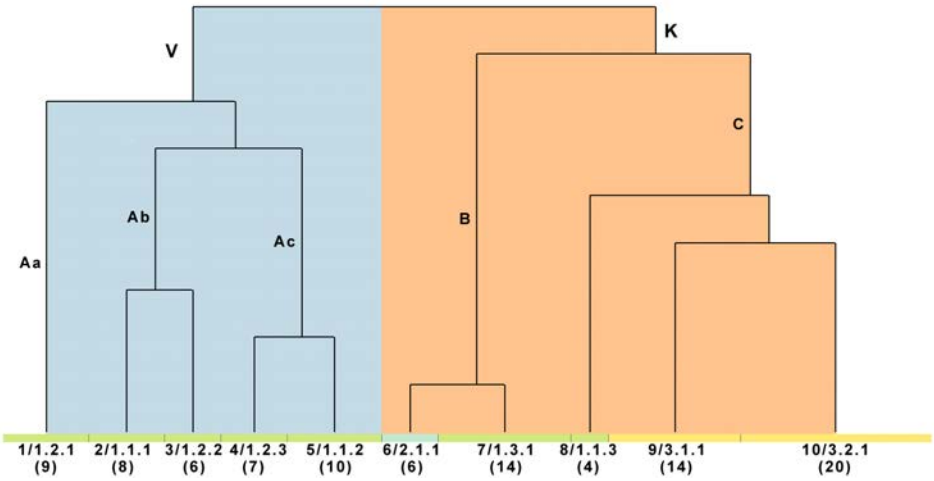

Fig. 3. Cluster tree of the 98 relevés achieved with modified TWINSPAN at the 10-cluster resolution, which we interpret as association level in this paper. The first division corresponds exactly to the two study areas, Vratsa (V) and Koprivshtitsa (K). At the bottom we provide for each cluster its original number in TWINSPAN, its hierarchical position in our syntaxonomic interpretation and, in brackets, the number of relevés belonging to it.

Abb. 3. Clusterbaum der 98 Vegetationsaufnahmen basierend auf der modifizierten TWINSPAN-Methode mit den 10 Endclusters, die wir in dieser Publikation als Assoziationen interpretieren. Die erste Teilung entspricht genau den beiden Untersuchungsgebieten, Vratsa (V) und Koprivshtitsa (K). Am unteren Ende der Abbildung ist für jedes Endcluster die ursprüngliche TWINSPAN-Nummer, die hierarchische Position in unserer syntaxonomischen Interpretation und in Klammern die Anzahl der zugehörigen Aufnahmen.

Koelerio-Corynephoretea, *Molinio-Arrhenatheretea* Tx. 1937 and *Calluno-Ulicetea*, with a slight prevalence of the first group (including the often dominating *Chrysopogon gryllus*). Further, Cluster 8, grouped by modified TWINSPAN together with the two *Koelerio-Corynephoretea* communities, while containing indeed many typical species of that class (*Rumex acetosella*, *Scleranthus perennis*), still had a higher fraction of *Festuco-Brometea* species (e.g. *Phleum phleoides*, *Koeleria macrantha* agg., *Asperula purpurea*). Within the main unit A, the three TWINSPAN subunits based on their diagnostic species were hardly interpretable in ecological terms and rather seemed to reflect floristic peculiarities of the individual study sites. Subunits A.b and A.c contained one xeric and one meso-xeric cluster each. In order to achieve better ecological interpretability and fit to supraregional classification schemes (ROYER 1991, RODWELL et al. 2002, DENGLER 2003), we therefore decided to combine the three meso-xeric clusters from unit A (i.e. Clusters 1, 3 and 4) into one alliance and the two xeric ones (i.e. Clusters 2 and 5) together with Cluster 8 from unit C into another alliance. Cluster 7 (from unit B), albeit being clearly meso-xeric (as shown by the occurrence of many *Molinio-Arrhenatheretea* species), lacked most of the diagnostic species of the before-mentioned meso-xeric alliance, while at the same time containing more acidophilous species. We therefore consider Cluster 7 as belonging to a third *Festuco-Brometea* alliance.

4.3 Identity of orders and alliances

4.3.1 *Festuco-Brometea*

According to the traditional concept (e.g. BRAUN-BLANQUET & TÜXEN 1943, ROYER 1991, POTT 1995), the class *Festuco-Brometea* was organised into geographically defined orders, with the *Brometalia erecti* comprising the units in the more oceanic parts of Europe and the *Festucetalia valesiacae* the units in the more continental parts of Europe. More recent treatments instead oppose one geographically widespread meso-xeric order (*Brometalia erecti* = *Brachypodietalia pinnati*) to several xerophytic orders such as *Festucetalia valesiacae* Br.-Bl. & Tx. ex Br.-Bl. 1950 (continental lowland steppes of deep soils), *Stipo pulcherrimae-Festucetalia pallentis* (rocky dry grasslands of the Alps, Carpathians and surrounding mountains with many dealpine species) and *Artemisio albae-Brometalia erecti* Ubaldi ex Dengler & Mucina in Mucina et al. 2009 (communities of the submediterranean-subatlantic regions) (e.g. MUCINA & KOLBEK 1993, RODWELL et al. 2002, DENGLER 2004c, MUCINA et al. 2009, DENGLER et al. 2012a).

The so far only supra-national classifications of the *Festuco-Brometea* of the Central Balkans (HORVAT et al. 1974, ROYER 1991) were still based on the first concept and accordingly assigned all units to a geographically defined order *Festucetalia valesiacae*. HORVAT et al. (1974) accepted a total of three alliances within this order, which in the more modern system would nicely correspond to three orders, namely the *Festucion rupicolae* to the *Festucetalia valesiacae*, the *Chrysopogono-Danthonion* to the *Brachypodietalia pinnati* and the *Saturejion montanae* to the *Stipo pulcherrimae-Festucetalia pallentis*. ROYER (1991) presented a somewhat intermediate solution by placing all associations in the eastern half of Europe including those from the Central Balkans in the *Festucetalia valesiacae*, but grouping them into the suborders *Filipendulo-Avenulenalia*, *Stipo-Festucenalia valesiacae* and *Seslerio-Festucenalia pallentis*, which correspond to the orders *Brachypodietalia pinnati*, *Festucetalia valesiacae* and *Stipo-Festucetalia pallentis*, respectively. The situation was complicated by the proposal of a specific Central Balkan order *Astragalo-Potentilletalia* by

MICEVSKI (1971), to which later some authors subordinated any type of dry grasslands from the region, whether xeric or meso-xeric, basiphilous or acidophilous (e.g. MICEVSKI 1978, REDŽIĆ 1999, BERGMEIER et al. 2009). TZONEV et al. (2009) finally merged the various incompatible approaches of class subdivisions and thus ended up with not less than six orders for the territory of Bulgaria.

For the time being and based on the accumulated evidence, we consider the acceptance of the three orders that are well supported in recent Central European treatments (e.g. MUCINA & KOLBEK 1993, DENGLER et al. 2012a) as well as in a Europe-wide analysis of synoptic tables (J. Dengler unpubl.), i.e. *Brachypodietalia pinnati* (meso-xeric), *Festucetalia valesiacae* (xeric, deep soils, lowlands) and *Stipo-Festucetalia pallentis* (xeric, rocky soils, mountains), also for Bulgaria as the most parsimonious approach, with the first and the last being present in our study areas.

In our dataset alliance 1.1 represents the *Stipo-Festucetalia pallentis* and could be identified with the *Saturejion montanae* described from Serbia. While the *Saturejion montanae* is accepted in several recent Bulgarian treatments (SOPOTLIEVA 2008, PEDASHENKO et al. 2009, TODOROVA & TZONEV 2010, VASSILEV 2012, VASSILEV et al. 2012a), it was typically subordinated to the *Festucetalia valesiacae* as in the original description (HORVAT et al. 1974). TZONEV et al. (2009) assigned the alliance under the illegitimate name *Chrysopogono grylli-Saturejion subspicatae* Horvat & Horvatić in Horvat et al. 1974 (see TERZI 2011) to the amphi-Adriatic order *Scorzonero villosae-Chrysopogonetalia grylli* Horvatić & Horvat in Horvatić 1963. To our knowledge, *Stipo-Festucetalia pallentis* were so far only once reported from Bulgaria by TZONEV et al. (2009), who assigned the alliance *Pimpinello-Thymion zygoidis* Dihoru 1970 from the Black Sea coast to this order, which is not supported floristically or ecologically according to usual concepts of the order as Circum-Pannonian and dealpine, mostly primary grasslands on steep rock cliffs. In contrast, the relevés by JOVANOVIĆ-DUNCIĆ (1955), on which HORVAT et al. (1974) mostly based their description of the *Saturejion montanae*, and our relevés fit well into the concept of the order. There is a high overlap between the diagnostic species of our study and those given for the order by MUCINA & KOLBEK (1993) for Austria and DENGLER et al. (2012a) for Transylvania, namely *Allium flavum*, *Melica ciliata*, *Sedum hispanicum*, *Sesleria rigida*, *Stipa pennata* subsp. *eriocaulis* and *Teucrium montanum*. The stands in Northern Bulgaria (see also PEDASHENKO et al. 2009, TODOROVA & TZONEV 2010, VASSILEV et al. 2012a) show some similarities to the Transylvanian *Seslerion rigidae* (compare DENGLER et al. 2012a) but are floristically sufficiently different to be considered a geographically vicariant alliance in the same order. Among our three associations, the first fits best into the *Saturejion montanae*, whereas this placement is not fully clear for the second and third. At least some relevés in the Association 1.1.2 show transitional character to the *Festucion valesiacae* (*Festucetalia valesiacae*) through the higher share of species such as *Koeleria macrantha* agg., *Poa angustifolia* or *Scabiosa ochroleuca*, which are typically more abundant in secondary steppe grasslands on deeper soils. The relevés of Assocation 1.1.3 are only loosely connected to the alliance and class, while several acidophilous *Koelerio-Corynephoretea* species are frequent (e.g. *Rumex acetosella*, *Plantago subulata*, *Scleranthus perennis*). In a large-scale synthesis, it might be justified to place this association in an alliance of its own, but for the time being, we prefer to leave these stands with dominant *Satureja pilosa* in the *Saturejion montanae* as did BERGMEIER et al. (2009) with stands of the same species in Northern Greece.

Alliance 1.2 could clearly be identified by its species composition with the *Cirsio-Brachypodion pinnati* as it has been extensively described in the eastern parts of central Europe (MUCINA & KOLBEK 1993, CHYTRÝ et al. 2007, ŠKODOVÁ 2007, DENGLER et al. 2012a). This alliance was not listed in the syntaxonomic overview of Bulgaria by TZONEV et al. (2009) but had been reported in three more recent studies (PEDASHENKO et al. 2010, VASSILEV 2012, VASSILEV et al. 2012a).

Alliance 1.3 could be identified with the *Chrysopogono grylli-Danthonion calycinae* described from Serbia (KOJIĆ 1959) and already reported several times from Bulgaria (APOSTOLOVA & MESHINEV 2006, TZONEV et al. 2009, VASSILEV et al. 2012a). The syntaxonomic assignment of this alliance to an order is debated controversially. APOSTOLOVA & MESHINEV (2006) still follow the traditional concept of the original description and place it in the *Festucetalia valesiacae*, TZONEV et al. (2009) are in favour of a placement in the acidophilous order *Koelerio-Phleetalia phleoidis* Korneck 1974, while BERGMEIER et al. (2009) prefer the Balkan order *Astragalo-Potentilletalia*. As the alliance has a clearly meso-xeric character and there are still doubts whether *Koelerio-Phleetalia* (see e.g. DENGLER 2004b) and *Astragalo-Potentilletalia* (see above) are justified as orders at all, we consider a preliminary placement in the *Brachypodietalia pinnati* presently as most parsimonious.

4.3.2 *Calluno-Ulicetea*

Alliance 2.1 shows a perfect match with the Central European alliance *Violion caninae*, the matt-grass swards of the lowland to montane belts (compare PEPPLER-LISBACH & PETERSEN 2001, KRAHULEC et al. 2007, UJHÁZY 2007). Astonishingly, neither the alliance nor the order *Nardetalia strictae* or the class *Calluno-Ulicetea* are given for Bulgaria in the overview by TZONEV et al. (2009). Instead only the *Potentillo ternatae-Nardion* is indicated, which is a group of subalpine to alpine matt-grass communities typically placed in the class *Juncetea trifidi* and clearly not the same as our stands, which essentially lack alpine species.

4.3.3 *Koelerio-Corynephoretea*

The class *Koelerio-Corynephoretea* so far found very little attention on the Balkan Peninsula. In HORVAT et al. (1974), only sandy steppes along the Danube and its tributaries as well as at the Black Sea coast are briefly mentioned (mainly *Festucion vaginatae* Soó 1929), while TZONEV et al. (2009) – in addition to two alliances of sandy steppes (placed in the *Festuco-Brometea* by them) – report only two other *Koelerio-Corynephoretea* alliances for the territory of Bulgaria: *Alysso-Sedion* Oberd. & T. Müller in T. Müller 1961 and *Thero-Airion* Tx. ex Oberd. 1957. At the European scale, synthetic works comparable to that of ROYER (1991) for the *Festuco-Brometea* are missing. We only can refer to the supranational syntheses developed by MORAVEC (1967) and those of the senior author of this paper (largely unpublished, but see DENGLER 2003, 2004a). The latter author accepts for those large parts of Europe, for which he compiled synoptic tables, eight orders, two in the subclass *Sedo-Scleranthenea* (Br.-Bl. 1955) Dengler in Dengler et al. 2003 (communities of shallow skeletal soils) and six in the subclass *Koelerio-Corynephorenea* (Klika in Klika & V. Novák 1941) Dengler in Dengler et al. 2003 (communities of deep sandy soils).

Following the concept of DENGLER (2003, 2004a) and similarly that of MORAVEC (1967), alliance 3.1 as an open cryptogam-rich community of skeletal soils derived from acidic bedrock belongs to the order *Sedo-Scleranthetalia*. Within this order, DENGLER (2003) accepts three geographically vicariant alliances: *Sedo albi-Veronicion dillenii* (often errone-

ously termed *Arabidopsion thalianae*) in low mountain ranges of temperate Europe, *Sedo-Scleranthion* Br.-Bl. 1955 in the Alps and *Sedion pyrenaici* Tx. ex Rivas-Martínez et al. in Díaz González & Fernández Prieto 1994 on the Iberian Peninsula. Recently BERGMEIER et al. (2009) described the new alliance *Diantho pinifolii-Jasionion heldreichii* from northern Greece, but their data are hardly comparable because they did not record bryophytes and lichens, though they make up approximately half of the species composition of such communities. Whether our association belongs to the *Sedo albi-Veronicion dillenii*, to the *Diantho pinifolii-Jasionion heldreichii* or even to an undescribed third alliance, can only be answered by analysing a more comprehensive dataset from a larger area. With the strong representation of *Plantago subulata* in terms of both frequency and cover, a species that is absent from the previously known associations of both alliances, our association reminds of the Iberian alliance *Hieracio castellani-Plantaginion radicatae* Rivas-Martínez & Cantó 1987 (*Plantago radicata = P. subulata*) in terms of ecology, physiognomy and floristics (see DENGLER 2004c), an alliance that is placed into the separate Iberian order *Jasiono sesseliflorae-Koelerietalia crassipedis* Rivas-Martínez & Cantó 1987 (DENGLER 2003).

Alliance 3.2 shows some resemblance with the Atlantic order *Thero-Airetalia* Rivas Goday 1964 – which is indeed present in Bulgaria with the *Vulpietum myuri* Philippi 1973 (SOPOTLIEVA 2008) – via the presence of *Vulpia myurus* and *Aira elegantissima*. Overall, however, the closed sward, the prevalence of hemicryptophytes over annuals, the presence of typical species such as *Potentilla argentea* agg., *Trifolium arvense* and *T. campestre* and the frequent dominance of *Agrostis capillaris* support the subordination to the *Trifolio arvensis-Festucetalia ovinae* (MORAVEC 1967, WEEDA et al. 1996, DENGLER 2003, 2004a), an order which, to our knowledge, has never before been reported from the Balkan Peninsula. DENGLER (2003, 2004a) accepts three largely vicariant alliances in temperate Europe: *Sedo-Cerastion arvensis* Sissingh & Tideman 1960 in the Atlantic parts, *Hyperico perforati-Scleranthion perennis* Moravec 1967 in the mountains of Central Europe, on the British Isles and in Fennoscandia and *Armerion elongatae* Pötsch 1962 in the subcontinental lowlands. Evidently, none of these alliances fits the communities in Bulgaria geographically or floristically. The only alliance with some resemblance is the *Armerio rumelicae-Potentillion* described by MICEVSKI (1978) from siliceous mountains in Macedonia and placed in the *Astragalo-Potentilletalia* (*Festuco-Brometea*). While the two associations included in the protologue show some transitional character between the *Festuco-Brometea* and the *Koelerio-Corynephoretea*, the selected type association (*Genisto carinalis-Agrostietum byzanthinae*, see Appendix S1) is clearly dominated by species of the latter class (e.g. *Aira elegantissima*, *Trifolium arvense*, *Rumex acetosella*, *Potentilla argentea* agg., *Scleranthus perennis*). Typified that way, we consider the *Armerio rumelicae-Potentillion* as belonging to the *Trifolio avensis-Festucetalia ovinae* and identical with our alliance 3.2 as indicated by many floristic coincidences (e.g. the high frequency of *Plantago subulata*). Whether the other association placed by MICEVSKI (1978) in this alliance (*Koelerio macranthae-Festucetum stojanovii*) also completely belongs to the alliance emendated in such a way, should to be tested in a large-scale analysis.

4.4 Description of the associations (Tables 5 and 6 in the supplement, Tables 7 and 8)

While we are convinced that each of the 10 distinguished clusters warrants association status and some on the basis of more data could be split even further, there are only few valid names available that have been published for dry grassland syntaxa in Bulgaria or

Table 7. Characteristics of the three dry grassland classes (FB = *Festuco-Brometea*, CU = *Calluno-Ulicetea*, KC = *Koelerio-Corynephoretea*). Means and standard deviations are given. Different letters indicate significant differences between communities at α = 0.05 from Turkey's HSD test; *P*-values derived from ANOVAs.

Tabelle 7. Eigenschaften der Bestände der drei Trockenrasen-Klassen (FB = *Festuco-Brometea*, CU = *Calluno-Ulicetea*, KC = *Koelerio-Corynephoretea*). Es sind Mittelwerte und Standardabweichungen angegeben. Unterschiedliche Kleinbuchstaben bezeichnen signifikante Unterschiede (α = 0,05) zwischen den Klassen gemäß Tukeys HSD-Test; in der letzten Spalte sind die *P*-Werte aus den Varianzanalysen angegeben.

Parameter	FB	CU	KC	*P*
No. of relevés (*n*)	58	6	34	
Altitude (m a.s.l.)	1108 ± 219^{b}	1059 ± 12^{ab}	910 ± 154^{a}	<0.001
Inclination (°)	18 ± 14	17 ± 8	16 ± 8	0.639
Heat index	0.08 ± 0.43	–0.19 ± 0.21	0.03 ± 0.21	0.201
Microrelief (cm)	15.3 ± 15.1	8.2 ± 2.1	11.9 ± 8.9	0.267
pH (H_2O) of the soil	6.2 ± 1.1^{b}	4.9 ± 0.3^{a}	5.0 ± 0.4^{a}	<0.001
Conductivity (µS/cm) of the soil	177 ± 76^{a}	239 ± 288^{a}	72 ± 33^{b}	<0.001
Loss at ignition of the soil (%)	19.4 ± 8.3^{b}	11.6 ± 4.2^{a}	7.6 ± 3.3^{a}	<0.001
Proportion of sand in the soil (%)	75.5 ± 9.8	78.7 ± 3.8	78.0 ± 6.0	0.325
Proportion of silt in the soil (%)	22.9 ± 9.6^{b}	19.8 ± 2.7^{ab}	18.6 ± 6.4^{a}	0.056
Proportion of clay in the soil (%)	0.5 ± 0.8^{b}	0.1 ± 0.1^{ab}	0.1 ± 0.1^{a}	<0.001
Total vegetation cover (%)	82 ± 19^{a}	93 ± 4^{a}	73 ± 18^{b}	0.012
Cover of herb layer (%)	80 ± 22^{a}	92 ± 6^{a}	57 ± 23^{b}	<0.001
Cover of cryptogam layer (%)	5 ± 7^{a}	3 ± 2^{a}	22 ± 19^{b}	<0.001
Cover of litter (%)	26 ± 25^{b}	8 ± 2^{ab}	11 ± 13^{a}	<0.001
Cover of stones and rocks (%)	11 ± 19	0 ± 1	13 ± 14	0.243
Cover of bare soil (%)	5 ± 11	3 ± 5	11 ± 12	0.053
Species richness of all taxa (10 m²)	41.3 ± 10.7^{b}	41.0 ± 7.4^{ab}	33.2 ± 10.7^{a}	0.002
Species richness of vascular plants (10 m²)	38.0 ± 10.2^{b}	37.0 ± 7.3^{ab}	26.9 ± 9.4^{a}	<0.001
Species richness of bryophytes (10 m²)	2.3 ± 2.2	3.2 ± 1.5	2.9 ± 1.7	0.268
Species richness of lichens (10 m²)	0.9 ± 1.7^{a}	0.8 ± 1.7^{a}	3.5 ± 2.7^{b}	<0.001

neighbouring countries. When we found a convincing match, we apply the association names here; otherwise we use an informal name, discuss potential matches under "Syntaxonomy" and leave the resolution to the planned large-scale analysis (K. Vassilev et al. in prep.). Only in two cases where the literature review yielded no close resemblance while we could document the same type from multiple places with more than 10 relevés in total, we provide formal descriptions of new associations.

Association 1.1.1: *Dianthus petraeus-Sesleria latifolia*-[*Saturejion montanae*] community (Fig. 4)

Characterisation: Moderately species-rich community with open horizontal structure, dominated by *Sesleria latifolia, Potentilla cinerea* agg., *Dianthus petraeus, Trifolium alpestre, Helianthemum nummularium* and *Carex humilis*. The cryptogam layer is weakly developed without any species dominating over others.

Ecology and distribution: This community mostly grows on steep east or south-east inclined terrains (mean heat index: 0.65) at the highest altitudes in the study area (mean elevation: 1409 m a.s.l.). Soils are derived from calcareous bedrock, with many outcrops at the

Table 8. Characteristics of the ten dry grassland associations. Means and standard deviations are given. Different letters indicate significant differences between communities at α = 0.05 from Turkey's HSD test; P-values derived from ANOVAs.

Tabelle 8. Eigenschaften der Bestände der drei Trockenrasen-Assoziationen. Es sind Mittelwerte und Standardabweichungen angegeben. Unterschiedliche Kleinbuchstaben bezeichnen signifikante Unterschiede (α = 0,05) gemäß Tukeys HSD-Test; in der letzten Spalte sind die *P*-Werte aus den Varianzanalysen angegeben.

Parameter	Assoc. 1.1.1	Assoc. 1.1.2	Assoc. 1.1.3	Assoc. 1.2.1	Assoc. 1.2.2	Assoc. 1.2.3	Assoc. 1.3.1	Assoc. 2.1.1	Assoc. 3.1.1	Assoc. 3.2.1	*P*
No. of relevés (*n*)	8	10	4	9	6	7	14	6	14	20	
Altitude (m a.s.l.)	1409 ± 39^{c}	1003 ± 34^{a}	819 ± 202^{a}	1271 ± 125^{b}	1275 ± 163^{bc}	1083 ± 66^{ac}	929 ± 149^{a}	1059 ± 12^{ac}	901 ± 128^{a}	916 ± 172^{a}	<0.001
Inclination (°)	30 ± 25	19 ± 14	31 ± 5	13 ± 7	19 ± 17	12 ± 5	14 ± 7	17 ± 8	17 ± 9	15 ± 8	0.019
Heat index	0.65 ± 0.71^{b}	–0.14 ± 0.28^{a}	0.33 ± 0.25^{ab}	–0.06 ± 0.17	–0.10 ± 0.54^{a}	0.05 ± 0.17	0.03 ± 0.19^{a}	–0.19 ± 0.21^{a}	0.09 ± 0.27^{a}	–0.01 ± 0.16^{a}	<0.001
Microrelief (cm)	22.9 ± 16.1^{bc}	28.5 ± 18.1^{c}	32.5 ± 15.0^{c}	11.8 ± 9.9^{ab}	13.0 ± 13.1^{abc}	7.0 ± 4.2^{ab}	4.1 ± 2.6^{a}	8.2 ± 2.1^{ab}	16.0 ± 11.3^{abc}	9.1 ± 5.5^{ab}	<0.001
pH (H_2O) of the soil	7.0 ± 0.6^{b}	7.3 ± 0.4^{b}	5.3 ± 0.6^{a}	5.3 ± 0.3^{a}	6.8 ± 0.9^{b}	7.3 ± 0.7^{b}	5.0 ± 0.2^{a}	4.9 ± 0.3^{a}	4.8 ± 0.3^{a}	5.1 ± 0.4^{a}	<0.001
Conductivity (µS/cm) of the soil	246 ± 36^{b}	189 ± 38^{ab}	74 ± 25^{ac}	161 ± 78^{abc}	216 ± 90^{ab}	213 ± 79^{ab}	136 ± 62^{abc}	239 ± 288^{ab}	61 ± 22^{c}	81 ± 37^{c}	<0.001
Loss at ignition of the soil (%)	29.7 ± 8.5^{e}	23.6 ± 5.0^{be}	3.9 ± 1.7^{a}	21.0 ± 4.7^{b}	23.4 ± 3.4^{be}	18.3 ± 3.1^{b}	12.9 ± 4.0^{cd}	11.6 ± 4.2^{acd}	7.0 ± 3.6^{a}	8.1 ± 3.0^{ac}	<0.001
Proportion of sand in the soil (%)	81.5 ± 6.6^{a}	79.5 ± 4.8^{ab}	75.7 ± 2.8^{ab}	74.0 ± 10.4^{a}	71.2 ± 17.7^{ab}	67.0 ± 12.2	76.3 ± 6.1^{ab}	78.7 ± 3.8^{ab}	79.6 ± 4.4^{ab}	76.9 ± 6.8^{a}	0.021
Proportion of silt in the soil (%)	18.1 ± 6.9^{ab}	19.4 ± 4.7^{ab}	23.1 ± 2.2^{ab}	24.8 ± 9.9^{ab}	25.1 ± 18.1^{ab}	31.5 ± 11.3	21.8 ± 6.8^{ab}	19.8 ± 2.7^{ab}	16.7 ± 5.2^{a}	20.0 ± 6.9^{a}	0.016
Proportion of clay in the soil (%)	0.1 ± 0.2^{ab}	0.6 ± 0.4^{abc}	0.2 ± 0.2^{abc}	0.8 ± 0.8^{bcd}	1.0 ± 1.2^{cd}	1.4 ± 1.1^{d}	0.0 ± 0.1^{a}	0.1 ± 0.1^{abc}	0.0 ± 0.0^{a}	0.1 ± 0.1^{a}	<0.001
Total vegetation cover (%)	77 ± 19^{abc}	72 ± 16^{ac}	40 ± 20^{d}	97 ± 2^{b}	94 ± 7^{ab}	87 ± 10^{ab}	89 ± 10^{ab}	93 ± 4^{ab}	61 ± 17^{cd}	81 ± 15^{ab}	<0.001
Cover of herb layer (%)	70 ± 30^{ab}	70 ± 16^{ab}	33 ± 15^{d}	97 ± 2^{c}	93 ± 8^{abc}	84 ± 10^{abc}	87 ± 11^{bc}	92 ± 6^{abc}	39 ± 17^{d}	70 ± 17^{a}	<0.001
Cover of cryptogam layer (%)	8 ± 11^{ab}	4 ± 5^{ab}	8 ± 9^{abc}	2 ± 5^{ab}	2 ± 3^{ab}	7 ± 11^{ab}	3 ± 7^{a}	3 ± 2^{ab}	28 ± 14^{c}	18 ± 21^{bc}	<0.001
Cover of litter (%)	18 ± 14^{ab}	15 ± 21^{ab}	1 ± 1^{a}	37 ± 24^{bc}	28 ± 26^{abc}	11 ± 10^{ab}	46 ± 25^{c}	8 ± 2^{ab}	4 ± 4^{a}	16 ± 15^{ab}	<0.001
Cover of stones and rocks (%)	17 ± 20^{abcd}	28 ± 22^{cd}	43 ± 29^{d}	0 ± 1^{a}	3 ± 6^{ab}	6 ± 7^{abc}	0 ± 0^{a}	0 ± 1^{ab}	19 ± 13^{bcd}	8 ± 13^{ab}	<0.001
Cover of open soil (%)	6 ± 4^{ab}	4 ± 3^{ab}	31 ± 34^{c}	2 ± 2^{a}	3 ± 3^{ab}	6 ± 6^{ab}	2 ± 2^{a}	3 ± 5^{ab}	16 ± 16^{bc}	7 ± 7^{ab}	<0.001
Species richness all taxa (10 m²)	40.8 ± 5.6^{abcd}	48.4 ± 10.0^{d}	27.3 ± 10.1^{ac}	41.9 ± 11.1^{a}	46.7 ± 7.4^{abd}	47.9 ± 7.9^{b}	34.5 ± 7.8^{abc}	41.0 ± 7.4^{abcd}	28.6 ± 6.6^{c}	36.4 ± 12.0^{abc}	<0.001
Species richness vascular plants (10 m²)	36.5 ± 5.0^{abcd}	44.8 ± 8.7^{c}	22.0 ± 7.5^{de}	39.8 ± 11.4^{a}	43.2 ± 8.9^{abc}	43.6 ± 8.2^{b}	32.5 ± 7.7^{abd}	37.0 ± 7.3^{abcd}	20.8 ± 6.3^{e}	31.1 ± 9.1^{ad}	<0.001
Species richness bryophytes (10 m²)	2.0 ± 2.3	3.0 ± 2.7	2.8 ± 1.9	2.1 ± 1.8	3.2 ± 3.4	2.7 ± 1.7	1.4 ± 1.5	3.2 ± 1.5	3.1 ± 1.1	2.8 ± 2.0	0.441
Species richness lichens (10 m²)	2.1 ± 3.3^{ab}	0.6 ± 0.7^{a}	2.8 ± 2.5^{ab}	0.0 ± 0.0^{a}	0.3 ± 0.5^{a}	1.4 ± 1.3^{a}	0.6 ± 1.2^{a}	0.8 ± 1.6^{a}	4.9 ± 1.6^{b}	2.5 ± 2.9^{a}	<0.001

surface and with almost neutral reaction (mean pH: 7.00), high conductivity and organic matter content. Stands were recorded in the area of Beglichka mogila peak and above the village of Milanovo, where they were used as low-intensity pastures or not at all (because of steepness of the terrain or abandonment).

Classification: While this community type has not been described in phytosociological terms before, some decades ago VELCHEV (1971) documented similar types in the same region with the dominance approach. Accordingly, three of his "associations" more or less correspond to our community: "*Sesleria latifolia-Fetuca dalmatica*", "*Sesleria latifolia-Stipa pennata*" and "*Sesleria latifolia-Satureja montana*".

Association 1.1.2: *Achillea clypeolata-Festuca stojanovii*-[*Saturejion montanae*] community

Characterisation: Very species-rich community with high occurrence of the dwarf shrub *Satureja montana* subsp. *kitaibelii*. Stands are rich of forbs (e.g. *Teucrium chamaedrys, Asperula purpurea, A. cynanchica, Veronica austriaca* and *Euphorbia cyparissias*), while grasses (*Koeleria macrantha* agg, *Poa angustifolia, P. compressa* and *Festuca stojanovii*) play a lesser role. Bryophytes and lichens are poorly presented in terms of richness and cover.

Fig. 4. *Dianthus petraeus-Sesleria latifolia*-[*Saturejion montanae*] community (order *Stipo pulcherrimae-Festucetalia pallentis*) in Parshevitsa, near Vratsa. Among the recognisable plants are *Achillea clypeolata, Jovibarba heufelii* and *Satureja montana* subsp. *kitaibelii* (Photo: J. Dengler, JD115374).

Abb. 4. *Dianthus petraeus-Sesleria latifolia*-[*Saturejion montanae*]-Gesellschaft (Ordnung *Stipo pulcherrimae-Festucetalia pallentis*) in Parshevitsa, nahe Vratsa. Man erkennt unter anderem *Achillea clypeolata, Jovibarba heufelii* und *Satureja montana* subsp. *kitaibelii* (Foto: J. Dengler, JD115374).

Ecology and distribution: Occurs on both steep and slightly inclined calcareous terrains with rocky outcrops at south, west or north-west exposition and with rough microrelief. Soils are shallow, rich in skeleton material and sand fraction. Organic matter content is high, and soil reaction is neutral to slightly alkaline. Relevés were taken in the area of Kravya and on the slopes of the Okolchitsa peak on extensively used pastures.
Classification: Floristically and ecologically similar stands, which likely belong to the same association, have been described by TZONEV (2009) as *Potentillo pilosae-Achilleetum clypeolatae* from the Chernelka Canyon, approx. 80 km East of Vratsa. Unfortunately, this publication is not valid according to Art. 1 ICPN because it appeared only online but not in print.

Association 1.1.3: *Satureja pilosa-Phleum phleoides*-[*Saturejion montanae*] community
Characterisation: Very species-poor community developed on silicate terrains, characterised by open horizontal structure (mean total vegetation cover: 40%). Like in Assoc. 1.1.2, a dwarf shrub is dominating – in this case *Satureja pilosa*. Numerous grasses like *Koeleria macrantha* agg., *Phleum phleoides*, *Dichanthium ischaemum, Festuca valesiaca* and *Chrysopogon gryllus* add to the vegetation cover as well as a high number of lichens. Transgressive species to the class *Koelerio-Corynephoretea* like *Plantago subulata, Scleranthus perennis, Rumex acetosella* and *Ceratodon purpureus* are also abundant.
Ecology and distribution: Stands cover steep south- or southeast-facing slopes with rough microrelief and many outcrops on siliceous bedrock. The soils have a high proportion of skeleton, acid reaction (mean pH = 5.3), a low conductivity value and scarce organic matter. Stands of this community were found on slopes above the towns Anton and Klisura, which are unsuitable for agricultural use because of their high inclination.
Classification: The *Artemisia alba*-[*Saturejion montanae*] community described by BERGMEIER et al. (2009) from northern Greece has also frequent *Satureja pilosa* but otherwise only limited floristic overlap.

Association 1.2.1: *Ferulago campestris-Agrostis capillaris*-[*Cirsio-Brachypodion*] community
Characterisation: Moderately species-rich community with closed horizontal structure and strongly dominated by *Agrostis capillaris*. Other mesophilous grasses like *Anthoxanthum odoratum, Festuca nigrescens, Brachypodium pinnatum* and *Briza media* show much lower cover and constancy values unlike some forbs: *Trifolium alpestre, Stachys officinalis, Achillea millefolium* agg., *Primula veris* and *Galium verum*. The cryptogam layer is poorly presented, whereas accumulation of litter is substantial.
Ecology and distribution: Occurs on both steep and slightly inclined terrains with varying exposition and microrelief at high altitude (mean 1271 m a.s.l.). Soils are derived from calcareous bedrock, have a prevailing sandy texture and are rich in skeleton material and organic matter. Communities were found in the area of Okolchitsa, Beglichka mogila peak and above the village of Milanovo, where they were used as low-intensity pastures; some were already abandoned.
Classification: Relevé BGR024 is dominated by *Festuca paniculata* subsp. *paniculata* and might therefore justify placement in a separate association or even a different higher syntaxon. GRABHERR (1993), for example, considers this taxon in Austria as diagnostic for the order *Festucetalia spadiceae* Barbero 1970 within the class *Caricetea curvulae* Br.-Bl. 1948 (alpine-subalpine acidic grasslands), but as we had only one such relevé, we considered any decision premature.

Association 1.2.2: *Tanacetum corymbosum-Sesleria latifolia*-[*Cirsio-Brachypodion*] community (Fig. 5)

Characterisation: Moderately species-rich community with closed horizontal structure, dominated by *Sesleria latifolia* and many forbs like *Trifolium alpestre, Primula veris, Helianthemum nummularium, Teucrium chamaedrys, Stachys officinalis* and *Prunella grandiflora*. The *Sesleria* dominance is similar to Assoc. 1.1.1, with which it often grows in close contact, but the sward is much denser and the species composition more mesophytic. Bryophytes and lichens have very low cover values.

Ecology and distribution: This community grows on calcareous terrains at high altitude (mean 1275 m a.s.l.), mostly on steep north- and northwest-facing slopes. The soils have sandy texture, neutral reaction (mean pH = 6.8), high conductivity values and high organic matter content. Stands were found in the area of Beglichka mogila peak, Okolchitsa peak and above the village of Milanovo, where they were used as low-intensity pastures. This community might be a transitional stage between grassland and forest vegetation. *Tanacetum corymbosum* is ecologically much related to forest edges, and *Sesleria latifolia* occurs in different plant communities, including as herb layer under tree canopy, for example in the black pine communities, and has thus been considered diagnostic for the *Seslerio-Pinetum nigrae* Em 1962. Unlike many other plants growing beneath the canopy, *S. latifolia* can survive or even spread in open places. Due to its strong competitive ability and low forage quality, *S. latifolia* becomes dominant in grasslands under different environmental conditions.

Classification: To our knowledge, no similar community type has been described so far.

Fig. 5. *Tanacetum corymbosum-Sesleria latifolia*-[*Cirsio-Brachypodion*] community (order *Brachypodietalia pinnati*) in Parshevitsa, near Vratsa. Among the recognisable plants are *Vincetoxicum hinrundinaria, Tanacetum corymbosum* and *Brachypodium pinnatum* (Photo: J. Dengler, JD115377).

Abb. 5. *Tanacetum corymbosum-Sesleria latifolia*-[*Cirsio-Brachypodion*]-Gesellschaft (Ordnung *Brachypodietalia pinnati*) in Parshevitsa, nahe Vratsa. Man erkennt unter anderem *Vincetoxicum hinrundinaria, Tanacetum corymbosum* und *Brachypodium pinnatum* (Foto: J. Dengler, JD115377).

Association 1.2.3: *Abietinella abietina-Sanguisorba minor*-[*Cirsio-Brachypodion*] community

Characterisation: Very species-rich community with semi-closed horizontal structure and many legumes present: *Medicago lupulina, M. sativa* subsp. *falcata, Lotus corniculatus*, *Trifolium alpestre* and *T. pratense*. Stands do not show clear dominance, but *Teucrium chamaedrys* and *Achillea millefolium* have high cover values among the most constant species. Cryptogams are also well presented and form a distinct layer.

Ecology and distribution: Occurs on slightly inclined terrains with varying aspects on slightly alkaline grounds and high conductivity values. Soils are rich in skeleton material, and the sand/silt fraction is the lowest among all studied communities. Records were taken at the area of Kravya, above the village of Milanovo and on slopes of Okolchitsa peak on extensively used pastures

Classification: While the community composition mainly consists of common species so that the association could be expected to be widespread, we are not aware of any previous publication of such a vegetation type from Bulgaria.

Association 1.3.1: *Agrostio capillaris-Chrysopogonetum grylli* (Fig. 6)

Characterisation: Moderately species-poor community, dominated by grasses like *Chrysopogon gryllus, Agrostis capillaris, Anthoxanthum odoratum, Festuca valesiaca* and *F. rubra*. Frequent forbs are *Achillea millefolium* agg., *Carex caryophyllea, Galium verum* and *Plantago lanceolata*. Closed horizontal structure and dense litter cover prevent the formation of a cryptogam layer.

Fig. 6. *Agrostio capillaris-Chrysopogonetum grylli* (alliance *Chrysopogono grylli-Danthonion calycinae*, order *Brachypodietalia pinnati*) north of Koprivshtitsa. The dominating grass is *Chrysopogon gryllus* (Photo: J. Dengler, JD115601).

Abb. 6. *Agrostio capillaris-Chrysopogonetum grylli* (Verband *Chrysopogono grylli-Danthonion calycinae*, Ordnung *Brachypodietalia pinnati*) nördlich von Koprivshtitsa. Das dominante Gras ist *Chrysopogon gryllus* (Foto: J. Dengler, JD115601).

Ecology and distribution: Stands cover mostly slightly inclined northeast- or northwest-facing slopes (mean heat index: 0.03) on acid, sandy soils poor in organic matter. This community was recorded in several areas at lower altitudes (mean: 929 m a.s.l.): north of Koprivshtitsa, near the towns Pirdop and Klisura as well as areas around Beklemeto mountain pass. Most stands were parts of large pastures used at very low intensity.
Classification: The *Agrostio-Chryospognetum* is the type association of the *Chrysopogono grylli-Danthonion calycinae* described in Serbia (KOJIĆ 1959) and so similar to our stands that, for the time being, it seems justified subordinating them here. According to VASSILEV (2012), at least 30 different associations have later been published within the alliance *Chrysopogono-Danthonion* throughout the Balkans, whose floristic differences are often only subtle. Therefore, after the intended critical plot-based revision, probably only few of them will remain.

Association 2.1.1: *Festuco rubrae-Genistelletum sagittalis* (Fig. 7)
Characterisation: Moderately species-rich community with closed horizontal structure, dominated by *Nardus stricta, Agrostis capillaris, Danthonia decumbens, Trifolium alpestre, Chamaespartium sagittale, Briza media, Anthoxanthum odoratum, Potentilla erecta* and *Viola canina*. Stands are rich in cryptogams, but they do not form a separate layer under the dense cover of grasses. Litter is weakly accumulated.
Ecology and distribution: This community mostly grows on west or northwest-inclined terrains on skeleton-rich, sandy soils derived from siliceous bedrock. Grounds are very acid (mean pH: 4.9), poor in organic matter and have high conductivity values. In the study areas, they were found only on low-intensity pastures south of the town of Koprivshtitsa.

Fig. 7. *Festuco rubrae-Genistelletum sagittalis* (alliance *Violion caninae*, order *Nardetalia stricae*) south of Koprivshtitsa. Among the recognisable plants are *Leontodon hispidus, Danthonia decumbens* and *Nardus stricta* (Photo: J. Dengler, JD115761).

Abb. 7. *Festuco rubrae-Genistelletum sagittalis* (Verband *Violion caninae*, Ordnung *Nardetalia stricae*) südlich von Koprivshtitsa. Man erkennt unter anderem *Leontodon hispidus, Danthonia decumbens* und *Nardus stricta* (Foto: J. Dengler, JD115761).

Classification: Unexpectedly, the *Festuco-Genistelletum* described from the Alsace (France) and widespread in southern Germany (PEPPLER-LISBACH & PETERSEN 2001, BECKER et al. 2012) matches the stand in Bulgaria to such a large degree that we suggest that they are one and the same association.

Association 3.1.1: *Cetrario aculeatae-Plantaginetum subulatae* (Fig. 8)
Characterisation: Moderately species-poor community, characterised by a high proportion of cryptogams: *Cladonia foliacea, Cetraria aculeata, Ceratodon purpureus, Polytrichum piliferum* and *Racomitrium canescens* agg., where lichens are dominating (mean cover of cryptogam layer: 29%). Stands have open horizontal structure (mean vegetation cover = 61%) and a low amount of accumulated litter. The most frequent vascular plants are *Plantago subulata, Rumex acetosella, Agrostis capillaris, Chrysopogon gryllus, Scabiosa triniifolia* and *Hypericum perforatum*.
Ecology and distribution: Occurs on both steep and slightly inclined terrains with varying exposition and microrelief and a high proportion of stones and rocks as well as bare soil. Grounds are derived from siliceous bedrock and very acid (mean pH = 4.8), poor in organic matter and of low conductivity. This community was found in several areas at lower altitudes (mean: 901 m a.s.l.): north of Koprivshtitsa, near the towns Pirdop and Klisura as well as a stand around Beklemeto mountain pass in pastures of varying intensity. There the *Cetrario-Plantaginetum* is found at small scale within extensive stands of the *Agrostio-Chrysopogonetum* (Assoc. 1.3.1) and the *Plantagini-Agrostietum* (Assoc. 3.2.1) surrounding outcrops or on hillocks of coarse gravel.

Fig. 8. *Cetrario aculeatae-Plantaginetum subulatae* (alliance unknown, order *Sedo-Scleranthetalia*) in Klisura, near Koprivshtitsa. Among the recognisable plants are *Plantogo subulata* and *Scabiosa trinifolia*, *Polytrichum piliferum* and *Cladonia foliacea* (Photo: J. Dengler, JD115649).

Abb. 8. *Cetrario aculeatae-Plantaginetum subulatae* (Verband ungeklärt, Ordnung *Sedo-Scleranthetalia*) in Klisura, nahe Koprivshtitsa. Man erkennt unter anderem *Plantogo subulata* und *Scabiosa trinifolia*, *Polytrichum piliferum* und *Cladonia foliacea* (Foto: J. Dengler, JD115649).

Classification: To our knowledge a similar vegetation type has never before been documented from Bulgaria or surrounding countries. We therefore publish a new association here based on our 14 relevés (see Appendix 1).

Association 3.2.1: *Plantagini subulatae-Agrostietum capillaris* (Fig. 9)
Characterisation: Similar to the *Cetrario aculeatae-Plantaginetum subulatae* (Assoc. 3.1.1), but with a much more closed sward dominated by grasses. On the other hand, lichens play a much smaller role in the species composition, with *Cetraria aculeata* being largely missing.
Ecology and distribution: Occurs on slightly inclined terrains with varying aspects. Soils are acid (mean pH = 5.3), poor in organic matter and of low conductivity. This community is the most frequent type in the siliceous study area and was found in all localities there.
Classification: SOPOTLIEVA (2008) described in her PhD thesis a *Trifolio arvensis-Festucetum valesiacae* nom. inval. (according to Art. 1 ICPN, but validation in preparation) from East Bulgaria (about 180 km away). Her unit, which she placed in the *Festucion valesiacae* (*Festuco-Brometea*), shows some similarities with our stands, but while in her case *Festuco-Brometea* species prevail, in our case *Koelerio-Corynephoretea* species do. There have also been reports from the Sofia region based on the dominance approach and without species lists of a "*Dichantium ischaemum-Festuca valesiaca+Plantago carinata*" and "*Dichantium ischaemum-Trifolium alpestre+Plantago carinata*" (*Plantago carinata = P. subulata*) (see review by APOSTOLOVA & SLAVOVA 1997), which might mean a similar community. As our community is very frequent but was not formally described before, we publish it as a new association here based on our 20 relevés (see Appendix 1).

Fig. 9. *Plantagini subulatae-Agrostietum capillaris* (alliance *Armerio rumelicae-Potentillion*, order *Trifolio arvensis-Festucetalia ovinae*) north of Koprivshtitsa. Among the recognisable plants are *Jasione heldreichii, Armeria rumelica* and *Racomitrium canescens* agg. (Photo: J. Dengler, JD115603).

Abb. 9. *Plantagini subulatae-Agrostietum capillaris* (Verband *Armerio rumelicae-Potentillion*, Ordnung *Trifolio arvensis-Festucetalia ovinae*) nördlich von Koprivshtitsa. Man erkennt unter anderem *Jasione heldreichii, Armeria rumelica* und *Racomitrium canescens* agg. (Foto: J. Dengler, JD115603).

5. Ecology and biodiversity

5.1 Vegetation-environment relationships

The most common type of land use in the studied grasslands was grazing (77% of plots), with 87% of the active pastures being used at low intensity. Unused grasslands were either abandoned pastures and meadows or natural grasslands that showed no evidence of management. Mechanical properties of soils were similar in all sampled areas with prevalence of the sand fraction (mean 76.6%, range 37.4–91.0%). The soil chemistry of the two study areas differed considerably. In the area of Vratsa, soils were developed from carbonate bedrock and showed a high humus content (mean 23.3%, range 13.4–43.9%), were base-rich with a mean pH (H_2O) of 6.7 (range 4.8–8.0) and had high conductivity values (mean 202 µS/cm, range 78–380 µS/cm). In the area of Koprivshtitsa, soils were developed from silicate bedrock, had a low humus content (mean 9.1%, range 2.3–22.0%), were acid with a mean pH (H_2O) of 5.0 (range 4.4–6.4) and had low conductivity values (mean 104 µS/cm, range 19–311 µS/cm).

The first DCA axis was strongly negatively correlated with loss at ignition, proportion of clay and conductivity as well as geology, with carbonate bedrock having a positive loading (Fig. 10). This implies that soil properties were the main factors determining vegetation differences in the study region. Accordingly, the DCA like the TWINSPAN tree (Fig. 3) separated two main vegetation types: (i) species-rich communities distributed on carbonate terrains, with base-rich soils having a high content of organic matter and a high clay fraction; (ii) less species-rich communities distributed on siliceous bedrock, with acid, sandy soils poor in organic matter. The second axis was strongly negatively correlated with cover of stones and positively correlated with total cover and cover of litter, indicating a gradient from open grasslands with many cryptogam species at rocky sites to dense grasslands with fewer cryptogam species on consolidated substrates.

Vegetation differences related to variations in ecological conditions are revealed by comparison of plant communities at class level (Table 7). *Festuco-Brometea* communities were found at the highest elevations in the study area (1108 m a.s.l.) on base-rich soils (mean pH = 6.2) rich in organic matter (19.4%), on steep slopes and rough microrelief. Horizontal structure of stands was open (82% vegetation cover), but litter cover was the highest among all classes (26%). These conditions appear to be most suitable to support high species richness (41.3 taxa on 10 m²). In contrast, *Koelerio-Corynephoretea* communities occured at lower altitudes (910 m a.s.l.), on slightly acidic soils (pH = 5.0) poor in organic matter (7.6%). Total vegetation cover and species richness were the lowest among all studied classes (73% and 33%, respectively), while cover (mean 22%) and richness of lichens (3.5 species) as well as cover of open soil covers were the highest (11%). Most ecological parameters characteristic for the class *Calluno-Ulicetea* had intermediate values between those of the other two classes except for total vegetation cover, which was the highest, and cover of litter, which was the lowest.

5.2 Biodiversity patterns

With a mean total richness of 38.5 species on 10 m² (Table 4), the studied dry grasslands were intermediately species-rich at the European scale, where DENGLER (2005) listed association means ranging from 8.4 to 75.2 at that scale. Compared to *Festuco-Brometea* and *Koelerio-Corynephoretea* associations of NE Germany (DENGLER 2005), all associations of

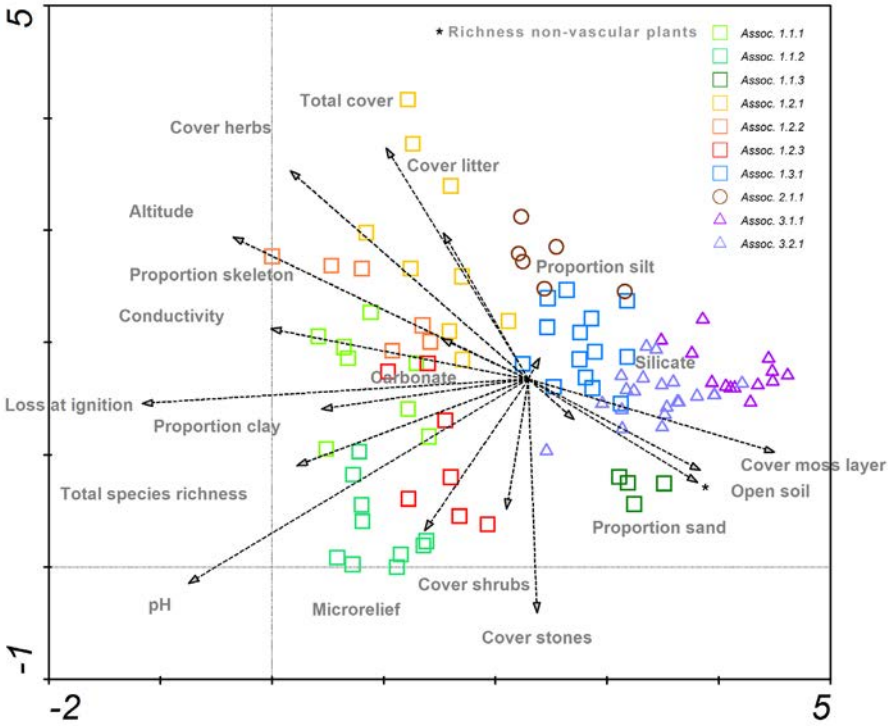

Fig. 10. DCA ordination diagram of the 98 10-m² vegetation plots. The plots are coded according to the accepted classification (squares: *Festuco-Brometea*; circles: *Calluno-Ulicetea*; triangles: *Koelerio-Corynephoretea*). Rare species were down-weighed. Eigenvalues: 1st axis: 0.59; 2nd axis: 0.37.

Abb. 10. DCA-Ordinationsdiagramm der 98 Aufnahmeflächen von 10 m² Größe. Die Symbole der Plots entsprechend der angenommenen Klassifikation (Quadrate: *Festuco-Brometea*; Kreise: *Calluno-Ulicetea*; Dreiecke: *Koelerio-Corynephoretea*). Seltene Arten wurden für die Berechnung heruntergewichtet. Eigenwerte: 1. Achse: 0,59; 2. Achse: 0,37.

the respective classes contained on average 10 species more on that spatial scale, while their richness was similar to corresponding vegetation types of the Baltic islands of Saaremaa and Öland, respectively (BOCH & DENGLER 2006, LÖBEL & DENGLER 2008; Tables 7–9). In contrast, the corresponding communities (orders *Stipo pulcherrimae-Festucetalia pallentis* and *Brachypodietalia pinnati*) of Transylvania, only about 450 km away, had generally higher species richness than those of this study: 46.4 vs. 38.8 and 66.0 vs. 41.0, respectively (DENGLER et al. 2012a).

In Bulgaria *Festuco-Brometea* communities tended to be richer than those of the *Koelerio-Corynephoretea*, a typical pattern throughout Europe. However, with only about eight species (24%), the difference was smaller than in other regions, where the surplus is rather around 50% and more (e.g. HOBOHM 1998, DENGLER 2005), and was significant only for the full dataset (Table 7), not for just the biodiversity plots (Table 9). Our single *Calluno-Ulicetea* association was as rich as the *Festuco-Brometea* stands (Tables 7–9), which is in line with HOBOHM (1998: Anhang 12.5), who found that communities of the order *Nardetalia strictae* are among the richest vegetation types in Central Europe. Within the classes the

analysed associations generally showed only little differentiation in total richness, except for the *Satureja pilosa-Phleum phleoides* community (Assoc. 1.1.3), which was much poorer than the other *Festuco-Brometea* associations (Table 8).

Considering the three investigated taxonomic groups, all associations had much higher vascular plant than bryophyte and lichen species richness. Thus vascular plant richness closely corresponded to overall richness patterns. Bryophyte species richness on 10 m² was similar in all 10 associations with means of 2.0–3.2 species (Table 8). In contrast, lichen richness was distributed quite unevenly: *Koelerio-Corynephoretea* stands showed higher values than the two other classes. In particular, the *Cetrario aculeatae-Plantaginetum subulatae* (Assoc. 3.1.1) had by far the highest values with 4.9 species per 10 m² (Table 8).

When analysing the seven spatial scales (Table 9), only few comparisons between the syntaxa were significant due to the low number of replicates. However, there was a non-significant tendency of *Festuco-Brometea* communities being richer in vascular plant species and all taxa than those of the two other classes, but only at the larger grain sizes. In contrast, at scales below 1 m², the *Calluno-Ulicetea* and partly also the *Koelerio-Corynephoretea* were richer in all taxa and vascular plants than *Festuco-Brometea*, albeit only insignificantly. This pattern was also reflected in the slope of the species-area-relationships, where the *z*-values of the *Festuco-Brometea* tended to be higher (mean: 0.253) than those of the other classes (0.210 and 0.218), although these differences were not significant. Higher *z*-values would indicate a faster increase of richness with area or, in other words, higher beta diversity. While the *z*-values in our study were within the typical range of dry grasslands across Europe (HOBOHM 1998, DENGLER 2005), they were clearly lower than in Transylvanian dry grasslands (DENGLER et al. 2012a).

6. Conclusions and outlook

Considering that so far there is no comprehensive classification on the Bulgarian dry grasslands, our study is a valuable contribution to the knowledge of the variety of the dry grassland vegetation in the country and on the Balkan Peninsula in general. It provides an important input to the emerging efforts towards a consistent classification of grassland vegetation in Europe (DENGLER et al. 2013). While the overall number of plots was limited, it seems they are the first published from this region that thoroughly recorded not only vascular plants but also terricolous bryophytes and lichens. This aspect of sampling together with the different perspectives of phytosociologists from various countries outside Bulgaria in the expedition team allowed contributing to a clarification of the syntaxonomic position of Bulgarian dry grassland syntaxa in the European context.

We presented the first explicit documentation of the alliance *Violion caninae* and the order *Trifolio arvensis-Festucetalia ovinae* from Bulgaria. Further, we provided arguments to split up the heterogeneous Balkan dry grassland order *Astragalo-Potentilletalia* to place its content into the orders *Stipo pulcherrimae-Festucetalia pallentis* (*Saturejion montanae*), potentially *Festucetalia valesiacae*, *Brachypodietalia pinnati* (*Chrysopogono grylli-Danthonion calycinae*) and *Trifolio-Festucetalia* (most parts of the *Armerio rumelicae-Potentillion*). As these ideas are tentative at this stage, a much more comprehensive analysis of dry grassland syntaxa in Bulgaria as well as its neighbouring countries is needed for further clarification. Improving the knowledge about the mentioned vegetation types also con

Table 9. Scale-dependent richness values as well as slope parameters of the power-law species-area relationships (*z*) (means ± standard deviations) of the three phytosociological classes, based on the 15 "biodiversity plots". Different letters indicate significant differences between communities at α = 0.05 from Turkey's HSD test; *P*-values derived from ANOVAs.

Tabelle 9. Skalenabhängiger Artenreichtum sowie Steigungsparameter der mit dem Potenzgesetz modellierten Artenzahl-Areal-Beziehungen (*z*) im Vergleich der drei pflanzensoziologischen Klassen, basierend auf 15 „Biodiversitätsplots". Unterschiedliche Kleinbuchstaben bezeichnen signifikante Unterschiede (α = 0,05) gemäß Tukeys HSD-Test; in der letzten Spalte sind die *P*-Werte aus den Varianzanalysen angegeben.

Plot size	Min	Max	*Festuco-Brometea*	*Calluno-Ulicetea*	*Koelerio-Corynephoretea*	*P*
n			10	2	3	
Species richness of all taxa						
0.0001 m²	1	4	2.5 ± 0.9	3.3 ± 1.1	3.0 ± 0.5	0.395
0.001 m²	1	7	3.9 ± 1.8	6.0 ± 0.7	5.0 ± 1.3	0.233
0.01 m²	2	15	8.1 ± 3.9	11.8 ± 3.9	7.8 ± 2.8	0.441
0.1 m²	4	27	14.6 ± 6.6	17.8 ± 3.9	13.3 ± 2.5	0.711
1 m²	8	38	25.6 ± 9.0	27.0 ± 7.8	24.5 ± 5.4	0.949
10 m²	19	56	40.3 ± 11.3	41.3 ± 6.7	35.8 ± 10.3	0.802
100 m²	47	89	68.3 ± 14.5	60.0 ± 5.7	58.7 ± 7.6	0.466
Species richness of vascular plants						
0.0001 m²	1	4	2.1 ± 0.8	3.3 ± 1.1	2.3 ± 1.2	0.241
0.001 m²	1	7	3.3 ± 1.9	6.0 ± 0.7	4.3 ± 2.0	0.187
0.01 m²	2	15	7.2 ± 3.6	11.5 ± 3.5	6.7 ± 3.4	0.293
0.1 m²	4	22	13.3 ± 6.0	17.0 ± 3.5	11.2 ± 4.5	0.536
1 m²	8	33	23.3 ± 8.3	26.0 ± 7.8	19.0 ± 5.7	0.601
10 m²	16	55	36.5 ± 11.3	37.3 ± 6.7	27.2 ± 8.3	0.409
100 m²	38	87	61.2 ± 15.9	53.0 ± 4.2	44.3 ± 3.5	0.210
Species richness of bryophytes						
0.0001 m²	0	2	0.3 ± 0.5	0.0 ± 0.0	0.3 ± 0.3	0.704
0.001 m²	0	2	0.4 ± 0.5	0.0 ± 0.0	0.3 ± 0.3	0.639
0.01 m²	0	3	0.6 ± 0.8	0.3 ± 0.4	0.5 ± 0.5	0.878
0.1 m²	0	3	1.0 ± 1.0	0.8 ± 0.4	1.0 ± 0.9	0.951
1 m²	0	4	1.6 ± 1.3	1.0 ± 0.0	2.3 ± 0.8	0.453
10 m²	1	7	2.7 ± 2.0	3.8 ± 0.4	3.3 ± 0.8	0.684
100 m²	2	11	4.8 ± 2.7	6.5 ± 2.1	5.0 ± 1.0	0.678
Species richness of lichens						
0.0001 m²	0	1	0.1 ± 0.3	0.0 ± 0.0	0.2 ± 0.3	0.831
0.001 m²	0	2	0.2 ± 0.5	0.0 ± 0.0	0.2 ± 0.3	0.893
0.01 m²	0	3	0.3 ± 0.7	0.0 ± 0.0	0.5 ± 0.9	0.731
0.1 m²	0	2	0.4 ± 0.7	0.0 ± 0.0	0.8 ± 0.8	0.440
1 m²	0	4	0.6 ± 0.8[a]	0.0 ± 0.0[a]	2.8 ± 0.8[b]	0.002
10 m²	0	6	0.9 ± 1.2[a]	0.3 ± 0.4[a]	4.5 ± 1.3[b]	0.001
100 m²	0	11	1.8 ± 2.1[a]	0.5 ± 0.7[a]	7.7 ± 2.9[b]	0.004
Species-area relationship for all taxa						
z-value	0.196	0.341	0.253 ± 0.042	0.210 ± 0.019	0.218 ± 0.008	0.201

tributes to a better understanding of habitat diversity. This particularly applies to species-rich *Nardus* grasslands (listed as habitat 6230* in Annex I of the Habitats Directive) and to eastern sub-Mediterranean dry grasslands (62A0).

Finally, this study was probably the first on the Balkan Peninsula thoroughly recording diversity patterns of dry grassland vegetation across spatial scales and taxa. In many respects the results matched those in other dry grasslands of Europe. However, while most types of dry grasslands are among the richest plant communities of any region in Europe (DENGLER 2005, WILSON et al. 2012), one big question remains unsolved at present: Why are the dry grasslands of a few narrow regions in Europe, such as Transylvania, the White Carpathians and the hemiboreal alvar sites, so much richer than all others including those in the study area, though they seem to be similar in site conditions and species pool size? Despite first explanatory approaches (e.g. HÁJKOVÁ et al. 2011, DENGLER 2012, DENGLER et al. 2012a, MERUNKOVÁ et al. 2012), we are still far from truly understanding this astonishing pattern. The best chance to solve this riddle is the compilation of standardised high-quality richness data together with information on as many predictors across many different regions in Europe as possible and their use in a large-scale meta-analysis.

Erweiterte deutsche Zusammenfassung

Einleitung – Die Balkanhalbinsel ist innerhalb Europas überdurchschnittlich reich an Pflanzenarten und Endemiten, während zugleich halbnatürliche Grasländer von hohem Naturschutzwert dort noch großflächig erhalten sind. Bulgarien hinkt, was die pflanzensoziologische Inventarisierng angeht, den meisten anderen europäischen Ländern hinterher, da dort bis zum Fall des Eisernen Vorhangs die wenigen Vegetationskundler nahezu ausschließlich der russischen Schule folgten. Seither wurden zahlreiche pflanzensoziologische Studien durchgeführt, was zu einer besonders in den Graslandklassen gut mit Aufnahmen bestückten nationalen Vegetationsdatenbank führte (APOSTOLOVA et al. 2012). Allerdings fehlten bislang überregionale Analysen, die auf die Eingliederung der bulgarischen Einheiten in ein europaweites syntaxonomisches System abzielten. Europäische Trockenrasen sind ein besonders interessantes Studienobjekt für Biodiversitätsanalysen, unter anderem, da sie auf Flächengrößen unter 100 m² die globalen Rekorde im Pflanzenartenreichtum halten (DENGLER 2005, 2012, WILSON et al. 2012). Zum Verständnis der Diversitätsmuster in paläarktischen Trockenrasen und der sie steuernden Faktoren sowie als Beitrag zu einer konsistenten supranationalen Klassifikation derselben führt die *European Dry Grassland Group* (http://www.edgg.org) seit 2009 jährliche Forschungsexpeditionen in noch unzureichend erforschte Regionen durch, um dort Grundlagendaten mit einer standardisierten Erfassungsmethode zu erheben (vgl. DENGLER et al. 2012). Die vierte derartige Expedition führte im Sommer 2012 nach Westbulgarien mit den folgenden Hauptzielen: (1) Abgrenzung der vorkommenden Typen von Trockenrasen und Ermittlung ihrer Kennarten mit statistischen Methoden; (2) Einordnung dieser Einheiten in das europäische syntaxonomische System; (3) Grundverständnis der ökologischen Faktoren, die zur Differenzierung der Einheiten führen; (4) Dokumentation der Diversitätsmuster von Gefäßpflanzen, Moosen und Flechten auf verschiedenen räumlichen Skalenebenen.

Untersuchungsgebiete – Für die Expedition wählten wir zwei zuvor kaum untersuchte Regionen in Nordwestbulgarien aus, Vratsa im westlichen Teil des Balkangebirges (Stara planina) und Koprivshtitsa im Tal zwischen Stara planina und den südlich angrenzenden Mittelgebirgszug Sredna gora, einschließlich der niederen Lagen beider Höhenzüge (Abb. 1). Die beiden Regionen liegen größtenteils in *Sites of Community Interest* des Natura 2000-Netzes und beinhalten großflächig extensiv genutzte, meist trockene Grasländer (Abb. 2). Sie unterscheiden sich deutlich in ihren physisch-geografischen Voraussetzungen (Tab. 1), Vratsa mit Kalkgestein liegt auf 970–1400 m Meereshöhe und Koprivshtitsa mit Silikatgestein auf 630–1200 m Meereshöhe.

Methoden – Wir analysierten eine möglichst große Bandbreite der in den beiden Untersuchungsgebieten vorkommenden Trockenrasentypen mit zwei komplementären Erhebungsmethoden: (a) zum einen erfassten wir sogenannte Biodiversitätsplots (n = 15) von 100 m² Größe, in die je zwei Subplots der Größen 0,0001, 0,001, 0,01, 0,1, 1 und 10 m² in zwei gegenüberliegenden Ecken geschachtelt waren (vgl. DENGLER 2009b), (b) zum anderen fertigten wir zusätzliche normale Vegetationsaufnahmen auf 10 m² großen Flächen an (n = 68). Auf sämtlichen Aufnahmeflächen beider Erfassungsmethoden wurden sämtliche epigäischen Gefäßpflanzen, Moose und Flechten erfasst, auf den 10 m² großen Flächen (insgesamt n = 98) zusätzlich die prozentuale Deckung, topografische, Boden-, und Landnutzungsvariablen. Für die Vegetationsklassifikation wurden die 10 m² großen Flächen mit der modifizierten TWINSPAN-Methode (ROLEČEK et al. 2009) gegliedert. Für die erhaltenen Endcluster wurden diagnostische Arten mittels phi-Werten in Kombination mit Fishers exaktem Test (CHYTRÝ et al. 2002) nach Standardisierung der Aufnahmezahl auf 1/10 ermittelt, für die übergeordneten Einheiten nach den darauf aufbauenden Prinzipien von LUTHER-MOSEBACH et al. (2012). Eine DCA mit passiv hinein projezierten Umweltvariablen diente der Visualisierung der Anordnung der Vegetationseinheiten entlang von floristischen Hauptgradienten. Unterschiede in den Umweltbedingungen und Biodiversitätsparametern zwischen den Vegetationseinheiten analysierten wir mittels Varianzanalyse.

Vegetationsklassifikation – Die 10-Cluster-Lösung von TWINSPAN war die feinste Auflösung, die noch floristisch klar unterscheidbare Einheiten erbrachte und wurde daher als Assoziationsebene angenommen. Während wir die Zuordnung der Aufnahmen zu den Endclustern unverändert ließen, modifizierten wir die Anordnung dieser Einheiten in der Hierarchie geringfügig (Abb. 3), um unsere regionalen Ergebnisse in das existente und gut belegte überregionale Klassifikationssystem besser einpassen zu können. Entsprechend konnten wir drei Vegetationsklassen mit Trockenrasen im Gebiet nachweisen. Die Klasse *Festuco-Brometea* ist vertreten mit den Felstrockenrasen (*Stipo pulcherrimae-Festucetalia pallentis*) und den Kalk-Halbtrockenrasen (*Brachypodietalia pinnati*). Zur ersten Ordnung stellen wir den balkanischen Verband *Saturejion montanae*, der bislang verschiedenen anderen Ordnungen untergeordnet war, und der in den Untersuchungsgebieten mit drei assoziationsgleichen Einheiten vertreten ist, der *Dianthus petraeus-Sesleria latifolia*-Gesellschaft (Abb. 4), der *Achillea clypeolata-Festuca stojanovii*-Gesellschaft und der azidoklinen *Satureja pilosa-Phleum phleoides*-Gesellschaft. Die *Brachypodietalia pinnati* umfassen einerseits den Verband *Cirsio-Brachypodion pinnati* mit der *Ferulago campestris-Agrostis capillaris*-Gesellschaft, der *Tanacetum corymbosum-Sesleria latifolia*-Gesellschaft (Abb. 5) und der *Abietinella abietina-Sanguisorba minor*-Gesellschaft, andererseits den azidoklinen Verband *Chrysopogono grylli-Danthonion calycinae* mit dem *Agrostio capillaris-Chrysopogonetum grylli* (Abb. 6). Aus der Klasse *Calluno-Ulicetea* konnte erstmalig der Verband *Violion caninae* (Ordnung *Nardetalia strictae*) für Bulgarien nachgewiesen werden, vertreten durch die zuvor nur aus dem südlichen Mitteleuropa bekannte Assoziation *Festuco rubrae-Genistelletum sagittalis* (Abb. 7). Die Klasse *Koelerio-Corynephoretea* war zuvor so gut wie nicht aus Bulgarien dokumentiert worden, so dass wir die beiden von uns gefundenen, in der Region von Kovprivshtitsa weit verbreiteten Assoziationen neu beschreiben mussten. Das *Cetrario aculeatae-Plantaginetum subulatae* ass. nov. (Abb. 8) ist eine offene, kryptogamenreiche Felsgrusflur saurer Gesteine und gehört wohl zu einem noch unbeschriebenen Verband der Ordung *Sedo-Scleranthetalia*. Das *Plantagini subulatae-Agrostietum capillaris* ass. nov. (Abb. 9) ist dagegen ein Sandhalbtrockenrasen mit meist recht geschlossener Grasnarbe, der sich zwanglos in den zuvor beschriebenen Verband *Armerio rumelicae-Potentillion* einordnen lässt, welcher aber entgegen der üblichen Praxis in der Region nicht in die Ordnung *Astragalo-Potentilletalia* (*Festuco-Brometea*), sondern die Ordnung *Trifolio arvensis-Festucetalia ovinae* (*Koelerio-Corynephoretea*) gestellt werden sollte. Alle Assoziationen bzw. assoziationsgleichen Einheiten werden vegetationsökologisch charakterisiert, ihre Ökologie und Verbreitung beschrieben und ihre Klassifikation im regionalen wie überregionalen Kontext diskutiert. Im Anhang S1 werden nomenklatorische Probleme erörtert und ggf. Typisierungen vorgenommen.

Ökologie und Biodiversität – Die DCA (Abb. 10) trennte entlang der ersten Achse (a) artenreiche Gesellschaften auf humus- und tonreichen Böden der basenreichen Gesteine des Gebiets um Vratsa von (b) relativ artenarmen Gesellschaften auf humus- und tonarmen Böden saurer Ausgangsgesteine um

Kovprivshtitsa. Entsprechend unterscheiden sich die Aufnahmen der beiden Klassen *Festuco-Brometea* und *Koelerio-Corynpephoretea* signifikant in ihren Umweltbedingungen- und in ihrer Biodiversität, während die *Calluno-Ulicetea* meist eine intermediäre Stellung einnehmen (Tab. 7). Mit 47–89 Arten auf 100 m² sind die untersuchten Bestände artenreich, aber erreichen nicht Extremwerte wie etwa in Siebenbürgen oder den Weißen Karpaten. Mit einem durchschnittlichen *z*-Wert von 0.25 ist zumindest in den *Festuco-Brometea*-Gesellschaften auch die *β*-Diversität ungewöhnlich hoch (Tab. 9).

Resümee und Ausblick – Der gemeinsame Blick von Trockenrasenspezialisten aus Bulgarien und verschiedenen anderen europäischen Ländern half im Rahmen der EDGG-Expedition, die vielfältigen Trockenrasentypen Nordwestbulgariens besser in ein überregionales System einzuordnen und leistet damit einen wichtigen Beitrag zu einer konsistenten europaweiten Klassifikation. Die standardisierte Erfassung der Biodiversitätsmuster von Gefäßpflanzen, Moosen und Flechten auf verschiedenen räumlichen Skalenebenen lieferte wertvolle Grundlagendaten (vor allem bei den Nicht-Gefäßpflanzen) und stellt einen wichtigen Beitrag zum Verständnis der treibenden Kräfte der Biodiversitsmuster paläarktischer Trockenrasen dar.

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Supplements and Appendices

Supplement 1. Table 4. Abridged synoptic table of the dry grassland communities in the study region in NW Bulgaria.

Beilage 1. Tabelle 4. Gekürzte Stetigkeitstabelle der analysierten Trockenrasengesellschaften Nordwest-Bulgariens.

Supplement 2. Table 5. Relevé table of the *Festuco-Brometea* communities in the study region in NW Bulgaria.

Beilage 2. Tabelle 5. Aufnahmentabelle der untersuchten *Festuco-Brometea*-Gesellschaften Nordwest-Bulgariens.

Supplement 3. Table 6. Relevé table of the *Calluno-Ulicetea* and *Koelerio-Corynephoretea* communities in the study region in NW Bulgaria.

Beilage 3. Tabelle 6. Relevé table of the *Calluno-Ulicetea* and *Koelerio-Corynephoretea* communities in the study region in NW Bulgaria.

Appendix 1. New descriptions and typifications of syntaxa.
The references to all given authorities are included in the reference list.

Anhang 1. Neubeschreibungen und Typisierungen von Syntaxa.
The Quellen zu allen Autoren von Syntaxa sind im Quellenverzeichnis aufgeführt.

Cetrario aculeatae-Plantaginetum subulatae **Pedashenko et al. ass. nov. hoc loco**
Type: Relevé BGR039 in Table 6 of this publication [Holotypus hoc loco]

Plantagini subulatae-Agrostietum capillaris **Pedashenko et al. ass. nov. hoc loco**
Type: Relevé BGR056 in Table 6 of this publication [Holotypus hoc loco]

Tuberario guttatae-Corynephoretea **Hohenester 1967**
Type: *Corynephoretalia* Tx. ex Hohenester 1967 [Lectotypus hoc loco]

Armerio rumelicae-Potentillion **Micevski 1978**
Protologue: "*Armerio-Potentillion*" MICEVSKI (1978: pp. 21 et seq.)
Type: *Genisto carinalis-Agrostietum byzanthinae* Micevski 1978* [Lectotypus hoc loco]

Saturejion montanae **Horvat et al. 1974**
Protologue: "*Saturejon montanae* Horvat 62" (HORVAT et al. 1974: p. 264)
Type: *Carici humilis-Stipetum grafianae* Jovanović-Dunjić 1955 [Lectotypus hoc loco]

Agrostio capillaris-Chrysopogonetum grylli **Kojić 1959**
Protologue: "Asocijacija *Agrostideto-Chyrsopogonetum grylli* (As. *Agrostis capillaris-Chyrsopogon gryllus*)" (KOJIĆ 1959: pp. 12–30)
Type: KOJIĆ (1959: Table 9, relevé 6) [Lectotypus hoc loco]

Carici humilis-Stipetum grafianae Jovanović-Dunjić 1955
Protologue: "*Humileto-Stipetum grafianae*" (JOVANOVIĆ-DUNJIĆ 1955)
Type: JOVANOVIĆ-DUNJIĆ (1955: Table 4, relevé 5) [Lectotypus hoc loco]

Additional supporting information may be found in the online version of this article.

Zusätzliche unterstützende Information ist in der Online-Version dieses Artikels zu finden.

Appendix S1. Overview and nomenclatural revision of the syntaxa discussed.

Anhang S1. Übersicht und nomenklatorische Revision der diskutierten Syntaxa.

Appendix S2. Origin of the relevés

Anhang S2. Herkunftsnachweis der Aufnahmen

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Table 4. Abridged synoptic table of the dry grassland communities in the study region in NW Bulgaria
Species are arranged according to decreasing phi-values in the respective species blocks (only those species that were significant according to Fisher's exact test are included) and according to decreasing overall constancy for the non-diagnostic species. Percentage constancies are given, whith the superscript symbols represent the phi values (** > 0.50; * > 0.25; ° > 0.00), and means of the header data, based on association means. Diagnostic species are highlighted in dark grey, while transgressive diagnostic species and differential species are highlighted in light grey and additionally marked in the column left of the species names. FB = *Festuco-Brometea* ; CU = *Calluno-Ulicetea* ; KC = *Koelerio-Corynephoretea* .

Tabelle 4. Gekürzte Stetigkeitstabelle der analysierten Trockenrasengesellschaften Nordwest-Bulgariens
Die Arten sind nach fallenden phi-Werten im jeweiligen Block angeordnet (wobei nur Arten mit statistisch signifikanter Häufung gemäß Fishers exaktem Test gelistet sind) bzw. nach fallender Gesamtstetigkeit im Fall der nicht diagnostischen Arten (Begleiter). Die Zahlen im Artenteil der Tabelle stellen prozentuale Stetigkeitswerte dar, wobei die hochgestellten Symbole die phi-Werte repräsentieren (** > 0.50; * > 0.25; ° > 0.00), während die Zahlen im Kopfteil der Tabelle Assoziationsmittelwerte sind. Diagnostische Arten sind in dunkelgrau hervorgehoben, transgressive diagnostische Arten und Differentialarten dagegen in hellgrau, mit zusätzlicher Kennzeichnung in der Spalte links vom Artnamen. FB = *Festuco-Brometea* ; CU = *Calluno-Ulicetea* ; KC = *Koelerio-Corynephoretea* .

	Syntaxon	All	FB	CU	KC	1.1	1.2	1.3	2.1	3.1	3.2	1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.2.3	1.3.1	2.1.1	3.1.1	3.2.1
	Number of associations		7	1	2	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Number of relevés		58	6	34	22	22	14	6	14	20	8	10	4	9	6	7	14	6	14	20
	Grazing intensity (0 = none to 3 = high)	**0.9**	0.8	0.8	1.1	0.6	0.8	1.3	0.8	1.2	1.0	0.5	1.0	0.3	0.8	0.7	1.0	1.3	0.8	1.2	1.0
	Burning (0 = no; 1 = yes)	**0.04**	0.0	0.3	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.0
	Altitude [m a.s.l.]	**1036**	1113	1059	909	1077	1210	929	1059	901	916	1409	1003	819	1271	1275	1083	929	1059	901	916
	Aspect [°]		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Inclination [°]	**17**	20	17	16	27	15	14	17	17	15	30	19	31	13	19	12	14	17	17	15
	Heat index	**0.05**	0.11	-0.19	0.04	0.28	-0.04	0.03	-0.19	0.09	-0.01	0.65	-0.14	0.33	-0.06	-0.10	0.05	0.03	-0.19	0.09	-0.01
	Microrelief [cm]	**14**	17	8	13	28	11	4	8	16	9	23	29	33	12	13	7	4	8	16	9
	Total vegetation cover [%]	**80**	79	93	71	63	93	89	93	61	81	77	72	40	97	94	87	89	93	61	81
	Cover shrub layer [%]	**0.2**	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0
	Cover herb layer [%]	**73**	76	92	54	58	91	87	92	39	70	70	70	33	97	93	84	87	92	39	70
	Cover cryptogam layer [%]	**10**	5	3	23	7	4	3	3	28	18	8	4	8	2	2	7	3	3	28	18
	Cover dead wood [%]	**0.1**	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
	Cover litter [%]	**20**	22	8	10	11	25	46	8	4	16	18	15	1	37	28	11	46	8	4	16
	Cover stones and rocks [%]	**11**	14	0	14	29	3	0	0	19	8	17	28	43	0	3	6	0	0	19	8
	Cover fine earth [%]	**7**	8	3	12	13	4	2	3	16	7	6	4	31	2	3	6	2	3	16	7
	Species richness (total)	**38.4**	41.0	41.0	32.5	38.8	45.5	34.5	41.0	28.6	36.4	40.8	48.4	27.3	41.9	46.7	47.9	34.5	41.0	28.6	36.4
	Species richness (vascular plants)	**34.1**	37.5	37.0	26.0	34.4	42.2	32.5	37.0	20.8	31.2	36.5	44.8	22.0	39.8	43.2	43.6	32.5	37.0	20.8	31.2
	Species richness (bryophytes)	**2.6**	2.4	3.2	2.9	2.6	2.7	1.4	3.2	3.1	2.8	2.0	3.0	2.8	2.1	3.2	2.7	1.4	3.2	3.1	2.8
	Species richness (lichens)	**1.8**	1.1	0.8	3.7	1.8	0.6	0.6	0.8	4.9	2.5	2.1	0.6	2.8	0.0	0.3	1.4	0.6	0.8	4.9	2.5
	Cl. 1 - Festuco-Brometea																				
	Teucrium chamaedrys	**42**	67**	.	13	75*	76*	14	.	.	25	75°	100*	50°	44	83°	100*	14	.	.	25
	Veronica austriaca subsp. austriaca	**26**	42*	.	3	43°	56*	.	.	.	5	38°	90*	.	33°	50°	86*	.	.	.	5
	Helianthemum nummularium	**28**	42*	.	5	32°	53*	43°	.	.	10	75°	20	.	44°	100**	14	43°	.	.	10
	Sesleria latifolia	**18**	34*	.	.	43*	36°	.	.	.	.	88**	40°	.	11	83*	14	.	.	.	.
	Filipendula vulgaris	**22**	33*	.	.	23	40*	43°	.	.	.	.	70*	.	44°	33°	43°	43°	.	.	.
	Medicago lupulina	**18**	33*	.	.	28°	49*	.	.	.	.	25°	60*	.	11	50°	86*	.	.	.	.
	Scabiosa columbaria subsp. columbaria	**17**	29*	.	3	30°	38*	.	.	.	5	50°	40°	.	22°	50°	43°	.	.	.	5
	Seseli peucedanoides	**14**	25*	.	.	20°	34*	14	.	.	.	50*	10	.	22°	67*	14	14	.	.	.
	Carex humilis	**13**	24*	.	.	35*	20°	.	.	.	.	75**	30°	.	11	50*	.	.	.	.	.
	Tortella tortuosa	**13**	23*	.	.	25°	29°	.	.	.	.	25°	50*	.	11	33°	43°	.	.	.	.
	Medicago sativa subsp. falcata	**13**	23*	.	.	23°	29°	.	.	.	.	.	70*	.	.	17°	71**	.	.	.	.
	Acinos arvensis	**12**	22*	.	.	21°	29*	.	.	.	.	13	50*	.	.	17°	71**	.	.	.	.
	All. 1.1 - Saturejion montanae (order Stipo pulcherrimae-Festucetalia pallentis)																				
	Asperula purpurea subsp. purpurea	**26**	42*	.	9	83**	15	.	.	7	10	75*	100*	75*	.	17	29	.	.	7	10
	Koeleria macrantha agg.	**48**	62*	.	37	88*	42	43	.	29	45	75°	90*	100*	22	33	71°	43	.	29	45
	Allium flavum subsp. flavum	**11**	19*	.	.	38*	6	.	.	.	.	75**	40*	.	.	17°	.	.	.	.	.
	Satureja montana subsp. kitaibelii	**14**	23*	.	.	43*	10	.	.	.	.	50*	80**	.	.	17°	14	.	.	.	.
	Teucrium montanum	**14**	24*	.	.	41*	16	.	.	.	.	63*	60*	.	.	33°	14	.	.	.	.
	Sedum hispanicum	**4**	8°	.	.	16*	.	7°	.	.	.	13°	10°	25*	.	.	.	7°	.	.	.
	Vincetoxicum hirundinaria	**5**	9°	.	.	16*	6	.	.	.	.	38*	10°	.	.	17°	.	.	.	.	.
	Assoc. 1.1.1 - Dianthus petraeus-Sesleria latifolia comm.																				
1	Potentilla cinerea agg.	**12**	23*	.	.	33*	20°	.	.	.	.	100**	.	.	11	33°	14	.	.	.	.
1.1	Erysimum diffusum	**7**	12°	.	.	28*	.	.	.	.	.	63**	20°	.	.	.	.	.	.	.	.
1.1	Dianthus petraeus	**15**	24*	.	4	43*	13	.	.	7	.	88**	40°	.	22°	17	.	.	.	7	.
	Sedum ochroleucum	**3**	5°	.	.	13*	.	.	.	.	.	38**	.	.	.	.	.	.	.	.	.
	Sesleria rigida	**3**	5°	.	.	13*	.	.	.	.	.	38**	.	.	.	.	.	.	.	.	.
	Draba lasiocarpa	**4**	7°	.	.	13°	5	.	.	.	.	38*	.	.	.	.	14°	.	.	.	.
	Astragalus monspessulanus	**2**	4°	.	.	8°	.	.	.	.	.	25*	.	.	.	.	.	.	.	.	.
	Inula ensifolia	**2**	4°	.	.	8°	.	.	.	.	.	25*	.	.	.	.	.	.	.	.	.
	Iris reichenbachii	**2**	4°	.	.	8°	.	.	.	.	.	25*	.	.	.	.	.	.	.	.	.
	Ornithogalum comosum	**2**	4°	.	.	8°	.	.	.	.	.	25*	.	.	.	.	.	.	.	.	.
	Stipa cf. pennata subsp. eriocaulis	**2**	4°	.	.	8°	.	.	.	.	.	25*	.	.	.	.	.	.	.	.	.
	Toninia sedifolia	**2**	4°	.	.	8°	.	.	.	.	.	25*	.	.	.	.	.	.	.	.	.
	Anthyllis vulneraria	**8**	14°	.	.	17°	17°	.	.	.	.	50*	.	.	22°	.	29°	.	.	.	.
	Verbascum lychnitis	**6**	9°	.	3	16°	5	.	.	.	5	38*	10°	.	.	.	14°	.	.	.	5
	Cetraria islandica	**4**	4	.	7°	8°	.	.	.	14°	.	25*	.	.	.	.	.	.	.	14°	.
1.1	Sedum album	**7**	12°	.	.	19*	8°	.	.	.	.	38*	20°	.	11°	.	14°	.	.	.	.
	Coronilla varia	**3**	6°	.	.	8°	6°	.	.	.	.	25*	.	.	.	17°	.	.	.	.	.
	Ditrichum flexicaule	**3**	6°	.	.	8°	6°	.	.	.	.	25*	.	.	.	17°	.	.	.	.	.
	Pedicularis leucodon subsp. occulta	**3**	6°	.	.	8°	6°	.	.	.	.	25*	.	.	.	17°	.	.	.	.	.
	Seseli degenii	**3**	6°	.	.	8°	6°	.	.	.	.	25*	.	.	.	17°	.	.	.	.	.
	Cladonia pocillum	**7**	9°	17°	3	13°	10°	.	17°	.	5	38*	.	.	.	.	29°	.	17°	.	5
	Cladonia symphycarpia	**10**	11°	17°	8	16°	10	.	17°	.	15°	38*	10	.	.	.	29°	.	17°	.	15°
	Assoc. 1.1.2 - Achillea clypeolata-Festuca stojanovii comm.																				
	Inula oculus-christi	**10**	16°	.	.	27*	10	.	.	.	.	.	80**	.	.	.	29°	.	.	.	.
	Geranium columbinum	**11**	16°	.	3	27*	10	.	.	.	5	.	80**	.	.	.	29°	.	.	.	5
	Stachys recta	**5**	7°	.	.	17*	.	.	.	.	.	.	50**	.	.	.	.	.	.	.	.
1.1	Achillea clypeolata	**9**	14°	.	.	32*	.	.	.	.	.	25°	70**	.	.	.	.	.	.	.	.
	Orlaya grandiflora	**8**	10°	.	3	20*	.	7	.	.	5	.	60**	.	.	.	.	7	.	.	5
	Poa compressa	**8**	10°	.	3	20*	4	.	.	.	5	.	60**	.	11°	.	.	.	.	.	5
1.1	Melica ciliata subsp. ciliata	**9**	16°	.	.	32*	5	.	.	.	.	.	70**	25°	.	.	14°	.	.	.	.
	Origanum vulgare	**6**	9°	.	.	17*	4	.	.	.	.	.	50**	.	11°	.	.	.	.	.	.
	Alyssum campestre	**6**	9°	.	.	17*	5	.	.	.	.	.	50**	.	.	.	14°	.	.	.	.
	Festuca cf. stojanovii	**6**	9°	.	.	17*	5	.	.	.	.	.	50**	.	.	.	14°	.	.	.	.
	Medicago minima	**6**	9°	.	.	17*	5	.	.	.	.	.	50**	.	.	.	14°	.	.	.	.
	Vicia sativa subsp. nigra	**5**	6°	.	3	13*	.	.	.	.	5°	.	40**	.	.	.	.	.	.	.	5°
	Elymus repens subsp. repens	**9**	14°	.	.	20°	12°	.	.	.	.	.	60**	.	22°	.	14°	.	.	.	.
	Centaurea orientalis	**3**	4°	.	.	10*	.	.	.	.	.	.	30**	.	.	.	.	.	.	.	.
	Fraxinus ornus	**3**	4°	.	.	10*	.	.	.	.	.	.	30**	.	.	.	.	.	.	.	.
	Stipa capillata	**3**	4°	.	.	10*	.	.	.	.	.	.	30**	.	.	.	.	.	.	.	.
	Torilis nodosa	**3**	4°	.	.	10*	.	.	.	.	.	.	30**	.	.	.	.	.	.	.	.
	Xeranthemum annuum	**3**	4°	.	.	10*	.	.	.	.	.	.	30**	.	.	.	.	.	.	.	.
	Calamintha nepeta	**5**	8°	.	.	13°	5	.	.	.	.	.	40**	.	.	.	14°	.	.	.	.
1	Bupleurum falcatum	**11**	19*	.	.	28*	16°	.	.	.	.	25°	60*	.	.	33°	14°	.	.	.	.
	Helleborus odorus subsp. odorus	**7**	9°	.	3	13°	7°	.	.	.	5	.	40*	.	22°	.	.	.	.	.	5
	Anthericum ramosum	**2**	3°	.	.	7°	.	.	.	.	.	.	20*	.	.	.	.	.	.	.	.
	Bromus cf. erectus	**2**	3°	.	.	7°	.	.	.	.	.	.	20*	.	.	.	.	.	.	.	.
	Geranium sanguineum	**10**	17°	.	.	17°	23°	.	.	.	.	.	50*	.	22°	33°	14°	.	.	.	.
	Prunus spinosa	**8**	11°	.	4	18°	5	7	.	7	.	13°	40*	.	.	.	14°	7	.	7	.
1	Poa angustifolia	**22**	30*	.	8	23°	34°	36°	.	.	15	.	70*	.	22°	50°	29°	36°	.	.	15
	Convovulus arvensis	**3**	3°	.	3	7°	.	.	.	.	5°	.	20*	.	.	.	.	.	.	.	5°
	Carduus acanthoides	**9**	11°	.	5	13°	13°	.	.	.	10°	.	40*	.	11°	.	29°	.	.	.	10°
1.1	Syntrichia ruralis agg.	**6**	6°	.	6°	14*	.	.	.	7°	5	13°	30*	.	.	.	.	.	.	7°	5
	Crataegus monogyna	**16**	17°	.	11	17°	14	29°	.	7	15°	.	50*	.	11	17°	14°	29°	.	7	15°
	Arabis auriculata	**5**	8°	.	.	14°	6	.	.	.	.	13°	30*	.	.	17°	.	.	.	.	.
	Scabiosa ochroleuca	**18**	25°	33°	3	24°	31°	7	33°	.	5	13	60*	.	33°	17	43°	7	33°	.	5
	Sherardia arvensis	**3**	5°	.	.	7°	5°	.	.	.	.	.	20*	.	.	.	14°	.	.	.	.
	Logfia arvensis	**13**	13°	.	18°	22°	10	.	.	21°	15°	.	40*	25°	.	.	29°	.	.	21°	15°
	Assoc. 1.1.3 - Satureja pilosa-Phleum phleoides comm.																				
	Satureja pilosa	**5**	14°	.	4	33*	.	.	.	7	.	.	.	100**	.	.	.	.	.	7	.
	Silene armeria	**16**	15	.	31°	33*	.	7	.	21°	40°	.	.	100**	.	.	.	7	.	21°	40°
	Phleum phleoides	**18**	23°	.	20	33°	13	21°	.	.	40°	.	.	100**	22°	17	.	21°	.	.	40°
	Euphorbia myrsinites	**4**	7°	.	5	17*	.	.	.	.	10°	.	.	50**	.	.	.	.	.	.	10°
	Lepraria sp.	**4**	7°	.	6	17*	.	.	.	7°	5	.	.	50**	.	.	.	.	.	7°	5
	Anthemis carpatica subsp. carpatica	**5**	7°	.	8°	17*	.	.	.	.	15°	.	.	50**	.	.	.	.	.	.	15°
	Veronica dillenii	**5**	8°	.	5	17*	.	7°	.	.	10°	.	.	50**	.	.	.	7°	.	.	10°
	Silene frivaldszkyana	**7**	7	.	16°	17°	.	.	.	21°	10°	.	.	50**	.	.	.	.	.	21°	10°
	Allium sphaerocephalon subsp. sphaerocephalon	**1**	4°	.	.	8°	.	.	.	.	.	.	.	25*	.	.	.	.	.	.	.
	Asperula tinctoria	**1**	4°	.	.	8°	.	.	.	.	.	.	.	25*	.	.	.	.	.	.	.
	Bryum alpinum	**1**	4°	.	.	8°	.	.	.	.	.	.	.	25*	.	.	.	.	.	.	.
	Cladonia convoluta	**1**	4°	.	.	8°	.	.	.	.	.	.	.	25*	.	.	.	.	.	.	.
	Cladonia floerkeana	**1**	4°	.	.	8°	.	.	.	.	.	.	.	25*	.	.	.	.	.	.	.
	Lactuca viminea subsp. viminea	**1**	4°	.	.	8°	.	.	.	.	.	.	.	25*	.	.	.	.	.	.	.
	Trapeliopsis granulosa	**1**	4°	.	.	8°	.	.	.	.	.	.	.	25*	.	.	.	.	.	.	.
	Dichantium ischaemum	**18**	20°	.	26°	28°	14	14	.	21°	30°	.	10	75*	.	.	43°	14	.	21°	30°
	All. 1.2 - Cirsio-Brachypodion pinnati (order Brachypodietalia pinnati)																				
	Stachys officinalis	**13**	24*	.	.	.	57**	.	.	.	.	.	.	.	89**	67*	14	.	.	.	.
	Plantago media	**16**	30*	17	.	4	66**	.	17	.	.	13	.	.	44°	67*	86**	.	17	.	.
	Primula veris	**18**	34*	.	.	15	65**	.	.	.	.	25°	20	.	67*	100**	29°	.	.	.	.
	Prunella grandiflora subsp. grandiflora	**13**	23*	.	3	4	50**	.	.	.	5	13	.	.	56*	67*	29°	.	.	.	5
	Brachypodium pinnatum subsp. pinnatum	**18**	33*	.	4	15	61**	.	.	7	.	25°	20	.	44°	67*	71*	.	.	7	.
	Pimpinella saxifraga	**14**	24*	.	4	4	48**	14	.	7	.	13	.	.	33°	67*	43°	14	.	7	.
	Asyneuma canescens subsp. canescens	**7**	13°	.	.	.	30*	.	.	.	.	.	.	.	56**	33*	.	.	.	.	.
	Trifolium montanum	**6**	12°	.	.	.	27*	.	.	.	.	.	.	.	33*	33*	14°	.	.	.	.
	Veratrum nigrum	**6**	12°	.	.	.	27*	.	.	.	.	.	.	.	33*	33*	14°	.	.	.	.
	Thymus pulegioides	**14**	25*	.	.	13	43*	7	.	.	.	.	40°	.	22°	50*	57*	7	.	.	.
	Tragopogon pratensis subsp. orientalis	**4**	8°	.	.	.	19*	.	.	.	.	.	.	.	11°	17°	29*	.	.	.	.
1	Galium mollugo agg.	**18**	33*	.	.	30°	47*	.	.	.	.	50°	40°	.	33°	50°	57*	.	.	.	.
	Avenula pubescens	**4**	7°	.	.	.	17*	.	.	.	.	.	.	.	22*	.	29*	.	.	.	.
	Inula hirta	**7**	13°	.	.	4	23*	7	.	.	.	13°	.	.	22°	33*	14°	7	.	.	.
	Clinopodium vulgare subsp. vulgare	**5**	9°	.	.	.	18*	7°	.	.	.	.	.	.	22°	17°	14°	7°	.	.	.
1	Fragaria viridis subsp. viridis	**13**	22*	.	.	18°	32*	7	.	.	.	13	40°	.	33°	33°	29°	7	.	.	.
	Brachythecium glareosum	**10**	15°	17°	3	3	27*	14°	17°	.	5	.	10	.	33°	33°	14°	14°	17°	.	5
	Campyliadelphus chrysophyllus	**1**	4°	.	.	.	10*	.	.	.	.	.	.	.	.	17*	14°	.	.	.	.
	Gentiana cruciata subsp. cruciata	**2**	4°	.	.	.	10*	.	.	.	.	.	.	.	.	17*	14°	.	.	.	.
	Alchemilla flabellata	**2**	4°	.	.	.	9*	.	.	.	.	.	.	.	11°	17*	.	.	.	.	.
	Centaurea jacea agg.	**2**	4°	.	.	.	9*	.	.	.	.	.	.	.	11°	17*	.	.	.	.	.
	Colchicum autumnale	**6**	11°	.	.	8	18*	.	.	.	.	13°	10°	.	22°	17°	14°	.	.	.	.
	Assoc. 1.2.1 - Ferulago campetris-Agrostis capillaris comm.																				
	Ferulago campestris	**5**	8°	.	.	.	19*	.	.	.	.	.	.	.	56**	.	.	.	.	.	.
	Hypericum maculatum subsp. maculatum	**6**	9°	.	.	.	19*	7°	.	.	.	.	.	.	56**	.	.	7°	.	.	.
	Carex montana	**3**	5°	.	.	.	11*	.	.	.	.	.	.	.	33**	.	.	.	.	.	.
	Centaurea phrygia agg.	**3**	5°	.	.	.	11*	.	.	.	.	.	.	.	33**	.	.	.	.	.	.
1.2	Allium carinatum subsp. carinatum	**11**	17°	.	3	4	33*	7	.	.	5	13°	.	.	67**	33°	.	7	.	.	5
1.2	Lathyrus pratensis	**5**	9°	.	.	.	20*	.	.	.	.	.	.	.	44**	17°	.	.	.	.	.
	Campanula patula	**6**	7°	17°	.	.	15°	7°	17°	.	.	.	.	.	44*	.	.	7°	17°	.	.
1.2	Festuca nigrescens subsp. nigrescens	**9**	11°	33°	.	.	24*	7	33°	.	.	.	.	.	56*	17°	.	7	33°	.	.
	Astrantia major subsp. major	**2**	3°	.	.	.	7°	.	.	.	.	.	.	.	22*	.	.	.	.	.	.
	Gladiolus imbricatus	**2**	3°	.	.	.	7°	.	.	.	.	.	.	.	22*	.	.	.	.	.	.
	Rorippa pyrenaica	**2**	3°	.	.	.	7°	.	.	.	.	.	.	.	22*	.	.	.	.	.	.
1.2	Vicia incana	**4**	7°	.	.	.	17*	.	.	.	.	.	.	.	33*	17°	.	.	.	.	.
	Dianthus carthusianorum	**6**	5	.	9°	.	11°	.	.	7°	10°	.	.	.	33*	.	.	.	.	7°	10°
	Vicia villosa subsp. villosa	**3**	3°	.	3	.	7°	.	.	.	5°	.	.	.	22*	.	.	.	.	.	5°
	Potentilla recta	**6**	10°	.	.	8°	17°	.	.	.	.	13°	10°	.	33*	17°	.	.	.	.	.
1.2	Thalictrum minus	**3**	5°	.	.	.	12*	.	.	.	.	.	.	.	22*	.	14°	.	.	.	.
1.2	Trifolium rubens	**3**	5°	.	.	.	12*	.	.	.	.	.	.	.	22*	.	14°	.	.	.	.
	Scorzonera hispanica	**6**	11°	.	.	8°	17°	.	.	.	.	25°	.	.	33*	17°	.	.	.	.	.
	Trifolium aureum	**7**	11°	.	.	4	17°	14°	.	.	.	13°	.	.	33*	17°	.	14°	.	.	.
	Assoc. 1.2.2 - Tanacetum corymbosum-Sesleria latifolia comm.																				
	Tanacetum corymbosum	**2**	5°	.	.	.	11*	.	.	.	.	.	.	.	.	33**	.	.	.	.	.
1.2	Viola hirta	**10**	20*	.	.	12	34*	.	.	.	.	25°	10	.	22°	67**	14°	.	.	.	.
1.2	Centaurea triumfetti	**6**	12°	.	.	8	20*	.	.	.	.	25°	.	.	11°	50*	.	.	.	.	.
1.2	Campanula glomerata	**3**	6°	.	.	.	15*	.	.	.	.	.	.	.	11°	33*	.	.	.	.	.
1.2	Centaurea scabiosa	**4**	7°	.	3	.	16*	.	.	.	5	.	.	.	.	33*	14°	.	.	.	5
	Thesium linophyllon	**5**	10°	.	.	12°	11°	.	.	.	.	25°	10°	.	.	33*	.	.	.	.	.
	Assoc. 1.2.3 - Abietinella abietina-Sanguisorba minor comm.																				
	Petrorhagia saxifraga	**6**	11°	.	.	7	19*	.	.	.	.	.	20°	.	.	.	57**	.	.	.	.
	Abietinella abietina	**15**	23°	17	3	13	38*	7	17	.	5	.	40°	.	11	17	86**	7	17	.	5
	Minuartia viscosa	**2**	4°	.	.	.	10*	.	.	.	.	.	.	.	.	.	29**	.	.	.	.
	Odontites verna subsp. serotina	**6**	8°	.	5	3	14°	.	.	.	10°	.	10°	.	.	.	43**	.	.	.	10°
1.2	Sanguisorba minor	**29**	41*	.	18	31	61*	14	.	.	35°	13	30	50°	33°	50°	100*	14	.	.	35°
	Polygala comosa	**3**	6°	.	.	4°	10°	.	.	.	.	13°	.	.	.	.	29*	.	.	.	.
	Euphrasia cf. stricta	**4**	5°	.	4	.	10°	7°	.	7°	.	.	.	.	.	.	29*	7°	.	7°	.
	Poa pratensis	**4**	7°	.	.	3	10°	7°	.	.	.	.	10°	.	.	.	29*	7°	.	.	.
	Stachys germanica subsp. germanica	**4**	6	17°	.	3	10°	.	17°	.	.	.	10°	.	.	.	29*	.	17°	.	.
	Lotus corniculatus	**41**	38	50°	37	20	54°	43°	50°	14	60°	50°	10	.	44°	33	86*	43°	50°	14	60°
	Trifolium pratense	**18**	20°	33°	9	.	36*	36°	33°	7	10	.	.	.	33°	17	57*	36°	33°	7	10
	Euphrasia pectinata	**13**	13	17°	15°	8	20°	7	17°	.	30°	.	.	25°	.	17°	43*	7	17°	.	30°
	Asperula cynanchica	**65**	68°	33	64°	64°	70°	71°	33	57	70°	63	80°	50	44	67°	100*	71°	33	57	70°
	All. 1.3 - Chrysopogono grylli-Danthonion calycinae (order Brachypodietalia pinnati?): Assoc. 1.3.1 - Agrostio capillaris-Chrysopogonetum grylli																				
	Rhinanthus rumelicus	**11**	7	17°	9°	.	.	50**	17°	7	10°	.	.	.	.	.	.	50**	17°	7	10°
	Prunella laciniata	**7**	7°	17°	.	.	6	36*	17°	.	.	.	.	.	.	17°	.	36*	17°	.	.
	Galium verum	**37**	34°	50°	24	.	52°	86*	50°	7	40°	.	.	.	67°	17	71*	86*	50°	7	40°
	Phleum pratense subsp. bertolonii	**2**	2°	.	.	.	.	14*	.	.	.	.	.	.	.	.	.	14*	.	.	.
	Prunella vulgaris	**2**	2°	.	.	.	.	14*	.	.	.	.	.	.	.	.	.	14*	.	.	.
	Veronica officinalis	**2**	2°	.	.	.	.	14*	.	.	.	.	.	.	.	.	.	14*	.	.	.
	Cerastium fontanum subsp. vulgare	**4**	5°	.	.	.	4°	21*	.	.	.	.	.	.	11°	.	.	21*	.	.	.
	Chamaecytisus heuffelii	**5**	3	.	6°	.	.	21*	.	7°	5°	.	.	.	.	.	.	21*	.	7°	5°
	Ajuga genevensis	**5**	5°	.	3	4°	.	21*	.	.	5°	13°	.	.	.	.	.	21*	.	.	5°
	Cichorium intybus	**13**	13°	.	14°	8	10	36*	.	7	20°	.	.	25°	.	.	29°	36*	.	7	20°
	Cl. 2 - Calluno-Ulicetea: Order - Nardetalia strictae: Alliance 2.1 - Violion caninae: Assoc. 2.1.1 - Festuco rubrae-Genistelletum sagittalis																				
	Nardus stricta	**6**	.	100**	.	.	.	.	100**	.	.	.	.	.	.	.	.	.	100**	.	.
	Potentilla erecta	**8**	3	100**	.	.	7	.	100**	.	.	.	.	.	22°	.	.	.	100**	.	.
	Carlina vulgaris	**9**	3	100**	3	.	5	7	100**	.	5	.	.	.	.	.	14°	7	100**	.	5
	Leucanthemum vulgare	**7**	1	83**	3	.	.	7	83**	.	5	.	.	.	.	.	.	7	83**	.	5
	Viola canina	**9**	6	83**	4	.	13°	.	83**	7	.	.	.	.	22°	17°	.	.	83**	7	.
	Rhizomnium punctatum	**3**	.	50**	.	.	.	.	50**	.	.	.	.	.	.	.	.	.	50**	.	.
D 1.2.1	Rumex acetosa subsp. acetosa	**11**	8	83**	.	.	15°	14°	83**	.	.	.	.	.	44*	.	.	14°	83**	.	.
	Dicranum scoparium	**4**	.	50**	3	.	.	.	50**	.	5	.	.	.	.	.	.	.	50**	.	5
	Danthonia decumbens	**16**	5	83**	18°	.	.	36°	83**	21°	15	.	.	.	.	.	.	36°	83**	21°	15
D 1.2.1	Luzula campestris agg.	**21**	15	100**	11	4	19	36°	100**	7	15	13	.	.	56*	.	.	36°	100**	7	15
	Briza media	**19**	18	100**	9	.	36°	14	100**	7	10	.	.	.	44°	50°	14	14	100**	7	10
	Holcus lanatus	**6**	1	50**	5	.	.	7°	50**	.	10°	.	.	.	.	.	.	7°	50**	.	10°
	Chamaespartium sagittale	**31**	10	100**	45°	.	4	57°	100**	50°	40°	.	.	.	11	.	.	57°	100**	50°	40°
	Polygala vulgaris	**2**	.	33**	.	.	.	.	33**	.	.	.	.	.	.	.	.	.	33**	.	.
D 1.2.2	Linum catharticum	**21**	28	100**	.	21	39°	14	100**	.	.	63°	.	.	22	67*	29	14	100**	.	.
	Hypochoeris maculata	**28**	23	100**	21	8	31°	43°	100**	21	20	.	.	25	44°	33°	14	43°	100**	21	20
	Cirsium ligulare	**11**	11	67*	.	3	18°	14	67*	.	.	.	10	.	22°	17°	14	14	67*	.	.
	Lychnis viscaria	**3**	1	33*	.	.	.	7°	33*	.	.	.	.	.	.	.	.	7°	33*	.	.
D 1.2	Cruciata glabra	**16**	21	83*	.	.	49*	.	83*	.	.	.	.	.	67*	67*	14	.	83*	.	.
D 1.1.1	Carlina acanthifolia subsp. utzka	**17**	22	83*	.	21	27°	7	83*	.	.	63*	.	.	33°	33°	14	7	83*	.	.
	Knautia arvensis	**3**	2	33*	.	.	4	.	33*	.	.	.	.	.	11°	.	.	.	33*	.	.
D 1.3	Leontodon autumnalis	**11**	5	50*	10	.	.	36*	50*	14°	5	.	.	.	.	.	.	36*	50*	14°	5
	Bellardiochloa violacea	**13**	3	50*	22°	.	.	21°	50*	29°	15°	.	.	.	.	.	.	21°	50*	29°	15°
D 1.2.1	Stellaria graminea	**10**	9	50*	.	.	15°	21°	50*	.	.	.	.	.	44*	.	.	21°	50*	.	.
	Euphrasia rostkoviana	**5**	3	33*	4	.	4	7°	33*	7°	.	.	.	.	11°	.	.	7°	33*	7°	.
D 1.3	Anthoxanthum odoratum	**38**	24	83*	38°	4	27	71°	83*	21	55°	13	.	.	67°	.	14	71*	83*	21	55°
	Festuca rubra	**13**	12	50*	3	.	17°	36°	50*	.	5	.	.	.	33°	17°	.	36°	50*	.	5
	Leontodon hispidus	**21**	23	67*	5	.	37°	50°	67*	.	10	.	.	.	33°	50°	29°	50°	67*	.	10
	Plagiomnium affine	**8**	5	33*	3	.	7	14°	33*	.	5	.	.	.	22°	.	.	14°	33*	.	5
	Festuca rupicola subsp. rupicola	**13**	13	50*	6	8	21°	7	50*	7	5	13	10	.	33°	17°	14	7	50*	7	5
D 1.2.2	Ranunculus montanus agg.	**6**	8	33*	.	4	15°	.	33*	.	.	13°	.	.	11°	33*	.	.	33*	.	.
D 1.3, D 1.2.1	Veronica chamaedrys	**15**	14	50*	3	.	19°	43*	50*	.	5	.	.	.	56*	.	.	43*	50*	.	5
D 1.2	Trifolium alpestre	**53**	63°	100*	21	46	82*	57	100*	7	35	88°	50	.	89°	100*	57	57	100*	7	35
	Cl. 3 - Koelerio-Corynephoretea																				
D 1.1.3	Rumex acetosella	**46**	21	33	95**	33	.	50°	33	100*	90*	.	.	100*	.	.	.	50°	33	100*	90*
	Plantago subulata	**50**	24	33	98**	33	.	71°	33	100*	95*	.	.	100*	.	.	.	71°	33	100*	95*
	Polytrichum piliferum	**24**	9	.	65**	21°	.	.	.	86**	45°	13	.	50*	.	.	.	.	.	86**	45°
	Scleranthus perennis	**30**	13	.	69**	25°	.	14	.	57*	80*	.	.	75*	.	.	.	14	.	57*	80*
	Ceratodon purpureus	**42**	20	50°	85**	38°	5	14	50°	86*	85*	38°	.	75*	.	.	14	14	50°	86*	85*
	Hieracium hoppeanum	**29**	9	33°	66**	17	.	14	33°	71*	60*	.	.	50°	.	.	.	14	33°	71*	60*
	Vulpia myuros	**8**	.	.	22*	.	.	.	.	14°	30*	.	.	.	.	.	.	.	.	14°	30*
D 1.3	Chrysopogon gryllus	**39**	21	17	69*	17	10	71*	17	79*	60*	.	.	50°	.	.	29	71*	17	79*	60*
D 1.3	Scabiosa triniifolia	**42**	22	33°	68*	12	17	71*	33°	71*	65°	.	10	25	22	.	29	71*	33°	71*	65°
	Cladonia coniocraea	**5**	.	.	15*	.	.	.	.	14°	15°	.	.	.	.	.	.	.	.	14°	15°
	Cladonia fimbriata	**4**	.	.	11*	.	.	.	.	7°	15*	.	.	.	.	.	.	.	.	7°	15*
	Cladonia ramulosa	**3**	.	.	10*	.	.	.	.	14*	5°	.	.	.	.	.	.	.	.	14*	5°
	Xanthoparmelia somloensis	**3**	.	.	10*	.	.	.	.	14*	5°	.	.	.	.	.	.	.	.	14*	5°
	Festuca valesiaca	**37**	26	17	54*	30	13	50°	17	43°	65*	.	40°	50°	11	.	29	50°	17	43°	65*
	All. 3.1 - ??? [probably new] (order Sedo-Scleranthetalia): Assoc. 3.1.1 - Cetario aculeatae-Plantaginetum subulatae																				
	Cetraria aculeata	**17**	5	.	51**	13	.	.	.	93**	10	13	.	25°	.	.	.	.	.	93**	10
3	Racomitrium canescens agg.	**12**	.	.	39**	.	.	.	.	57**	20°	.	.	.	.	.	.	.	.	57**	20°
3	Cladonia foliacea	**26**	12	.	64**	21	5	7	.	93**	35°	13	.	50°	.	.	14	7	.	93**	35°
	Cladonia macilenta	**2**	.	.	7°	.	.	.	.	14*	.	.	.	.	.	.	.	.	.	14*	.
	Cladonia portentosa	**2**	.	.	7°	.	.	.	.	14*	.	.	.	.	.	.	.	.	.	14*	.
	Xanthoparmelia conspersa	**2**	.	.	7°	.	.	.	.	14*	.	.	.	.	.	.	.	.	.	14*	.
3	Pinus sylvestris	**8**	1	.	22*	.	.	7°	.	29*	15°	.	.	.	.	.	.	7°	.	29*	15°
3	Cladonia rangiformis	**12**	5	.	25*	4	.	21°	.	36*	15°	13°	.	.	.	.	.	21°	.	36*	15°
	All. 3.2 - Armerio rumelicae-Potentillion (order Trifolio arvensis-Festucetalia ovinae): Assoc. 3.2.1 - Plantagini subulatae-Agrostietum capillaris																				
3	Aira elegantissima	**9**	.	.	25*	.	.	.	.	14°	35*	.	.	.	.	.	.	.	.	14°	35*
3, D 1.1.2	Trifolium arvense	**13**	4	.	27*	10°	.	.	.	14°	40*	.	30*	.	.	.	.	.	.	14°	40*
	Apera spica-venti subsp. spica-venti	**3**	.	.	8°	.	.	.	.	.	15*	.	.	.	.	.	.	.	.	.	15*
	Potentilla argentea agg.	**22**	14	.	31°	11	10	36°	.	7	55*	13	20°	.	.	.	29°	36°	.	7	55*
	Cladonia cariosa	**2**	.	.	5°	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	.	10*
	Cladonia cf. glauca	**2**	.	.	5°	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	.	10*
	Cruciata pedemontana	**2**	.	.	5°	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	.	10*
	Dianthus viscidus	**2**	.	.	5°	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	.	10*
	Jasione cf. montana	**2**	.	.	5°	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	.	10*
	Peltigera didactyla	**2**	.	.	5°	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	.	10*
	Sedum rubens	**2**	.	.	5°	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	.	10*
	Potentilla inclinata	**4**	1	.	8°	.	.	7°	.	.	15*	.	.	.	.	.	.	7°	.	.	15*
	Cynosurus echinatus	**11**	6	.	19°	3	5	14°	.	7	30*	.	10°	.	.	.	14°	14°	.	7	30*
	Linaria genistifolia	**7**	4	.	16°	8°	.	.	.	7°	25*	.	.	25*	.	.	.	.	.	7°	25*
	Petrorhagia prolifera	**6**	3	.	10°	7°	.	.	.	.	20*	.	20*	.	.	.	.	.	.	.	20*
	Differential for Calluno-Ulicetea and Koelerio-Corynephoretea vs. Festuco-Brometea																				
D 1.3, D 1.2.1	Agrostis capillaris	**68**	43	100*	93*	13	55	100*	100*	86°	100*	13	.	25	100*	50	14	100*	100*	86°	100*
	Diagnostic/differential for more than one association in different higher syntaxa																				
	Cerastium banaticum	**14**	24°	17	.	21°	33°	7	17	.	.	63*	.	.	33°	50*	14	7	17	.	.
	Arenaria serpyllifolia	**11**	18°	.	3	22°	20°	.	.	.	5	25°	40*	.	.	17°	43*	.	.	.	5
	Bromus squarrosus	**6**	10°	.	.	10°	14°	.	.	.	.	.	30*	.	.	.	43*	.	.	.	.
	Campanula persicifolia	**5**	8°	.	3	8°	11°	.	.	.	5	25*	.	.	.	33*	.	.	.	.	5
	Minuartia verna	**5**	9°	.	.	13°	10°	.	.	.	.	38*	.	.	.	.	29*	.	.	.	.
	Poa badensis	**4**	8°	.	.	8°	10°	.	.	.	.	25*	.	.	.	.	29*	.	.	.	.
	Companions (> 10%)																				
	Achillea millefolium agg.	**68**	69°	83°	49	52	78°	93°	83°	29	70°	75°	80°	.	67°	67°	100°	93°	83°	29	70°
	Carex caryophyllea	**62**	51	67°	67°	39	52	86°	67°	64°	70°	38	80°	.	33	50	71°	86°	67°	64°	70°
	Euphorbia cyparissias	**61**	64°	17	60°	68°	58	71°	17	50	70°	75°	80°	50	33	83°	57	71°	17	50	70°
	Hypericum perforatum	**56**	46	83°	67°	53	35	57°	83°	64°	70°	38	70°	50	11	67°	29	57°	83°	64°	70°
	Hieracium pilosella	**43**	44°	50°	32	20	58°	71°	50°	29	35	50°	10	.	67°	50°	57°	71°	50°	29	35
	Plantago lanceolata	**41**	42°	67°	20	18	54°	79*	67°	.	40	13	40	.	44°	33	86*	79*	67°	.	40
	Centaurea rhenana	**38**	34	33	42°	38°	20	64°	33	29	55°	.	40°	75*	.	17	43°	64°	33	29	55°
	Thymus longicaulis	**38**	37	50°	31	24	41°	64°	50°	21	40°	38°	10	25	44°	50°	29	64°	50°	21	40°
	Hieracium praealtum subsp. bauhinii	**31**	18	67*	44°	.	32°	29°	67*	43°	45°	.	.	.	22	17	57°	29°	67*	43°	45°
	Leontodon crispus	**30**	37°	17	29	45°	41°	.	17	7	50°	50°	10	75*	33°	33°	57°	.	17	7	50°
	Eryngium campestre	**29**	35°	.	25	42°	28	36°	.	14	35°	.	50°	75*	11	17	57°	36°	.	14	35°
	Trifolium campestre	**24**	18	33°	23°	13	14	43°	33°	.	45°	.	40°	.	.	.	43°	43°	33°	.	45°
	Cladonia furcata	**21**	16	17	34°	8	20°	29°	17	43°	25°	.	.	25°	.	17	43°	29°	17	43°	25°
	Genista tinctoria agg.	**21**	27°	.	17	21	36°	14	.	29°	5	13	50°	.	44°	50°	14	14	.	29°	5
	Rosa sp.	**20**	23°	.	21°	22°	30°	7	.	21°	20	25°	40°	.	11	50°	29°	7	.	21°	20
	Trifolium repens	**17**	9	33°	22°	3	9	29°	33°	14	30°	.	10	.	11	17°	.	29°	33°	14	30°
	Hypnum cupressiforme var. lacunosum	**16**	13	33°	17°	19°	10	.	33°	14	20°	38°	20°	.	.	17°	14	.	33°	14	20°
	Hypochoeris radicata	**14**	3	33°	27*	.	.	21°	33°	29°	25°	.	.	.	.	.	.	21°	33°	29°	25°
	Rhytidium rugosum	**14**	16°	.	12	8	19°	29°	.	14°	10	25°	.	.	22°	33°	.	29°	.	14°	10
	Cladonia pyxidata agg. (non pocillum)	**13**	12	17°	23°	28*	.	.	17°	36°	10	25°	10	50*	.	.	.	.	17°	36°	10
	Thymus glabrescens subsp. urumovii	**13**	9	17°	16°	13°	5	14°	17°	7	25°	38*	.	.	.	.	14°	14°	17°	7	25°
	Dianthus moesiacus	**12**	10	.	21°	17°	.	21°	.	21°	20°	.	.	50*	.	.	.	21°	.	21°	20°
	Poa bulbosa	**12**	6	.	22°	8	5	7	.	14°	30°	13°	10°	.	.	.	14°	7	.	14°	30°
	Trifolium striatum	**12**	11°	.	16°	18°	5	7	.	7	25°	.	30°	25°	.	.	14°	7	.	7	25°
	Silene roemeri	**11**	8	.	13°	.	11°	21°	.	.	25°	.	.	.	33*	.	.	21°	.	.	25°
	Cephaloziella cf. divaricata	**10**	7	17°	21°	17°	.	.	17°	21°	20°	.	.	50*	.	.	.	.	17°	21°	20°

13_Pedashenko 4+6 268x700 mm 22.08.13 10:55 Seite 2

Table 6: Relevé table of the *Calluno-Ulicetea* and *Koelerio-Corynephoretea* communities in the study region in NW Bulgaria
Species are arranged according to decreasing phi-values in the respective species blocks (only those species that were significant according to Fisher's exact test are included) and according to decreasing overall constancy for the non-diagnostic species. Diagnostic species are highlighted in dark grey, while transgressive diagnostic species and differential species are highlighted in light grey and additionally marked in the column left of the species names. Uncertain species that had been excluded from the numerical analyses are indicated in italics; taxa or layers that had been joined for the numerical analyses are inserted below the "aggregate" line in italics with preceding "-". For phanerophytes, the layer is indicated in brackets: S = shrub layer; H = herb layer. Plot locations (latitude, longitude, altitude) and date of the relevés are available in Appendix 2. The nomenclatural type relevés of associations 3.1.1 and 3.2.1 are marked as "n.t." and in bold type.

Tab. 6: Aufnahmentabelle der untersuchten *Calluno-Ulicetea*- und *Koelerio-Corynephoretea* -Gesellschaften Nordwest-Bulgariens
Die Arten sind nach fallenden phi-Werten im jeweiligen Block angeordnet (wobei nur Arten mit statistisch signifikanter Häufung gemäß Fishers exaktem Test gelistet sind) bzw. nach fallender Gesamtstetigkeit im Fall der nicht diagnostischen Arten (Begleiter). Diagnostische Arten sind in dunkelgrau hervorgehoben, transgressive diagnostische Arten und Differentialarten dagegen in hellgrau, mit zusätzlicher Kennzeichnung in der Spalte links vom Artnamen. Arten mit unsicherer Bestimmung, die von bei den numerischen Analysen ausgeschlossen waren, sind kursiv gesetzt; Sippen oder Vorkommen derselben Sippe in verschiedenen Schichten, die in den numerischen Analysen zusammengefasst wurden, stehen unter dem jeweiligen aggregierten Eintrag in kursiv mit führendem "-". Bei Phanerophyten ist die Schicht in Klammern angegeben: S = Strauchschicht, H = Krautschicht. Koordinaten (geografische Breite und Länge, Meereshöhe) sowie Datum der Aufnahmen, sind im Anhang 2 verfügbar. Die nomenklatorischen Typusaufnahmen der Assoziationen 3.1.1 und 3.2.1 sind mit "n.t." und Fettdruck gekennzeichnet.

		Class 2: Calluno-Ulicetea						Class 3: Koelerio-Corynephoretea																															
								Alliance 3.1														Alliance 3.2																			
		Association 2.1.1						Association 3.1.1														Association 3.2.1																			
															n.t.																							n.t.			
	Plot number	BG14NE	BG14SW	BG15NW	BG15SE	BGR066	BGR067	BG08NE	BG08SW	BG09SW	BGR028	BGR033	BGR034	BGR036	**BGR039**	BGR042	BGR048	BGR053	BGR057	BGR059	BGR063	BG09NE	BG13NE	BG13SW	BGR058	BGR068	BGR029	BGR030	BGR040	BGR041	BGR043	BGR044	BGR047	BGR050	BGR052	BGR054	BGR055	**BGR056**	BGR061	BGR062	BGR064
	Region (V = Vratsa; K = Koprivshtitsa)	K	K	K	K	K	K	K	K	K	K	K	K	K	**K**	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	**K**	K	K	K
	TWINSPAN, modified, 3 clusters	II	II	II	II	II	II	III	III	III	III	III	III	III	**III**	III	III	III	III	III	III	III	III	III	III	III	III	III	III	III	III	III	III	III	III	III	III	**III**	III	III	III
	TWINSPAN, modified, 5 clusters	D	D	D	D	D	D	E	E	E	E	E	E	E	**E**	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	**E**	E	E	E
	TWINSPAN, modified, 10 clusters	6	6	6	6	6	6	9	9	9	9	9	9	9	**9**	9	9	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	**10**	10	10	10
	Grazing intensity (0 = none to 3 = high)	0	1	1	1	1	1	1	1	1	1	1	1	3	**3**	1	0	0	3	0	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	0	1	**3**	1	2	1
	Burning (0 = no; 1 = yes)	0	1	0	0	1	0	0	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0	0	0
	Altitude [m a.s.l.]	1065	1067	1054	1051	1040	1074	904	918	839	941	978	990	918	**932**	746	772	750	816	1250	866	839	1179	1176	1203	1180	913	860	875	815	1036	865	762	694	633	957	1075	**810**	711	877	861
	Aspect [°]	180	340	310	310	275	NA	70	105	180	340	55	190	150	**60**	360	240	120	250	230	40	85	200	200	140	180	150	90	280	90	180	180	340	360	230	195	195	**223**	190	56	40
	Inclination [°]	22	15	10	10	30	NA	22	26	5	18	28	12	4	**25**	3	25	23	12	15	15	5	14	22	12	20	2	20	20	10	25	3	25	18	23	11	23	**12**	22	2	15
	Heat index	0.06	-0.13	-0.15	-0.15	-0.58	NA	0.35	0.49	0.01	-0.16	0.38	0.00	0.04	**0.36**	-0.01	-0.36	0.40	-0.19	-0.18	0.14	0.08	-0.05	-0.08	0.16	0.06	0.02	0.36	-0.36	0.17	0.07	0.01	-0.23	-0.05	-0.28	-0.02	-0.04	**-0.12**	-0.01	0.03	0.14
	Microrelief [cm]	5	7	10	10	7	NA	8	10	7	40	20	10	10	**8**	10	35	10	6	30	20	7	5	15	5	15	15	10	8	5	10	5	10	20	7	12	20	**5**	3	2	2
	Total vegetation cover [%]	100	90	95	95	90	90	45	45	75	60	75	75	70	**65**	90	75	60	30	50	45	92	85	60	85	50	90	95	93	95	70	75	85	80	95	55	60	**70**	95	95	95
	Cover shrub layer [%]	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	**1**	0	0	0
	Cover herb layer [%]	82	99	95	93	90	90	30	30	45	35	75	65	40	**30**	65	20	25	28	30	25	65	82	60	85	50	75	90	50	70	70	60	60	70	80	45	50	**50**	95	95	95
	Cover cryptogam layer [%]	1	3	1	5	0	6	15	15	30	25	10	20	35	**40**	45	55	40	15	30	20	55	5	1	0	6	30	5	80	25	5	15	30	10	35	12	15	**30**	1	0	0
	Cover dead wood [%]	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0	0	0
	Cover litter [%]	10	7	10	10	6	5	5	2	2	0	15	5	3	**1**	5	3	8	1	3	1	5	15	5	10	5	3	20	2	10	15	5	30	10	40	2	2	**25**	35	40	50
	Cover stones and rocks [%]	0	0	2	0	0	0	10	35	5	30	18	20	25	**1**	5	25	1	25	40	30	3	3	20	2	30	10	0	0	0	15	0	0	10	1	40	35	**0**	0	0	0
	Cover fine earth [%]	0	0	2	0	8	10	40	20	20	10	7	5	5	**33**	1	2	35	42	2	0	4	8	20	5	20	2	5	6	5	15	25	5	2	3	3	5	**10**	5	0	0
	Species richness (total)	27	45	47	45	43	39	32	24	22	33	43	25	40	**25**	30	29	25	24	29	20	42	60	34	38	33	59	32	52	38	26	10	31	49	37	40	27	**30**	28	28	33
	Species richness (vascular plants)	25	40	42	42	42	31	23	18	15	25	35	22	32	**16**	22	18	18	15	17	15	34	42	31	37	31	46	29	44	31	23	8	25	42	34	35	20	**25**	26	27	33
	Species richness (bryophytes)	2	5	4	3	1	4	2	3	3	3	3	1	4	**2**	4	5	3	3	5	2	4	6	2	0	2	8	3	3	4	2	1	4	5	2	1	4	**3**	1	1	0
	Species richness (lichens)	0	0	1	0	0	4	6	3	4	5	6	2	6	**7**	4	6	4	6	7	3	4	12	1	1	0	5	1	5	3	1	1	2	2	1	4	3	**2**	1	0	0
	Differential for Calluno-Ulicetea and Koelerio-Corynephoretea vs. Festuco-Brometea																																								
	Agrostis capillaris	0.2	8	7	12	35	1	5	0.8	1	2	2	.	1	0.1	1	0.1	0.2	.	0.1	0.1	1	1	2	3	3	5	10	8	10	2	0.5	10	6	25	0.7	3	22	10	0.5	35
	Cl. 2 - Calluno-Ulicetea: All. 2.1 - Violion caninae (Ord. Nardetalia strictae): Assoc. 2.1.1 - Festuco rubrae-Genistelletum sagittalis																																								
	Nardus stricta	50	35	2	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Potentilla erecta	20	6	4	3	0.3	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Carlina vulgaris	0.2	1	0.4	1	0.1	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Leucanthemum vulgare	3	.	1.5	1	0.5	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Viola canina	1	1	3	1	0.5	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Rhizomnium punctatum	1	0.8	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Rumex acetosa subsp. acetosa	0.5	0.1	1.5	2	0.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Dicranum scoparium	0.1	0.4	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.
	Danthonia decumbens	25	45	20	.	15	25	.	.	.	.	0.1	0.2	4	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	0.2	.	.	.	.	.	.	.	.	.	.	.	0.1
	Luzula campestris agg.	0.8	2	0.2	1	1	0.2	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	0.1	.	.	.	.	.	0.2
	- Luzula campestris agg.	*0.8*	*2*	.	.	*1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.
	- Luzula campestris	.	.	*0.2*	*1*	.	*0.2*	.	.	.	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	*0.2*
	Briza media	1	2	1	2	8	0.3	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	0.2
	Holcus lanatus	.	.	0.1	0.1	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	1.5
	Chamaespartium sagittale	10	20	1	1	8	1	0.1	.	.	2	8	2	0.5	0.2	.	.	.	.	.	0.5	.	.	.	0.3	.	0.2	.	0.1	.	1	.	1	.	.	0.3	.	.	5	.	2
	Polygala vulgaris	.	.	0.05	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Linum catharticum	0.2	0.5	0.3	0.2	0.2	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Hypochoeris maculata	1	2	0.3	0.2	5	0.5	0.3	.	.	0.1	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	0.1	.	0.1	0.3	.	.	.	.	.
	Cirsium ligulare	.	.	0.5	2	0.8	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Lychnis viscaria	.	.	0.1	.	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cruciata glabra	10	4	0.5	0.2	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Carlina acanthifolia subsp. utzka	0.2	.	1.2	0.8	6	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Knautia arvensis	.	.	.	1.5	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Leontodon autumnalis	1	23	.	.	0.5	.	.	.	.	0.1	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2
	Bellardiochloa violacea	.	0.3	0.2	3	.	.	.	0.1	.	0.5	20	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25	0.1	.	.	.	.	30	.	.
	Stellaria graminea	.	0.8	0.5	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Euphrasia rostkoviana	.	.	0.4	0.3	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Euphrasia cf. rostkoviana	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Euphrasia rostkoviana	.	.	*0.4*	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Anthoxanthum odoratum	.	0.3	1	2.5	1	2	0.1	.	.	.	1	.	.	.	0.5	.	.	.	.	.	0.3	.	0.1	1	.	0.1	5	0.1	0.1	.	.	8	0.2	2	0.01	.	.	.	.	.
	Festuca rubra	.	.	3	3	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.
	Leontodon hispidus	1	.	5	3	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.8
	- Leontodon hispidus	*1*	.	.	*3*	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.8*
	- Leontodon hispidus subsp. danubialis	.	.	*3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Leontodon hispidus subsp. hispidus	.	.	*2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Plagiomnium affine	.	.	0.1	4.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Festuca rupicola subsp. rupicola	.	.	10	7	32	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	.	.	.	.
	- Festuca cf. rupicola subsp. rupicola	.	.	.	.	*32*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Festuca rupicola subsp. rupicola	.	.	*10*	*7*	.	.	.	.	.	.	.	*3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*6*	.	.	.	.
	Ranunculus montanus agg.	.	.	0.2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Veronica chamaedrys	0.1	.	0.2	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.
	Trifolium alpestre	10	3	6	4	25	2	.	.	.	.	.	0.6	.	.	.	.	.	.	.	.	.	7	.	5	.	.	.	.	.	5	.	.	0.2	.	.	0.2	.	0.2	0.2	.
	Cl. 3 - Koelerio-Corynephoretea																																								
	Rumex acetosella	.	.	.	.	0.3	0.5	3	0.3	5	0.1	0.6	0.4	1	0.3	0.5	2	0.4	2.5	1	0.1	2	6	0.5	0.2	1	2	0.1	0.1	0.3	1	0.8	0.2	.	0.6	10	5	0.4	0.2	0.2	.
	- Rumex acetosella	.	.	.	.	*0.3*	*0.5*	*3*	*0.3*	*5*	*0.1*	*0.6*	*0.4*	*1*	*0.3*	*0.5*	*2*	*0.4*	*2.5*	*1*	*0.1*	*2*	.	.	*0.2*	*1*	*2*	*0.1*	*0.1*	*0.3*	*1*	*0.8*	*0.2*	.	*0.6*	*10*	*5*	*0.4*	*0.2*	*0.2*	.
	- Rumex acetosella cf. subsp. multifidus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*6*	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Plantago subulata	.	5	.	.	.	0.5	15	6	25	15	15	20	10	20	15	1	15	14	8	18	1	30	10	10	10	.	3	0.3	15	15	50	5	0.5	2	0.2	20	0.5	5	1	1.5
	Polytrichum piliferum	.	.	.	.	.	.	10	10	25	20	1	8	22	35	30	30	30	.	15	.	20	0.1	0.5	.	5	10	4	3	10	.	.	.	.	.	.	1.5	.	.	.	.
	Scleranthus perennis	.	.	.	.	.	.	.	0.1	3	.	0.1	.	0.5	.	0.6	.	0.4	2	3	.	10	0.8	1	0.2	1	0.2	.	1	2	0.5	.	.	.	5	8	1	5	0.2	0.3	0.1
	Ceratodon purpureus	.	.	.	0.2	0.3	3	.	0.01	1	0.1	0.5	.	1	0.5	2	0.2	3	5	5	6	30	0.2	0.3	.	1	1	0.1	.	20	5	15	0.5	0.1	35	3	6	28	0.2	0.01	.
	Hieracium hoppeanum	.	.	.	.	1	0.1	7	8	4	.	.	.	10	10	.	1	1	0.6	0.5	0.4	20	2	2	2	.	.	.	20	.	.	.	0.5	.	2	12	2	.	1	1	1
	Vulpia myuros	.	.	.	.	.	.	.	.	1	.	.	.	.	.	5	.	.	.	.	.	7	.	1	.	10	.	.	.	2	.	.	.	.	0.2	.	.	3	.	.	.
	Chrysopogon gryllus	.	.	.	.	.	20	0.1	4	0.1	.	2.5	25	3	.	1	5	0.8	4	.	0.2	1	.	.	.	.	.	20	.	10	20	5	.	0.5	45	.	6	6	35	8	40
	Scabiosa triniifolia	.	.	.	.	0.5	0.1	0.5	0.2	0.1	.	2	3	1	0.2	0.5	0.3	0.2	.	.	.	4	0.8	0.2	0.5	3	.	1	.	0.8	0.5	.	1	0.2	.	0.05	.	.	0.4	1	.
	Cladonia coniocraea	.	.	.	.	.	.	0.5	0.1	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	1	.	.	.	.	.	.	.	.	6	.	.	.	.	.
	Cladonia fimbriata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	0.2	.	.	.	1	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.
	Cladonia ramulosa	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.
	- Cladonia cf. ramulosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	.
	- Cladonia ramulosa	.	.	.	.	.	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Xanthoparmelia somloensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	0.1	.	.	0.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Festuca valesiaca	.	.	.	.	5	.	5	6	.	.	.	.	5	0.2	.	0.5	.	0.7	.	.	.	2	2	5	3	.	10	10	25	.	.	.	8	2	0.3	.	8	.	60	4
	All. 3.1 - ??? [probably new] (Ord. Sedo-Scleranthetalia): Assoc. 3.1.1 - Cetrario aculeatae-Plantaginetum subulatae																																								
	Cetraria aculeata	.	.	.	.	.	.	0.1	0.1	0.1	0.1	5	12	2	3	0.1	.	4	0.5	0.1	2	.	0.2	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
3	Racomitrium canescens agg.	.	.	.	.	.	.	1	5	0.1	.	.	.	0.3	.	.	2	0.8	1	1	.	.	.	.	.	.	0.1	.	72	1	.	.	.	.	.	.	.	1	.	.	.
3	Cladonia foliacea	.	.	.	.	.	.	0.5	2	2	.	3	17	1	0.3	2	1	2	0.1	1	2	0.2	0.2	0.3	0.1	.	2	.	1	1	.	.	.	.	.	.	.	.	.	.	.
	Cladonia macilenta	.	.	.	.	.	.	.	.	.	2	.	.	.	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cladonia portentosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Xanthoparmelia conspersa	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3	Pinus sylvestris	.	.	.	.	.	.	.	.	.	1.5	.	.	.	.	.	0.1	3	.	.	0.2	.	.	.	.	.	.	.	0.1	.	.	.	0.4	.	.	0.3	.	.	.	.	.
	- Pinus sylvestris (S)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*3*	.	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.3*	.	.	.	.	.
	- Pinus sylvestris (H)	.	.	.	.	.	.	.	.	.	*1.5*	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	*0.4*	.	.	.	.	.	.	.	.
3	Cladonia rangiformis	.	.	.	.	.	.	.	.	.	.	0.5	.	2	0.5	0.1	.	.	.	5	.	.	0.5	.	.	.	1	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.
	All. 3.2 - Armerio rumelicae-Potentillion (Ord. Trifolio arvensis-Festucetalia ovinae): Assoc. 3.2.1 - Plantagini subulatae-Agrostietum capillaris																																								
3	Aira elegantissima	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	0.01	.	.	.	.	.	0.2	1	3	0.1	.	.	0.1	0.1	0.01	.	.	.	.	.	.
3	Trifolium arvense	.	.	.	.	.	.	.	.	.	.	0.4	.	0.5	.	.	.	.	.	.	.	0.5	0.2	0.5	.	.	2	.	0.2	0.2	.	.	.	.	.	.	.	0.5	.	0.1	.
	Apera spica-venti subsp. spica-venti	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	0.3	.	.	.	.	0.2
	Potentilla argentea agg.	.	.	.	.	.	.	.	.	.	.	.	.	1.5	.	.	.	.	.	.	.	4	0.5	0.2	1	1	5	0.1	1	.	.	.	.	.	.	0.1	.	4	.	5	.
	Cladonia cariosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	2	.	.	.	.
	Cladonia cf. glauca	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.
	Cruciata pedemontana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.05	0.01	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Dianthus viscidus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	3	.	.	.
	Jasione cf. montana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.
	Peltigera didactyla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.01	.	.	.	.	.	.	.	.	.	.	.	0.01	.	.	.	.	.	.
	Sedum rubens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.8	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Potentilla inclinata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	0.2	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.
	Cynosurus echinatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	.	.	.	.	.	.	0.1	0.1	0.1	1	.	.	.	0.5	.	.	.	3	.	.	.	.	.	.	.
	Linaria genistifolia	.	.	.	.	.	.	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	0.3	.	0.5	0.1	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.
	Petrorhagia prolifera	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	0.1	.	.	.	0.1	.	0.1	.	.	.	.	.
	Companions																																								
	Hypericum perforatum	2	.	1	2	3	0.3	0.1	.	1	0.1	0.1	.	0.1	0.1	0.2	.	0.1	.	0.3	.	2	1	5	3	2	1	1	.	0.2	.	.	0.1	.	0.2	5	2	.	.	0.2	0.5
	Carex caryophyllea	.	0.5	2	1	1	.	1	0.1	.	.	0.8	2.5	0.1	0.3	1	0.2	.	.	0.2	.	.	15	4	3	1	1	0.1	0.5	.	0.2	.	0.5	0.1	1	0.3	0.3	.	0.5	.	.
	Asperula cynanchica	.	0.1	.	.	1	.	4	0.2	.	.	0.3	.	0.5	0.1	.	.	0.2	0.2	.	0.1	.	1	0.2	1	3	4	0.5	1	2	.	.	3	2	3	.	.	.	0.1	0.1	0.4
	Achillea millefolium agg.	5	0.5	4	2	2	.	.	.	.	.	0.8	0.01	0.5	0.01	.	.	.	.	.	.	2	.	0.5	0.5	0.4	1	.	0.5	.	0.5	.	.	2	.	0.05	0.2	0.2	0.5	0.5	0.5
	- Achillea millefolium agg.	*5*	*0.5*	*4*	*2*	*2*	.	.	.	.	.	*0.8*	*0.01*	*0.5*	*0.01*	.	.	.	.	.	.	*2*	.	*0.5*	*0.5*	*0.4*	*0.5*	.	*0.5*	.	*0.5*	.	.	*2*	.	*0.05*	*0.2*	*0.2*	*0.5*	.	*0.5*
	- Achillea millefolium agg. (hairy)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Achillea pannonica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	.
	Euphorbia cyparissias	.	.	.	0.1	.	.	0.1	0.1	.	.	0.5	1	.	.	.	0.5	.	0.2	0.1	.	1.5	3	0.1	40	1	0.2	.	.	0.8	2	.	2	6	1.2	.	1.5	.	0.3	0.3	.
	Hieracium praealtum subsp. bauhinii	.	0.5	.	0.2	0.1	0.1	2	0.2	.	0.4	.	0.1	0.1	0.2	.	.	.	.	.	.	1	0.1	.	.	.	.	.	0.5	.	0.2	.	.	.	0.5	0.2	1	0.1	0.8	.	.
	Centaurea rhenana	.	.	.	.	1.5	0.5	0.5	.	.	.	.	.	1	0.2	.	.	.	0.4	.	.	0.5	0.5	1	.	.	1	0.1	2	.	0.8	.	.	.	1	.	.	0.3	0.1	.	0.5
	Lotus corniculatus	0.1	0.5	.	.	.	0.1	.	.	.	.	.	0.2	0.2	.	.	.	.	.	.	.	.	5	0.1	1	0.8	0.5	.	3	0.1	.	.	.	.	2.5	0.1	.	1	0.3	.	1
	Hieracium pilosella	.	2	1	1.2	.	.	.	.	.	5	5	4	.	.	0.8	.	.	.	.	.	.	.	.	.	.	3	0.5	1	5	5	.	0.5	2	.	.	.	.	.	.	.
	Thymus longicaulis	.	.	0.2	3	0.3	.	.	0.4	.	1.5	1.5	.	.	.	.	.	.	.	.	.	.	3	0.3	.	0.3	15	12	.	.	.	.	.	.	1	15	.	.	2	.	.
	- Thymus cf. longicaulis	.	.	*0.2*	*3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*3*	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Thymus longicaulis	.	.	.	.	*0.3*	.	.	*0.4*	.	*1.5*	*1.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.3*	*15*	*12*	.	.	.	.	.	.	*1*	*15*	.	.	*2*	.	.
	Koeleria macrantha agg.	.	.	.	.	.	.	.	.	.	0.5	0.2	.	0.5	.	.	.	0.5	.	.	.	.	.	.	.	.	.	3	2	1	4	0.5	.	12	.	3	6	.	.	.	5
	- Koeleria macrantha agg.	.	.	.	.	.	.	.	.	.	*0.5*	*0.2*	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	*3*	.	*1*	*4*	*0.5*	.	*12*	.	*3*	.	.	.	.	.
	- Koeleria cf. nitidula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*2*	.	.	.	.	.	.	.	*6*	.	.	.	*5*
	- Koeleria nitidula	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cladonia furcata	.	.	.	.	.	0.4	0.5	.	0.1	.	0.5	.	7	4	0.1	.	.	.	.	.	.	0.2	.	.	.	1	0.2	3	1	.	.	.	.	.	.	.	.	.	.	.
	Galium verum	.	.	.	3	1	0.2	.	.	.	.	1.5	.	.	.	.	.	.	.	.	.	2	.	.	.	.	1	0.1	.	.	.	.	.	2	.	0.1	.	0.5	.	0.5	1
	Leontodon crispus	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	3	0.8	2	4	1.5	.	0.3	.	.	.	.	0.1	0.3	.	.	.	0.5	.	0.1
	- Leontodon cf. crispus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.
	- Leontodon crispus	.	*3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	*3*	*0.8*	*2*	*4*	*1.5*	.	.	.	.	.	.	*0.1*	*0.3*	.	.	.	*0.5*	.	*0.1*
	Plantago lanceolata	.	.	2	2	2	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	0.2	1	0.1	0.1	.	.	.	.	.	.	0.5	.	.	3	.	0.2	.
	Hypochoeris radicata	.	.	.	.	1.5	0.3	.	0.2	.	0.4	.	.	0.3	.	.	.	.	.	.	0.1	0.3	0.1	.	0.5	.	1.5	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.
	Silene armeria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	4	.	6	.	.	.	.	.	.	.	.	.	2	1	.	.	0.1	7	1	.	0.2	0.2	0.3
	Trifolium campestre	.	.	0.1	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	0.8	0.5	2	4	.	.	0.3	.	.	.	.	.	.	.	.	0.5	.	0.4	0.3
	Trifolium repens	0.1	.	.	.	0.1	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	0.1	.	0.2	0.1	3	0.2	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	0.1
	Dichantium ischaemum	.	.	.	.	.	.	1	6	.	.	.	.	.	.	.	.	.	1.5	.	.	.	.	.	.	.	.	20	0.5	.	.	1	.	.	.	0.1	.	.	.	0.4	0.3
	Eryngium campestre	.	.	.	.	.	.	.	.	.	.	0.5	.	0.1	.	.	.	.	.	.	.	0.8	.	.	.	.	0.5	.	.	.	0.2	.	.	0.2	.	.	.	0.3	.	0.5	0.1
	Cephaloziella cf. divaricata	.	.	.	.	.	0.1	.	.	.	.	.	.	0.5	.	.	.	.	0.1	0.1	.	.	0.1	.	.	.	0.1	.	0.2	.	0.5	.	.	.	.	.	.	.	.	.	.
	Cladonia pyxidata agg. (non pocillum)	.	.	.	.	.	0.1	.	.	2	.	4.5	.	0.5	0.1	.	.	.	0.1	.	.	1	0.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Hypnum cupressiforme var. lacunosum	.	.	0.3	0.3	.	.	.	.	.	.	.	.	.	.	0.1	1	.	.	.	.	.	.	.	.	.	.	1	.	0.1	.	.	2	0.5	.	.	.	.	.	.	.
	Phleum phleoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	5	.	.	.	0.5	0.5	.	.	.	5	0.1	0.2	.	6	.	.
	Poa bulbosa	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	0.1	.	.	0.1	.	0.1	0.1	0.5	.	0.05	0.1	.	.	.	.	.	.	.	.	.	.	.
	Dianthus moesiacus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.8	0.1	0.1	.	.	.	.	.	.	.	.	.	0.5	.	0.5	.	.	0.5	2	.	.	.	.	.	.	.
	Euphrasia pectinata	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	0.3	0.5	0.2	.	0.1	.	.	.	.	0.1	.	.	.	.	.	.	.	.
	Rosa sp.	.	.	.	.	.	.	.	.	0.1	.	0.2	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	0.3	1.2	.	1	.	0.5	.	.	.
	- Rosa sp. (S)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*1*	.	*0.5*	.	.	.
	- Rosa sp. (H)	.	.	.	.	.	.	.	.	*0.1*	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.3*	*1.2*	.	.	.	.	.	.	.
	Sanguisorba minor	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.4	0.5	0.2	0.5	.	.	.	0.2	0.5	0.1	.	.	.	.	.
	Thymus glabrescens subsp. urumovii	.	.	.	.	.	1	.	.	.	.	.	1.5	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	3	0.1	.	0.2	.	.	.	2	.	.	.	.
	Anthemis sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*5*	.	.	.	.	*5*	.	.	.	.	.	*2*	.	.	.	.	*0.2*	*0.5*	.	*0.2*	.	.
	Deschampsia flexuosa	.	0.1	0.5	.	.	.	1	.	.	1	.	.	.	.	.	6	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Logfia arvensis	.	.	.	.	.	.	.	.	0.6	0.1	.	.	0.1	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	0.01	.	.	0.2	.	.	.
	Trifolium striatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	0.1	0.1	.	.	.	.	2	.	.	.	.	.	.	.	.	0.2	.	0.3	.
	- Trifolium cf. striatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.3*	.
	- Trifolium striatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	.	.	.	*0.1*	*0.1*	.	.	.	.	*2*	.	.	.	.	.	.	.	.	*0.2*	.	.	.
	Verbascum sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	*0.2*	.	.	.	.	*0.1*	.	.	.	*1.5*	.	.	.	*0.5*	.	.	.	*0.1*	.	.	.	.	.	.
	Chondrilla juncea	.	.	.	.	.	.	.	.	0.1	.	0.2	.	.	.	.	.	.	.	.	.	6	.	.	.	.	.	0.2	.	0.5	.	.	.	.	.	.	.	.	.	.	.
	Cichorium intybus	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	0.2	.	0.5	.	0.1	.
	Genista tinctoria agg.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	0.5	0.1	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.
	- Genista depressa	.	.	.	.	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Genista lydia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	*0.1*	*3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*2*	.	.	.	.	.	.
	Silene frivaldszkyana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	0.2	0.1	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	0.5	.	.	.	.	.	.
	Silene roemeri	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	0.5	0.2	0.3	.	.	.	3	.	.
	Teucrium chamaedrys	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	0.2	.	2	.	.	.	.	.	.	.	0.7	.	.	.	0.8	.
	Thymus sp.	.	.	.	.	.	.	.	.	.	.	.	.	*5*	*1*	.	.	.	.	*8*	.	.	.	.	.	.	.	.	*10*	.	.	.	.	.	.	.	.	*0.5*	.	.	.
	Trifolium pratense	.	0.2	0.1	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	0.1	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Alchemilla sp.	*1*	*0.1*	*3*	*5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Armeria rumelica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.	12	.	0.5	.	.	.	.	0.3	.	.	.	.	.	.	.
	Bryum argenteum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.01	0.01	.	.	.	.	.	.	.	.	.	.	.	0.01	.	.	0.5	.	.	.
	Centaurium erythraea subsp. erythraea	.	.	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	0.1	0.1	.	.	.	.	.	.	.	.	.	.	.	.
	Cerastium brachypetalum	.	.	.	.	.	.	.	.	.	.	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	0.3
	Cladonia symphycarpia	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	0.3	.	.	.	.	.	.	3	.	.	.	.	.
	Crataegus monogyna	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	0.5
	- Crataegus monogyna (S)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Crataegus monogyna (H)	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	*0.5*
	Danthonia alpina	.	.	.	.	.	25	1	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.
	Euphrasia sp.	.	.	.	.	.	.	.	*0.05*	.	.	.	.	.	*0.05*	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	.	*0.3*	.	.	.	.	.	.
	Festuca ser. Valesiacae	.	.	.	.	.	.	.	.	.	.	*10*	.	.	.	*20*	.	.	.	.	.	.	.	.	.	.	*5*	.	.	.	.	.	.	.	.	.	.	.	*20*	.	.
	Rhinanthus rumelicus	.	.	.	0.1	.	.	.	.	.	.	.	0.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.5	0.2	.	.	.	.	.	.	.
	Rhytidium rugosum	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	9	.	.	.	.	.	.	.
	Anthemis carpatica subsp. carpatica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	15	18	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Asperula purpurea subsp. purpurea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	0.2	.	.	.	.
	Centaurea sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	*1*	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cladonia sp.	.	.	*0.01*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	*1*	.	.	.	.	.	.	.	.
	Dianthus carthusianorum	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Hieracium sp.	.	.	.	.	.	.	.	.	.	*0.3*	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.
	Poa angustifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	0.01	.	.	.	.	0.2
	Scabiosa ochroleuca	.	0.1	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Silene otites subsp. otites	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.5	.	.	.	.	.	.	.	.
	Thymus glabrescens subsp. glabrescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	0.5	.
	Abietinella abietina	.	.	0.01	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.
	Agrostis vinealis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	3	.	.	.	.	.	.	.	.	.	.	.	.
	Brachythecium albicans	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Brachythecium glareosum	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.
	Bruckenthalia spiculifolia	.	1	.	.	.	.	.	.	.	0.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Bryum sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*2*	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Carduus acanthoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.
	Cetraria islandica	.	.	.	.	.	.	.	.	.	0.1	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Cetraria cf. islandica	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Cetraria islandica	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cf. Grimmia sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.
	Chamaecytisus heuffelii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Chamaecytisus pygmaeus	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Chamaecytisus sp.	.	.	.	.	.	.	.	.	.	.	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*2*	.	.	.	.	.	.	.
	Cladonia pocillum	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.
	Cladonia squamosa	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.
	- Cladonia cf. squamosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.
	- Cladonia squamosa	.	.	.	.	.	.	.	.	.	*2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Dorycnium pentaphyllum	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
	Euphorbia myrsinites	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.
	Euphrasia liburnica	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Festuca nigrescens subsp. nigrescens	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Festuca sp.	.	.	.	*1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Helianthemum nummularium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	3	.
	Jasione heldreichii	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.
	Lepraria sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.
	Lichenes sp. (indet.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.
	Odontites verna subsp. serotina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	0.1	.	.	.	.	.	.	.
	Placynthiella icmalea	.	.	.	.	.	.	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.
	Sedum sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.01*	.	.	.	.	.	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Syntrichia ruralis agg.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Taraxacum sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	0.01	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Thymus praecox subsp. polytrichus	.	0.5	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Trifolium sp. (non alpestre, non repens)	.	*0.01*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.
	Veronica arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Veronica dillenii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.
	Veronica sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.3*	.	.	.	.	.	.	.	.	.	.	.

Other species occurring in one relevé: Acinos alpinus subsp. majoranifolius: BGR058: 0.1; Ajuga genevensis: BG13NE: 3; Allium carinatum subsp. carinatum: BGR058: 0.1; Anagallis arvensis: BGR048: 0.2; Anchusa officinalis: BG09NE: 0.2; Anthemis arvensis: BGR047: 0.2; Anthemis tinctoria: BGR040: 1; Arenaria serpyllifolia: BGR058: 0.1; Avenula cf. compressa: BGR040: 3; Brachypodium pinnatum subsp. pinnatum: BG08NE: 0.1; Bromus riparius: BGR061: 0.6; Bryophyta sp. 1 (indet.): BGR067: 0.3; Bryum caespiticium: BG13NE: 0.1; Calamagrostis cf. arundinacea: BGR028: 2.5; Campanula patula: BG14SW: 0.1; Campanula persicifolia: BGR050: 0.5; Campanula sp.: BGR033: 0.1; Centaurea affinis: BGR062: 6; Centaurea cf. scabiosa: BGR054: 0.1; Cerastium banaticum: BG15NW: 0.1; Cerastium cf. semidecandrum: BGR040: 0.05; Cerastium pumilum subsp. glutinosum: BGR058: 0.1; Cetraria ericetorum: BGR059: 0.1; Cf. Collema sp.: BGR048: 5; Cf. Galium verum: BG13NE: 0.2; Cf. Genista / Chamaecytisus: BGR036: 0.3; Cf. Grimmia sp. (big): BGR055: 0.3; Cf. Leucanthemum vulgare: BGR036: 0.05; Chlorophyta sp.: BG08NE: 0.4; Cladonia cervicornis agg.: BGR053: 0.1; Cladonia cf. arbuscula: BGR047: 1; Cladonia cf. borealis: BGR039: 0.05; Cladonia cf. pleurota: BG13NE: 0.3; Cladonia subrangiformis: BG13NE: 0.5; Cladonia subulata: BG09NE: 0.5; Convovulus arvensis: BGR056: 0.2; Conyza canadensis: BGR052: 0.2; Cuscuta sp.: BGR050: 0.2; Dianthus petraeus: BGR059: 3; Dicranella heteromalla: BGR028: 0.1; Digitalis lanata: BGR029: 1; Echium vulgare: BGR029: 1; Erigeron annuus: BGR029: 0.1; Euphrasia cf. nemorosa: BGR029: 0.1; Euphrasia cf. stricta: BGR036: 0.1; Festuca dalmatica:BG09NE: 0.5; Filago cf. vulgaris: BG14SW: 0.2; Fissidens dubius: BG14SW: 0.2; Galium sp.: BGR034: 0.05; Genista cf. pilosa: BGR034: 5; Gentianella germanica agg.: BG14SW: 0.1; Geranium columbinum: BG13NE: 0.1; Gypsophila muralis: BGR056: 0.2; Helleborus odorus subsp. odorus: BGR050: 0.3; Hypogymnia tubulosa: BGR028: 0.1; Jovibarba heuffelli: BGR059: 0.2; Juniperus communis subsp. alpina (H): BG08NE: 2; Juniperus communis subsp. communis (H): BGR053: 0.3; Lichenes sp. (crustose, black): BGR057: 0.1; Lichenes sp. (crustose, grey): BGR057: 0.1; Luzula luzuloides: BGR028: 0.1; Mentha longifolia: BGR029: 0.2; Muscari sp.: BGR050: 0.1; Neofuscelia pulla: BG13NE: 0.7; Omalotheca sylvatica: BGR028: 0.1; Orlaya grandiflora: BG13NE: 0.01; Parmelia omphalodes subsp. discordans: BGR048: 5; Pimpinella saxifraga: BGR033: 0.2; Plantago media: BG15SE: 0.1; Pleurozium schreberi: BG14SW: 0.2; Poa compressa: BGR029: 0.2; Polytrichum juniperinum: BGR029: 5; Prunella grandiflora subsp. grandiflora: BGR030: 0.1; Prunella laciniata: BGR066: 0.5; Prunella sp.: BGR040: 0.1; Prunus cerasifera (H): BG14SW: 0.2; Prunus cf. spinosa (H): BGR063: 0.1; Pyrus pyraster (H): BGR064: 0.2; Quercus cerris (H): BGR034: 0.2; Quercus sp. (H): BGR050: 0.1; Ranunculus repens: BG14SW: 0.2; Rorippa lippizensis: BG09NE: 0.2; Salvia verticillata: BGR054: 0.2; Satureja pilosa: BGR034: 0.1; Scabiosa columbaria subsp. columbaria: BGR054: 0.1; Scleranthus annuus: BGR048: 0.1; Spermatophyta sp.: BG15SE: 0.01; Stachys germanica subsp. germanica: BGR066: 0.2; Teesdalia nudicaulis: BG09NE: 1; Thymus cf. striatus: BGR057: 0.2; Trifolium dubium: BGR029: 0.2; Trisetum flavescens subsp. flavescens: BGR061: 0.8; Verbascum lychnitis: BGR054: 1.5; Verbascum macrurum: BG09SW: 0.4; Veronica austriaca subsp. austriaca: BGR050: 7; Veronica verna: BGR059: 0.2; Vicia hirsuta: BG09SW: 0.1; Vicia sativa subsp. nigra: : 0.1; Vicia villosa subsp. varia: BGR050: 0.2; Vicia villosa subsp. villosa: BG09NE: 0.2; Viola sp. (round leaves): BGR064: 0.4; Viola tricolor: BG13NE: 0.5; Xanthoparmelia cf. tinctina: BGR050: 0.1.

13_Pedashenko 5 352x528 mm 22.08.13 10:59 Seite 1

Table 5: Relevé table of the *Festuco-Brometea* communities in the study region in NW Bulgaria

Species are arranged according to decreasing phi-values in the respective species blocks (only those species that were significant according to Fisher's exact test are included) and according to decreasing overall constancy for the non-diagnostic species. Diagnostic species are highlighted in dark grey, while transgressive diagnostic species and differential species are highlighted in light grey and additionally marked in the column left of the species names. Uncertain species that had been excluded from the numerical analyses are indicated in italics; taxa or layers that had been joined for the numerical analyses are inserted below the "aggregate" line in italics with preceding "-". For phanerophytes, the layer is indicated in brackets: S = shrub layer; H = herb layer. Plot locations (latitude, longitude, altitude) and date of the relevés are available in Appendix 2.

Tab. 5: Aufnahmentabelle der untersuchten *Festuco-Brometea* -Gesellschaften Nordwest-Bulgariens

Die Arten sind nach fallenden phi-Werten im jeweiligen Block angeordnet (wobei nur Arten mit statistisch signifikanter Häufung gemäß Fishers exaktem Test gelistet sind) bzw. nach fallender Gesamtstetigkeit im Fall der nicht diagnostischen Arten (Begleiter). Diagnostische Arten sind in dunkelgrau hervorgehoben, transgressive diagnostische Arten und Differentialarten dagegen in hellgrau, mit zusätzlicher Kennzeichnung in der Spalte links vom Artnamen. Arten mit unsicherer Bestimmung, die von bei den numerischen Analysen ausgeschlossen waren, sind kursiv gesetzt; Sippen oder Vorkommen derselben Sippe in verschiedenen Schichten, die in den numerischen Analysen zusammengefasst wurden, stehen unter dem jeweiligen aggregierten Eintrag in kursiv mit führendem "-". Bei Phanerophyten ist die Schicht in Klammern angegeben: S = Strauchschicht, H = Krautschicht. Koordinaten (geografische Breite und Länge, Meereshöhe) sowie Datum der Aufnahmen, sind im Anhang 2 verfügbar.

		Class 1: Festuco-Brometea																																																							
		Alliance 1.1																						Alliance 1.2																						Alliance 1.3													
		Association 1.1.1								Association 1.1.2										Assoc. 1.1.3				Asccocation 1.2.1									Association 1.2.2						Association 1.2.3							Association 1.3.1													
	Plot number	BGR006	BGR007	BGR009	BGR011	BGR012	BGR016	BGR017	BGR026	BG01NE	BG01SW	BG04NE	BG04SW	BGR002	BGR003	BGR004	BGR005	BGR020	BGR023	BG10NE	BG10SW	BG11NE	BG11SW	BG02NE	BG05NE	BG05SW	BG06NW	BG06SE	BGR008	BGR022	BGR024	BGR031	BG02SW	BGR013	BGR015	BGR018	BGR019	BGR025	BG03NE	BG03SW	BGR001	BGR010	BGR014	BGR021	BGR032	BG07NE	BG07SW	BG12NE	BG12SW	BGR027	BGR035	BGR037	BGR038	BGR045	BGR046	BGR049	BGR051	BGR060	BGR065
	Region (V = Vratsa; K = Koprivshtitsa)	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	K	K	K	K	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	K	K	K	K	K	K	K	K	K	K	K	K	K	K
	TWINSPAN, modified, 3 clusters	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	III	III	III	III	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	II	II	II	II	II	II	II	II	II	II	II	II	II	II
	TWINSPAN, modified, 5 clusters	B	B	B	B	B	B	B	B	C	C	C	C	C	C	C	C	C	C	E	E	E	E	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	TWINSPAN, modified, 10 clusters	2	2	2	2	2	2	2	2	5	5	5	5	5	5	5	5	5	5	8	8	8	8	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	4	4	4	4	4	4	4	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Grazing intensity (0 = none to 3 = high)	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	2	1	0	1	1	1	3	3	1	2	3	1	0	1	1	1	0	0
	Burning (0 = no; 1 = yes)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Altitude [m a.s.l.]	1411	1454	1396	1460	1391	1409	1412	1336	993	992	1044	1044	984	970	951	983	1051	1017	647	641	997	989	1420	1280	1286	1260	1262	1429	1001	1290	1215	1420	1388	1110	1394	1038	1302	1070	1070	1000	1054	1141	1048	1200	885	905	884	852	997	1008	909	929	871	776	692	857	1284	1159
	Aspect [°]	90	135	98	145	95	320	155	90	300	295	300	265	305	160	180	180	20	160	130	135	180	170	282	250	290	65	50	225	315	180	20	290	280	240	105	340	270	70	110	340	180	223	120	270	55	58	90	90	18	182	300	180	360	200	320	10	200	225
	Inclination [°]	45	18	35	10	45	5	75	5	33	32	7	8	18	2	45	25	10	10	38	25	30	31	18	8	8	10	10	26	3	12	20	14	42	10	38	10	2	10	10	7	14	18	18	5	23	30	8	8	10	12	18	12	3	10	15	23	8	14
	Heat index	0.99	0.26	0.70	0.12	1.00	-0.07	2.09	0.09	-0.61	-0.60	-0.11	-0.14	-0.29	0.02	0.16	0.07	0.03	0.09	0.67	0.38	0.09	0.20	-0.32	-0.12	-0.14	0.15	0.12	-0.29	-0.04	0.03	0.07	-0.24	-0.90	-0.14	0.78	-0.09	-0.03	0.15	0.17	-0.06	0.04	-0.18	0.30	-0.09	0.31	0.44	0.14	0.14	0.03	0.03	-0.30	0.03	-0.01	-0.03	-0.20	0.01	-0.03	-0.15
	Microrelief [cm]	20	10	20	40	10	3	50	30	25	30	20	20	40	5	35	10	30	70	40	20	50	20	25	2	7	8	30	5	10	16	3	35	10	22	3	1	7	5	3	4	5	7	10	15	2	3	1	1	5	5	2	2	5	5	5	3	10	8
	Total vegetation cover [%]	90	85	80	78	95	88	35	65	76	67	80	60	65	85	45	98	85	57	55	60	25	20	95	95	95	95	100	98	100	95	99	95	98	80	100	92	98	85	85	98	75	95	95	75	90	95	60	80	90	95	92	92	100	90	85	95	95	80
	Cover shrub layer [%]	0	0	0	0	0	0	0	0	0	2	1	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Cover herb layer [%]	90	85	80	75	95	75	3	55	75	65	75	55	65	85	45	98	82	55	50	40	25	17	95	95	95	95	100	98	100	95	99	95	98	78	100	90	98	85	82	98	75	75	95	75	90	95	55	80	90	95	92	92	100	90	85	85	95	80
	Cover cryptogam layer [%]	0	0	0	3	0	15	30	18	1	2	5	15	1	5	1	0	10	2	7	20	0	3	3	0	15	0	0	1	2	1	1	3	0	1	0	8	1	10	5	1	2	30	0	3	1	0	8	0	2	0	0	1	1	2	0	25	1	0
	Cover dead wood [%]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Cover litter [%]	40	30	30	8	20	5	2	5	3	5	10	30	3	5	2	70	20	5	1	0	2	1	10	70	15	80	30	30	40	35	20	50	15	2	70	15	15	15	3	5	15	2	30	5	80	65	70	15	35	30	40	30	20	50	30	70	15	90
	Cover stones and rocks [%]	3	3	15	15	2	6	60	32	25	30	15	30	30	10	75	0	10	50	17	20	75	60	3	0	0	0	0	0	0	1	0	3	0	15	0	0	1	2	8	0	10	3	2	20	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Cover fine earth [%]	10	12	5	3	2	6	5	3	5	5	3	10	3	2	1	2	5	1	18	20	5	80	1	1	5	5	0	2	1	1	1	2	2	4	0	8	1	13	7	2	15	1	0	5	1	2	4	5	5	5	1	1	0	0	5	1	1	2
	Species richness (total)	39	40	42	40	35	48	33	49	45	49	57	52	62	49	27	38	50	55	37	34	15	23	38	52	59	43	29	32	52	46	26	43	41	46	35	62	53	43	51	60	41	53	50	37	42	37	31	26	29	33	43	33	18	32	41	49	37	32
	Species richness (vascular plants)	39	40	42	38	34	35	26	38	44	46	49	46	60	45	27	38	41	52	28	29	15	16	32	51	58	41	29	30	49	43	25	34	41	42	35	57	50	39	45	57	40	44	49	31	39	35	28	26	27	33	43	29	15	29	40	44	35	32
	Species richness (bryophytes)	0	0	0	1	1	4	4	6	1	3	6	5	1	3	0	0	8	3	3	4	0	4	6	1	1	2	0	2	3	3	1	9	0	3	0	5	2	3	3	2	1	6	1	3	3	1	3	0	2	0	0	0	1	1	1	5	2	0
	Species richness (lichens)	0	0	0	1	0	9	2	5	0	0	2	1	1	1	0	0	1	0	6	2	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	3	1	0	2	0	3	0	1	0	0	0	0	0	4	2	2	0	0	0	0
Cl. 1 - Festuco-Brometea																																																											
	Teucrium chamaedrys	2	1	0.5	.	1	0.5	.	1	15	8	25	12	15	15	2	1	5	5	0.1	.	2	.	.	15	1	.	0.1	.	.	2	.	.	2	3	0.5	8	20	2	2	1	7	8	8	10	.	.	.	.	.	.	.	.	.	.	1	30	.	.
	Veronica austriaca subsp. austriaca	0.1	0.8	.	0.1	.	.	.	.	4	0.5	2	1	0.2	2	.	3	0.5	0.1	.	.	.	.	.	8	5	.	.	.	.	0.6	.	0.2	.	.	.	0.5	2	12	0.5	8	0.2	0.2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Helianthemum nummularium	7	0.5	3	.	3	4	.	3	.	.	.	.	.	.	.	0.5	.	0.5	.	.	.	.	8	0.2	2	.	.	.	.	1	.	8	2	0.8	0.3	4	8	.	.	2	.	.	.	.	12	25	.	.	7	.	.	.	.	.	1	2	.	4
	- Helianthemum nummularium	*7*	*0.5*	*3*	.	*3*	*4*	.	*3*	.	.	.	.	.	.	.	*0.5*	.	*0.5*	.	.	.	.	*8*	*0.2*	*2*	.	.	.	.	*1*	.	*8*	*2*	*0.8*	*0.3*	*4*	*8*	.	.	*2*	.	.	.	.	.	.	.	.	*7*	.	.	.	.	.	*1*	*2*	.	*4*
	- Helianthemum nummularium cf. subsp. nummularium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*12*	*25*	.	.	.	.	.	.	.	.	.	.	.	.
	Sesleria latifolia	60	45	60	.	65	4	0.3	0.6	2	.	.	0.8	.	.	18	.	.	1	.	.	.	.	90	.	.	.	.	.	.	.	.	80	55	35	85	1	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Filipendula vulgaris	.	.	.	.	.	.	.	.	0.1	0.5	.	.	0.7	1	.	1.5	2	1	.	.	.	.	.	0.5	1	.	.	.	8	1	.	.	.	.	.	1	3	.	.	3	0.2	.	8	.	1	1	.	.	.	0.1	2	.	0.2	.	.	.	3	.
	Medicago lupulina	.	0.01	.	.	.	.	.	0.1	.	0.1	.	0.8	0.5	.	0.1	0.1	0.5	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	0.1	.	0.7	0.1	1	3	.	0.2	0.8	0.2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Scabiosa columbaria subsp. columbaria	0.8	.	0.1	.	1	.	.	0.6	.	.	3	0.4	.	1	.	.	3	.	.	.	.	.	.	1	.	.	.	.	.	1	.	0.1	1	.	.	.	1	0.2	.	2	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Seseli peucedanoides	0.1	.	.	0.1	0.1	.	.	0.1	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	0.2	.	.	.	.	0.2	.	.	0.5	.	0.7	1	0.4	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	0.1	.
	- Seseli cf. peucedanoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Seseli peucedanoides	*0.1*	.	.	*0.1*	*0.1*	.	.	*0.1*	.	.	.	.	.	.	.	*0.2*	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	*0.2*	.	.	*0.5*	.	*0.7*	*1*	*0.4*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	*0.1*	.
	Carex humilis	15	30	.	4	5	6	4	.	.	.	.	.	.	.	8	10	.	1	.	.	.	.	0.5	.	.	.	.	.	.	.	.	5	.	.	2	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Carex cf. humilis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*10*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Carex humilis	*15*	*30*	.	*4*	*5*	*6*	*4*	.	.	.	.	.	.	.	*8*	.	.	*1*	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	*5*	.	.	*2*	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Tortella tortuosa	.	.	.	.	0.3	.	1.5	.	.	.	6	6	1	.	.	.	0.1	0.5	.	.	.	.	.	.	.	.	.	.	.	0.3	.	1	.	.	.	2	.	1	0.2	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Medicago sativa subsp. falcata	.	.	.	.	.	.	.	.	2	5	.	4	5	5	.	1.5	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	0.2	0.2	25	3	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Acinos arvensis	.	.	.	.	.	.	.	0.4	.	.	0.5	0.1	1	0.1	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	0.1	0.1	.	.	0.5	0.1	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
All. 1.1 - Saturejion montanae (order Stipo pulcherrimae-Festucetalia pallentis)																																																											
	Asperula purpurea subsp. purpurea	1	1.5	1	.	0.2	.	1	8	15	15	12	15	0.5	3	6	8	10	5	3	3	.	1	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	0.5	.	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Koeleria macrantha agg.	.	1	0.8	2	.	0.3	2	0.8	6	6	12	2	7.0	8	3	3	.	0.5	10	5	5	3	.	.	.	0.5	.	1	.	.	.	.	.	0.1	.	.	1	2	10	.	0.5	0.5	0.5	.	0.5	0.2	.	.	0.2	0.2	0.1	.	.	.	1	.	.	.
	- Koeleria macrantha agg.	.	*1*	*0.8*	*2*	.	.	*2*	*0.8*	.	.	.	.	.	.	*3*	.	.	*0.5*	.	.	.	.	.	.	.	*0.5*	.	*1*	.	.	.	.	.	*0.1*	.	.	*1*	.	.	.	*0.5*	*0.5*	*0.5*	.	.	.	.	.	*0.2*	*0.2*	.	.	.	.	*1*	.	.	.
	- Koeleria cf. macrantha	.	.	.	.	.	.	.	.	*6*	*6*	.	.	*7.0*	.	.	*3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Koeleria cf. nitidula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	*0.2*	.	.	.	.	*0.1*	.	.	.	.	.	.	.
	- Koeleria nitidula	.	.	.	.	.	*0.3*	.	.	.	.	*12*	*2*	.	*8*	.	.	.	.	*10*	*5*	*5*	*3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*2*	*10*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Allium flavum subsp. flavum	0.2	0.2	0.3	3	.	0.2	0.5	.	0.4	.	.	.	0.1	.	0.1	0.01	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Satureja montana subsp. kitaibelii	.	5	.	.	5	0.5	0.3	.	22	12	3	3	1.5	35	3	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Teucrium montanum	3	2	.	.	2	3	0.1	.	1	0.5	.	2	.	2	1	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.8	0.5	.	.	.	.	.	.	.	.	.	.	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Sedum hispanicum	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2
	- Sedum cf. hispanicum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Sedum hispanicum	.	.	.	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*
	Vincetoxicum hirundinaria	0.05	.	0.2	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Assoc. 1.1.1 - Dianthus petraeus-Sesleria latifolia comm.																																																											
1	Potentilla cinerea agg.	1.5	4	1	6	2	30	2	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	0.5	.	.	.	.	5	.	.	.	.	.	.	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.1	Erysimum diffusum	.	0.01	0.1	0.2	0.3	.	.	0.8	.	0.01	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.1	Dianthus petraeus	3	1.5	0.8	5	1	0.5	2	.	2	1.5	.	.	0.3	0.5	.	.	.	.	.	.	.	.	0.2	.	.	.	.	1	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Sedum ochroleucum	.	.	.	0.2	.	0.1	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Sesleria rigida	15	.	.	45	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Draba lasiocarpa	.	.	.	0.1	.	0.1	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Astragalus monspessulanus	0.05	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Inula ensifolia	2	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Iris reichenbachii	0.2	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Ornithogalum comosum	0.01	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Stipa cf. pennata subsp. eriocaulis	.	0.2	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Toninia sedifolia	.	.	.	.	.	0.01	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Anthyllis vulneraria	.	.	.	8	.	0.4	0.5	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Verbascum lychnitis	0.1	.	.	0.1	0.5	.	.	.	.	.	.	.	2.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cetraria islandica	.	.	.	.	.	0.3	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.1	Sedum album	.	.	0.5	1	.	.	1	.	.	0.01	.	.	0.5	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Coronilla varia	.	.	2	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Ditrichum flexicaule	.	.	.	.	.	2	.	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Pedicularis leucodon subsp. occulta	.	0.2	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Seseli degenii	.	0.2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cladonia pocillum	.	.	.	.	.	1	1.5	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cladonia symphycarpia	.	.	.	0.1	.	1	.	1	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D 1.1.1	Carlina acanthifolia subsp. utzka	.	0.1	0.2	.	1	1.5	0.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	2	.	.	.	.	0.5	5	.	.	.	.	.	.	.	0.2	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.
Assoc. 1.1.2 - Achillea clypeolata-Festuca stojanovii comm.																																																											
	Inula oculus-christi	.	.	.	.	.	.	.	.	.	1.5	2	3	1.5	1	0.5	1.5	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	18	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Geranium columbinum	.	.	.	.	.	.	.	.	0.3	0.5	0.1	0.5	0.4	0.2	.	.	0.2	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Stachys recta	.	.	.	.	.	.	.	.	2	0.2	0.1	.	.	0.5	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.1	Achillea clypeolata	.	.	.	.	0.2	.	0.7	.	4	.	.	0.8	0.5	15	3	1	.	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Orlaya grandiflora	.	.	.	.	.	.	.	.	2	2	0.1	0.4	.	.	0.2	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1
	Poa compressa	.	.	.	.	.	.	.	.	1	1.5	0.3	4	.	.	.	8	.	0.3	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.1	Melica ciliata subsp. ciliata	.	.	.	.	.	.	.	.	4	3	0.2	1	3.0	.	1	.	.	5	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Origanum vulgare	.	.	.	.	.	.	.	.	.	.	3	5	1.0	.	.	.	5	2	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Alyssum campestre	.	.	.	.	.	.	.	.	0.1	0.3	0.01	.	0.2	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Alyssum cf. campestre	.	.	.	.	.	.	.	.	.	.	*0.01*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Alyssum campestre	.	.	.	.	.	.	.	.	*0.1*	*0.3*	.	.	*0.2*	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Festuca cf. stojanovii	.	.	.	.	.	.	.	.	5	5	.	.	.	3	1.5	.	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Medicago minima	.	.	.	.	.	.	.	.	0.1	.	1	0.1	0.5	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Vicia sativa subsp. nigra	.	.	.	.	.	.	.	.	0.1	0.01	0.1	.	.	.	.	0.01	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Elymus repens subsp. repens	.	.	.	.	.	.	.	.	0.5	8	.	.	7.0	1	.	1	.	5	.	.	.	.	.	.	2	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Centaurea orientalis	.	.	.	.	.	.	.	.	0.1	.	.	.	0.2	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Centaurea cf. orientalis	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Centaurea orientalis	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Fraxinus ornus (H)	.	.	.	.	.	.	.	.	.	0.01	.	.	.	.	0.3	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Stipa capillata	.	.	.	.	.	.	.	.	1	0.02	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Torilis nodosa	.	.	.	.	.	.	.	.	.	.	0.1	0.05	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Xeranthemum annuum	.	.	.	.	.	.	.	.	0.5	2	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Calamintha nepeta	.	.	.	.	.	.	.	.	.	.	.	1.5	6.0	.	.	.	1	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	Bupleurum falcatum	.	.	.	0.2	0.5	.	.	.	0.1	0.3	0.1	0.2	0.2	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	0.2	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Helleborus odorus subsp. odorus	.	.	.	.	.	.	.	.	.	.	.	.	2.0	.	.	1	2	1.5	.	.	.	.	0.1	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Anthericum ramosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Bromus cf. erectus	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Geranium sanguineum	.	.	.	.	.	.	.	.	8	15	.	.	.	0.2	.	10	.	8	.	.	.	.	.	.	.	.	.	.	1	16	.	.	.	.	4	.	6	.	.	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Prunus spinosa	.	.	.	0.1	.	.	.	.	4	.	0.01	0.1	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.
	- Prunus cf. spinosa (H)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.
	- Prunus spinosa (S)	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Prunus spinosa (H)	.	.	.	*0.1*	.	.	.	.	*4*	.	*0.01*	.	.	.	.	.	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	Poa angustifolia	.	.	.	.	.	.	.	.	.	7	1	2	2.0	1	.	.	1	0.1	.	.	.	.	.	.	.	0.5	.	3	.	.	.	.	.	.	1	0.5	0.2	.	0.3	8	.	.	.	.	.	.	0.2	1	.	.	.	.	.	.	1	0.5	2	.
	Convovulus arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Carduus acanthoides	.	.	.	.	.	.	.	.	0.2	1	.	.	0.5	0.3	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Carduus cf. acanthoides	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Carduus acanthoides	.	.	.	.	.	.	.	.	*0.2*	*1*	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*1*	*0.2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.1	Syntrichia ruralis agg.	.	.	.	.	.	.	.	1	.	.	0.1	0.8	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Crataegus monogyna	.	.	.	.	.	.	.	.	2	1.5	2	8	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	0.1	.	.	.	.	0.1	.	.	.	.	.	0.2	.	.	0.2	.	.	0.2	0.2	.	.	.	.	.	.
	- Crataegus monogyna (S)	.	.	.	.	.	.	.	.	.	*1.5*	.	*8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Crataegus monogyna (H)	.	.	.	.	.	.	.	.	*2*	.	*2*	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	*0.1*	.	.	.	.	*0.1*	.	.	.	.	.	*0.2*	.	.	*0.2*	.	.	*0.2*	*0.2*	.	.	.	.	.	.
	Arabis auriculata	.	.	0.8	.	.	.	.	.	0.1	.	.	.	.	.	.	.	0.6	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Arabis cf. auriculata	.	.	*0.8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Arabis auriculata	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	*0.6*	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Scabiosa ochroleuca	.	.	.	.	.	.	.	0.3	.	0.1	.	.	1.0	0.3	0.5	0.5	.	0.1	.	.	.	.	0.1	.	2	.	.	.	.	0.5	.	.	.	.	.	1	.	0.4	.	.	.	0.2	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.
	Sherardia arvensis	.	.	.	.	.	.	.	.	.	.	.	.	0.1	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Logfia arvensis	.	.	.	.	.	.	.	.	0.1	0.5	.	.	0.01	0.1	.	.	.	.	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D 1.1.2	Trifolium arvense	.	.	.	.	.	.	.	.	.	.	0.3	0.2	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Assoc. 1.1.3 - Satureja pilosa-Phleum phleoides comm.																																																											
	Satureja pilosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	15	10	10	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Silene armeria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.4	0.1	0.5	1.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.
	Phleum phleoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	5	8	2	.	0.2	.	.	.	.	.	0.5	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	0.5	.	.	.	.	3	.	.
	Euphorbia myrsinites	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Lepraria sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Anthemis carpatica subsp. carpatica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Veronica dillenii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.01
	Silene frivaldszkyana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Allium sphaerocephalon subsp. sphaerocephalon	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Asperula tinctoria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Bryum alpinum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cladonia convoluta	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cladonia floerkeana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Lactuca viminea subsp. viminea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Trapeliopsis granulosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Dichantium ischaemum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	2	1	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.5	.	.	1	.	0.1	.	5	.	.	8	.	.	.	.	.	.	.	.	.	.
D 1.1.3	Rumex acetosella	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.05	0.1	0.5	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	0.3	0.5	.	.	.	.	0.3	0.6	.	.	0.5	0.3
All. 1.2 - Cirsio-Brachypodion pinnati (Ord. Brachypodietalia pinnati)																																																											
	Stachys officinalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	0.2	3	3	0.1	4	2	0.2	0.5	0.2	.	1	2	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Plantago media	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	0.5	.	.	.	0.5	1.5	.	0.1	.	1	.	3	0.6	0.5	0.3	1	5	0.2	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Primula veris	0.2	0.05	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	0.5	.	.	.	.	.	0.3	.	.	0.2	0.1	.	2	0.1	1	0.3	0.7	0.5	0.1	0.5	0.8	.	.	1	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Prunella grandiflora subsp. grandiflora	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	0.5	.	2	1.5	3	0.3	0.5	.	.	1	1	.	.	1	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Brachypodium pinnatum subsp. pinnatum	.	.	0.5	.	5	.	.	.	.	.	.	.	.	.	.	30	0.5	.	.	.	.	.	.	.	.	10	80	.	.	8	85	.	5	10	15	1	.	1	0.1	0.5	65	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Pimpinella saxifraga	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	0.5	.	5	.	.	.	.	0.01	1	5	.	2	.	0.2	0.5	.	1	.	.	.	0.2	.	.	.	.	.	1	.	.	.	.	.	.	.
	Asyneuma canescens subsp. canescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	3	0.2	0.2	0.2	.	.	.	.	0.2	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Trifolium montanum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	0.5	1	.	.	.	.	0.3	4	.	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Veratrum nigrum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.7	.	.	.	1	3	0.2	0.5	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Thymus pulegioides	.	.	.	.	.	.	.	.	.	.	1	2	.	1	.	.	3	.	.	.	.	.	.	2	.	.	.	.	5	.	.	.	0.8	8	.	4	.	15	20	.	3	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.
	Tragopogon pratensis subsp. orientalis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	2	.	.	.	0.2	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	Galium mollugo agg.	.	1	0.8	0.2	.	.	.	0.2	0.3	.	3	4	.	.	.	.	2	.	.	.	.	.	0.1	.	.	.	.	1.2	.	1.5	.	0.1	2	.	.	.	1.5	.	0.1	.	1.5	0.5	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Avenula pubescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Inula hirta	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	1	.	.	10	.	.	.	0.5	.	0.3	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
	Clinopodium vulgare subsp. vulgare	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	0.2	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	0.2	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.
1	Fragaria viridis subsp. viridis	.	.	.	0.2	.	.	.	.	0.5	.	7	3	1.0	.	.	.	.	.	.	.	.	.	.	10	8	.	.	.	.	1	.	0.5	.	.	.	0.2	.	.	.	2	.	.	8	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.
	Brachythecium glareosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	0.5	.	.	0.2	.	0.3	.	.	.	0.3	.	.	.	.	0.8	.	.	0.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	0.5	.
	Campyliadelphus chrysophyllus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	0.01	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Gentiana cruciata subsp. cruciata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Alchemilla flabellata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Centaurea jacea agg.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Colchicum autumnale	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	.	.	.	.	.	0.2	.	.	.	.	0.5	.	.	.	.	.	0.2	.	.	.	.	.	0.05	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
D 1.2	Trifolium alpestre	7	2	2	1	5	5	.	0.05	0.5	1	.	.	.	0.1	.	1	.	0.3	.	.	.	.	0.2	8	4	1	0.5	1.5	.	6	0.2	2	1	3	2	12	3	.	.	4	0.5	1	1	.	.	2	.	.	0.5	0.2	.	0.5	.	.	0.5	0.5	0.5	1
D 1.2	Cruciata glabra	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	2	5	3	1	0.4	.	0.5	0.2	.	.	0.1	0.1	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Assoc. 1.2.1 - Ferulago campestris-Agrostis capillaris comm.																																																											
	Ferulago campestris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	5	0.2	2	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Hypericum maculatum subsp. maculatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	0.1	.	5	.	2	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.
	Carex montana	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	5	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Centaurea phrygia agg.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25	5	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.2	Allium carinatum subsp. carinatum	.	.	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	0.2	0.2	0.2	0.1	.	.	.	0.1	0.2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	.
1.2	Lathyrus pratensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	1	.	0.5	.	2	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Campanula patula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	0.1	1	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
	- Campanula patula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*1*	.	.	.	.	.	.	.
	- Campanula patula subsp. epigaea	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	*0.1*	*1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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	- Festuca cf. nigrescens subsp. nigrescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*3*	.	.	.	.	.	.	.	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Festuca nigrescens subsp. nigrescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*40*	*50*	*1*	*4*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*5*	.	.	.	.	.	.	.	.	.	.	.	.
	Astrantia major subsp. major	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Gladiolus imbricatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Rorippa pyrenaica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.1	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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	Dianthus carthusianorum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	0.4	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Vicia villosa subsp. villosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Potentilla recta	.	.	.	.	.	.	.	0.7	.	.	.	.	.	.	.	.	.	0.1	.	.	.	.	.	0.5	0.2	2	.	.	.	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Potentilla recta	.	.	.	.	.	.	.	*0.7*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.3*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	- Potentilla recta subsp. pilosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	*0.5*	*0.2*	*2*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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	- Trifolium rubens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Scorzonera hispanica	.	.	0.2	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.7	0.5	.	.	.	.	2	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Trifolium aureum	.	.	.	.	.	.	.	0.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	1	.	.	.	0.5	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	1.5
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D 1.2.1	Luzula campestris agg.	.	0.02	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.2	.	.	0.1	.	1	0.1	.	0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	0.1	.	.	0.2	.	.	.	.	.	0.1	0.1	.	.
	- Luzula campestris agg.	.	*0.02*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.1*	.	.
	- Luzula campestris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.2*	.	.	.	.	*1*	*0.1*	.	*0.5*	.	.	.	.	.	.	.	.	.	.	.	.	.	*0.5*	*0.1*	.	.	*0.2*	.	.	.	.	.	*0.1*	.	.	.
D 1.2.1	Rumex acetosa subsp. acetosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0.5	0.1	.	0.5	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	0.1	.	.

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| | | Class 1: Festuco-Brometea | | |

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