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DRY GRASSLAND VEGETATION IN THE TRANSITION ZONE BETWEEN TWO BIOGEOGRAPHIC REGIONS

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Abstract

The geographic position of Bulgaria results in a variety of climatic and biogeographic influences on the country's vegetation. We aim to describe the plant diversity of dry grasslands distributed in the transitional belt between the south-eastern European and Mediterranean biogeographic regions in SE Bulgaria, and to reveal if there are any obvious differences in soil properties, presence of life forms and chorotypes between syntaxa. The data set consists of 349 relevés of vascular plants and bryophytes sampled in different semi-natural herbaceous vegetation types. By applying TWINSPAN, we classified 176 relevés of dry grasslands to eight associations and one unranked community. One association and two subassociations are described here for the first time. Data on soil depth, soil moisture, soil pH, humus and total N content, numbers of different life forms and chorotypes were analysed statistically. The dry grasslands in SE Bulgaria were classified into different vegetation classes sharing the same territory: their communities present similarities in species composition and they have similar ratios of hemicryptophytes/therophytes and Euro-Asiatic/Mediterranean species. Dry grassland vegetation occupies mostly shallow and dry soils that vary slightly in pH, humus content and soil moisture between associations.

Keywords: Bulgaria, *Festuco-Brometea, Helianthemetea guttati, Koelerio-Corynephoretea*.

Izvleček

Različni klimatski in biogeografski vplivi na vegetacijo so pogojeni z geografskim položajem Bolgarije. V članku opisujemo vrstno raznolikost suhih travišč, ki se pojavljajo v prehodnem pasu med jugovzhodno Evropsko in Mediteransko biogeorafsko regijo in razkrivamo, ali obstajajo očitne razlike med sintaksoni v lastnostih tal, življenskih oblikah in horotipih. Podatkovni niz vsebuje 349 vegetacijskih popisov cevnic in mahov, vzorčenih v različnih polnaravnih zeliščnih vegetacijskih tipih. Z uporabo TWINSPAN metode smo klasificirali 176 popisov suhih travišč v osem asociacij in eno nerangirano združbo. V članku sta prvič opisani ena asociacija in dve subasociaciji. Statistično smo analizirali podatke o globini, vlažnosti in pH tal, vsebnosti humusa in skupnega dušika ter število različnih življenskih oblik in horotipov. Suha travišča v JV Bolgariji smo uvrstili v različne vegetacijske razrede na tem območju: združbe so podobne po vrstni sestavi in imajo podobno razmerje hemikriptofiti/terofiti ter Evroazijske/Mediteranske vrste. Suha travišča uspevajo na pretežno plitvih in suhih tleh, ki se med asociacijami malo razlikujejo v pH, vsebnosti humusa in vlažnosti tal.

Ključne besede: Bolgarija, *Festuco-Brometea, Helianthemetea guttati, Koelerio-Corynephoretea*.

1. INTRODUCTION

Bulgaria is a small country in the central part of the Balkan Peninsula with diverse relief, climate and geology, as well as a rich flora that is reflected in a large number of different plant communities. Its geographic position determines multiple biogeographic influences. The majority of the country falls under the influence of the Central European bioclimate, resulting in broadleaved deciduous forests as potential natural vegetation. Close proximity to the Mediterranean region

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is a reason for the presence of small patches of Mediterranean vegetation types, while in north-eastern Bulgaria there are stretches of steppe and forest-steppe vegetation, which are affected by a steppic bioclimate. Bondev (2002) has divided the country into three regions in terms of phytogeography: European broadleaved deciduous forests, Euro-Asiatic steppe and forest-steppe, and Mediterranean sclerophytic vegetation. They all belong to Takhtajan's Holarctic Kingdom (Takhtajan 1986). According to recent biogeographic divisions (Gruev & Kuzmanov 1994, Bondev 2002, Asenov 2006), the Mediterranean sclerophytic region is confined to the southernmost territory of Bulgaria, and traditionally is considered as part of Struma and Mesta river valleys which are situated further west from our study area. The Euro-Asiatic steppe and forest-steppe region is distributed in the eastern part of the country, and the rest of the territory is characterised by European deciduous vegetation.

Following the biogeographic division suggested by Rivaz-Martínez et al. (2004), the study area falls within the Bulgarian part of the Apennino-Balkan province. It neighbours the Thracian part of the Graeco-Aegean province, and forms the boundary between the Mediterranean and Eurosiberian biogeographic regions.

To date, few vegetation studies have been conducted in this part of the country. Sopotlieva (2008) provided an overview of the diversity of the grassland vegetation in her PhD thesis. Several new syntaxa were established, but not effectively published. Studies on halophytic communities and some dry grasslands were conducted in the following years (Sopotlieva & Apostolova 2007, Tzonev et al. 2008, Sopotlieva 2009, Elíaš et al. 2013).

We regard biogeographical division as a tool for ordering and better understanding the driving mechanisms of plant communities' distribution patterns. Based on current knowledge about spatial distribution of biogeographic regions in Bulgaria, we aim 1) to understand vegetation diversity in the transitional belt between the south-eastern European and Mediterranean biogeographic regions; 2) to reveal any obvious differences in soil properties, or patterns of life forms and chorotypes between recognised syntaxa in the boundary area between two biogeographic regions, and 3) to publish effectively some newly described syntaxa.

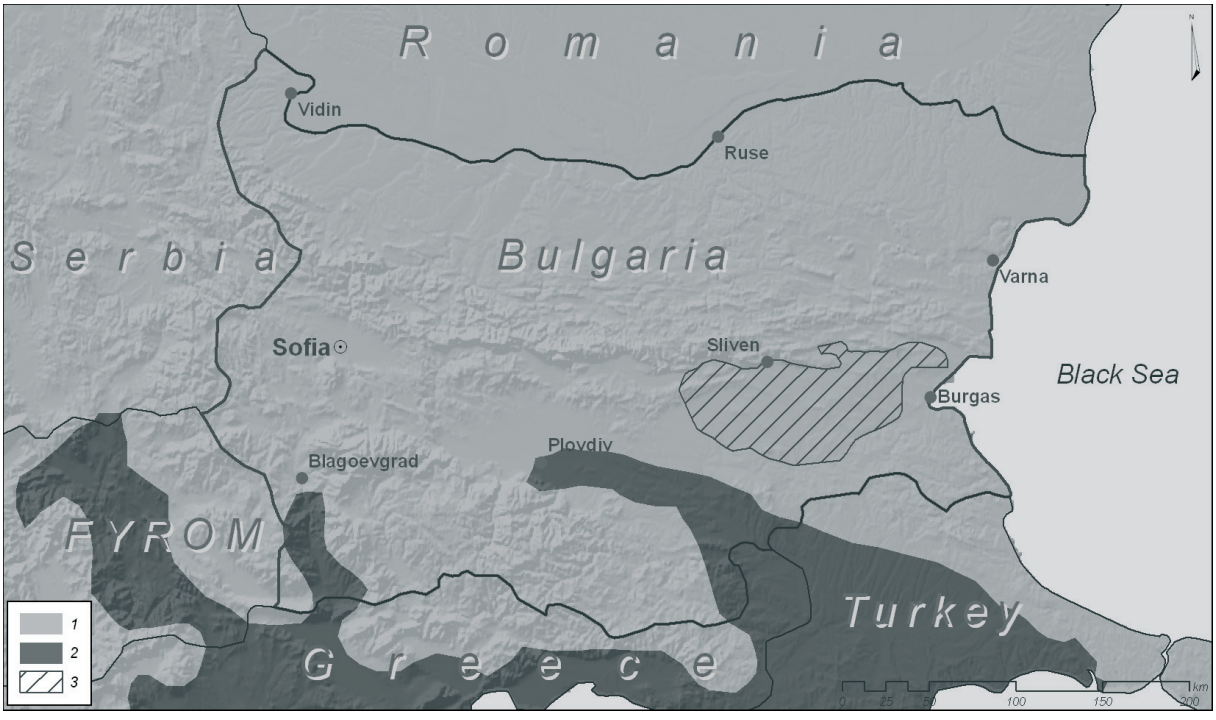

Figure 1: Map of Bulgaria with Eurosiberian (1) and Mediterranean (2) biogeographical regions, according Rivaz-Martínez et al. (2004). The study area is outlined (3).
Slika 1: Zemljevid Bolgarije z Evrosibirsko (1) in Mediteransko (2) biogeografsko regijo po Rivaz-Martínez et al. (2004). Označeno je raziskovano območje (3).

2. MATERIAL & METHODS

2.1 Study area

The study was conducted in the Straldzha-Aytos phytogeographic region (Bondev 2002). It is situated between 42 and 43° N latitude and 26 and 27° E longitude, in southeastern Bulgaria (Figure 1). The total study area is approximately 5 500 sq. km and mostly belongs to the Toundzha river hilly valley. The relief is diverse, including lowlands, as well as hilly regions of the easternmost parts of the Balkan Mountains (Stara planina), Sredna Gora Mountain, and several other isolated hills. The altitude reaches up to 670 m a.s.l. The region is characterised by diverse geology including volcanic rocks (basalts) and sediments (mergels, sandstone and limestone). Vertisols, fluvisols and solonetz soil types are characteristic for the flat areas, while the hills are mainly covered by luvisols and leptosols (Ninov 2002).

The climate is mild with a mean annual temperature of 12.3 °C and annual precipitation of 531 mm (unpublished data provided by Bulgarian National Institute of Meteorology and Hydrology, Bulgarian Academy of Sciences). The majority of the Straldzha-Aytos phytogeographic region is considered a separate, transitional climatic region between Continental and Mediterranean, according to current climatic division of Bulgaria (Velev 2002).

2.2 Vegetation and soil sampling, soil analyses

A total of 349 relevés were sampled following the Braun-Blanquet approach (Braun-Blanquet 1965; Westhoff & van der Maarel 1980) in a variety of semi-natural herbaceous vegetation types (dry, mesic and salt-rich). We placed a minimum of one plot in each stand that we subjectively considered visually homogeneous in terms of vegetation structure and floristic composition. All plots were square-shaped with an area of 16 m^2 (Chytrý & Otýpková 2003). The abundance and cover of species were estimated on the nine-grade modified scale of Braun-Blanquet (Westhoff & van der Maarel 1980). The total cover of vegetation was estimated in percentage. Altitude and coordinates were measured by GPS Garmin Etrex Summit (WGS 84 system) with altimeter calibrated by current atmospheric pressure. Slope was estimated by visual deviation from an imaginary vertical line, soil depth was evaluated on a three-level scale (shallow, medium deep and deep) and soil moisture was similarly evaluated as dry, moist or wet. Observed present grazing intensity was coded as follows: 0 – no grazing, 1 – low intensity grazing, 2 – moderate intensity grazing, 3 – intensive grazing. The data set has been entered into the Bulgarian Vegetation Database (Apostolova et al. 2012; GIVD ID EU-BG-001) stored in TURBOVEG software (Hennekens & Schaminée 2001).

Nomenclature of the species followed Kozhuharov (1992) for vascular plants and Natcheva & Ganeva (2005) for mosses. In some cases, we merged narrowly defined species or subspecies as follows: *(S) Anagallis arvensis – Anagallis arvensis*, *A. arvensis* subsp. *arvensis*, *A. arvensis* subsp. *foemina*; *(S) Bupleurum commutatum - Bupleurum commutatum*, *B. commutatum* subsp. *commutatum*, *B. commutatum* subsp. *aequalis*; *(S) Elymus elongatus - Elymus elongatus*, *E. elongatus* subsp. *ponticus; (S) Elymus hispidus - Elymus hispidus*, *E. hispidus* subsp. *barbulatus*, *E. hispidus* subsp. *hispidus*; *(S) Hieracium praealtum - Hieracium praealtum*, *H. praealtum* subsp. *bauchinii*; *(S) Onobrychis alba - Onobrychis alba, O. alba* subsp. *calcarea*; *(S) Trifolium repens - Trifolium repens*, *T. repens* subsp. *repens*; *(S) Vicia pannonica - Vicia pannonica*, *V. pannonica* subsp. *striata*; *(S) Taraxacum* sp. – *Taraxacum* species, *Taraxacum officinale*.

The chorotypes are given according to Assyov et al. (2002) for vascular plants and according to Ganeva & Düll (1999) for mosses. Numerous chorotypes are combined in several groups, as follows: Alpine (Alp) – incl. also Alpine-Mediterranean (Alp-Med), Alpine-Balkan (Alp-Bal), subalpine (subAlp); Balkan (Bal) – incl. also Balkan-Anatolian (Bal-Anat), Balkan-Dacian (Bal-Dac), Appenino-Balkan (Ap-Bal), Pannonian-Balkan (Pann-Bal); Boreal – incl. also sub Boreal; European (Eur) – incl. also European-Mediterranean (Eur-Med), European-Pontic (Eur-Pont), European-sub Mediterranean (Eur-subMed), European-North American (Eur-NAm); Europan-Asiatic (Eur-As) – incl. also European-Central Asiatic (Eur-CAs), European-Siberian (Eur-Sib), sub Mediterranean-Asiatic (subMed-As), subMediterranean-Siberian (subMed-Sib), European-Oriental-Turanian (Eur-OT), Temperate (Temp; for moss species); Mediterranean (Med) – incl. also Mediterranean-Asiatic (Med-As), Mediterranean-Central Asiatic (Med-CAs), sub Mediterranean

(subMed); Pontic (Pont) – incl. also Pontic-Asiatic (Pont-As), Pontic-Central Asiatic (Pont-CAs), Pontic-Mediterranean (Pont-Med), Pontic-sub-Mediterranean (Pont-subMed), Pontic-Siberian (Pont-Sib). The life forms were assessed based on data on the species' biological types provided by Kozhuharov (1992).

Soil samples were collected within the vegetation sample plots at 5–10 cm depth. The samples were air-dried. The pre-treatment of samples for chemical analyses followed ISO 11464:1994 (E). Basic soil properties were measured such as pH, humus and total nitrogen content. Soil reaction was measured in water solution using a 1:5 soil:water ratio and using the Jenway3310 pH-meter (ISO 10390:1994 (E)). Humus was determined according to the modified Turin method (Kononova 1966) and total nitrogen content according to the modified Kjeldahl method (Donov et al. 1974). Analyses were performed in the Analytical Laboratory of the Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia.

2.3 Classification and statistical analyses

We applied a "top down" analysis, i.e. in the first step we tried to identify major vegetation types (classes and alliances), and then within the alliances to distinguish different associations. Different numerical methods were used – TWINSPAN with three pseudospecies cut-levels (0, 5, 25%) and Cluster Analysis with different combinations of distance measures and group linkage methods (Relative Sorensen & Flexible beta (β = −0.25); Relative Sorenesen & Ward's method, Relative Euclidian & Ward's method, etc.). TWINSPAN provided the clearest ecological interpretation of the resulting vegetation types and roughly corresponded to the phytosociological alliances. These vegetation types were then checked by the statistical tendency of species to have a joint occurrence in particular vegetation type by use of the Cocktail method (Bruelheide 1995), using the phi-coefficient (Chytrý et al. 2002). Based on the results of the Cocktail method, several relevés were manually moved within the groups for better representation of the diagnostic species groups. Finally, the vegetation groups were checked using the Frequency-Positive-Fidelity Index (Tichý 2005). Plant species were ordered in groups by fidelity. The latter was calculated by phi-coefficient of association, applied to the classified data set with equalised sizes of clusters (Tichý & Chytrý 2006). As a result 296 relevés were classified into nine alliances (Sopotlieva 2008). Dry grassland vegetation types were subjected to further classification to association level and analyses on floristic and ecological properties. Associations were established within each alliance after applying TWINSPAN. Vegetation classes, alliances and associations were recognised after referring to the appropriate literature for Central Europe and Mediterranean region (e.g. Chytrý (ed.) 2007; Chytrý & Tichý 2003; Klika 1931, 1933, 1934, 1936, 1939; Mucina 1997; Oberdorfer (ed.) 1993; Rivas-Martínez et al. 2001; Royer 1991; Valachovič & Maglocký 1995), as well as for the neighbouring countries (Horvat 1962; Horvat et al. 1974; Horvatić 1963, 1975; Jovanović-Dunjić 1955; Kojić et al. 1997, 1998; Micevski 1970, 1977, 1978; Pop 1968, 1977; Pop et al. 2002; Roman 1974; Sanda et al. 1997, 1999). The same literature sources were used to allocate species to higher syntaxonomic units.

We tested for differences in some environmental and vegetation parameters with one-way analyses of variance (ANOVAs) carried out in STATISTICA 9 (StatSoft 2009). We tested whether the prerequisites of 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 α = 0.05 to identify significant differences among groups of syntaxa.

3. RESULTS

Dry grasslands make up the majority of the studied vegetation. We assigned 176 relevés of dry grasslands collected in the Straldzha-Aytos phytogeographic region to eight associations and one unranked community (Table 1).

3.1 Syntaxonomical scheme and nomenclatural notes

Our syntaxonomical scheme mainly follows the traditional concepts for *Festuco-Brometea* and *Koelerio-Corynephoretea*, but also proposals of Rodwell et al. (2002) for the position of *Trifolion*

cherleri within higher units, and recent investigations of Bulgarian grasslands, especially for *Saturejion montanae* (Pedashenko et al. 2013).

Class: *Festuco-Brometea* Br.-Bl. & Tx. ex Klika & Hadač 1944
Order: *Festucetalia valesiaca* Soó 1947
Alliance: *Festucion valesiacae* Klika 1931
Association: *Bothriochloetum ischaemi* Krist 1937
subassociation: *typicum*
subassociation: *asperuletosum cynanchicae* Sopotlieva & Apostolova 2014 [see below]
Association: *Festuco valesiacae-Stipetum capillatae* Sillinger 1930
Association: *Medicagini-Festucetum valesiacae* Wagner 1941
Association: *Trifolio arvensis-Festucetum valesiacae* Sopotlieva & Apostolova 2014 [see below]
Chrysopogon gryllus-community
Order: *Stipo pulcherrimae-Festucetalia pallentis* Pop 1968
Alliance: *Saturejion montanae* Horvat et al. 1974
Association: *Euphorbio myrsinitae-Bothriochloetum ischaemi* R. Jovanović 1955 subass. *medicaginetosum rhodopaeae* Sopotlieva & Apostolova 2014 [see below]
Class *Helianthemetea guttati* (Br.-Bl. in Br.-Bl. et al. 1952) Rivas Goday & Rivas-Martínez 1963
Order: *Helianthemetalia guttati* Br.-Bl. in Br.-Bl. et al. 1940
Alliance: *Trifolion cherleri* Micevski 1970
Association: *Erysimo-Trifolietum* Micevski 1977
Association: *Poo bulbosae-Achilletum pseudopectinatae* Sopotlieva 2009
Class: *Koelerio-Corynephoretea* Klika in Klika & Novák 1941
Order: *Corynephoretalia canescentis* Klika 1934
Alliance: *Thero-Airion* Tx. ex Oberdorfer 1957
Association: *Vulpietum myuri* Philippi 1973

Nomenclatural notes on new syntaxa
Associations
Trifolio arvensis-Festucetum valesiacae Sopotlieva & Apostolova ass. nov. hoc loco
Typus: Relevé 5 in Table 5 of this publication [Holotypus hoc loco]
Diagnostic species: *Odontites serotina, Potentilla neglecta, Herniaria hirsuta, Carex praecox, Elymus hispidus*.

Subassociations
Bothriochloetum ischaemi Krist 1937 *asperuletosum cynanchicae* Sopotlieva & Apostolova subass. nov. hoc loco
Typus: Relevé 51 in Table 2 of this publication [Holotypus hoc loco]
Differential species: *Asperula cynanchica, Trifolium arvense, Bromus squarrosus, Euphorbia myrsinites, Teucrium polium, Koeleria nitidula, Convolvulus cantabrica, Ceratodon purpureus, Chrysopogon gryllus, Minuartia caespitosa, Helianthemum salicifolium*.
Euphorbio myrsinitae-Bothriochloetum ischaemi R. Jovanović 1955 *medicaginetosum rhodopaeae* Sopotlieva & Apostolova subass. nov. hoc loco
Typus: Relevé 14 in Table 7 of this publication [Holotypus hoc loco]
Differential species: *Grimmia pulvinata, Echinops ritro, Paronychia cephalotes*, *Medicago rhodopaea, Weissia wimmeriana*, *Scleranthus annuus, Sedum acre, Ajuga chamaepytis, Inula aschersoniana, Crupina vulgaris, Didymodon acutus, Helianthemum salicifolium, Koeleria nitidula, Bombycilaena erecta, Hypericum rumeliacum, Minuartia caespitosa, Hippocrepis ciliata, Pleurochaete squarrosa, Centaurea ovina* subsp. *besserana, Koeleria brevis*.

3.2 Outlines of vegetation types

The association *Bothriochloetum ischaemi* (Table 2) includes plant communities dominated by *Dichanthium (Bothriochloa) ischaemum*. They have a closed horizontal structure with total coverage ranging between 70 and 100%. Total species richness is 239 vascular plant species and average number of species per relevé is 24. The biological spectrum of the association shows a predominance of hemicryptophytes (50%), but also significant presence of therophytes (46%). Other groups as chamaephytes (2%), cryptophytes (1%) and species with unidentified life form (1%) play a negligible role in the communities. The association is characterised by high presence of species with continental-steppic distributions (including European, Euro-Asiatic and Pontic chorotypes). They share 54% of the total floristic composition. The Euro-Asiatic species prevail (26%). Surprisingly, Mediterranean species are the second most numerous group represented by 24%. The regional specificity is revealed by 16 Balkan endemic species.

Figure 2: Stand of *Bothriochloetum ischaemi asperuletosum cynanchicae* close to Dragantsi village.
Slika 2: Sestoj asociacije *Bothriochloetum ischaemi asperuletosum cynanchicae* v bližini vasi Dragantsi.

The heterogeneity within the sampled communities was the reason for defining two subassociations: *typicum* and *asperuletosum cynanchicae*. *Asperuletosum cynanchicae* (Figure 2) is a new subassociation and includes communities of more xerothermic environments as compared to the typical one. It is distinguished by 12 differential species (see Table 2). According to our results, the differential species group of subass. *typicum* should be supplemented by *Achillea setacea*, *Rumex pulcher*, *Carduus nutans* and *Bromus arvensis*, which show high constancy there. On the other hand, *Crepis setosa* has extremely broad distribution and should be excluded from the differential species group of the typical subassociation.

Ecology: Communities of both subassociations occupy low altitudes, but stands of *asperuletosum cynanchicae* occur on steeper and preferably southern slopes (Table 9). Soil pH shows similar values, but the typical subassociation occupies soils more enriched by organic matter than *asperuletosum cynanchicae* (Figure 3).

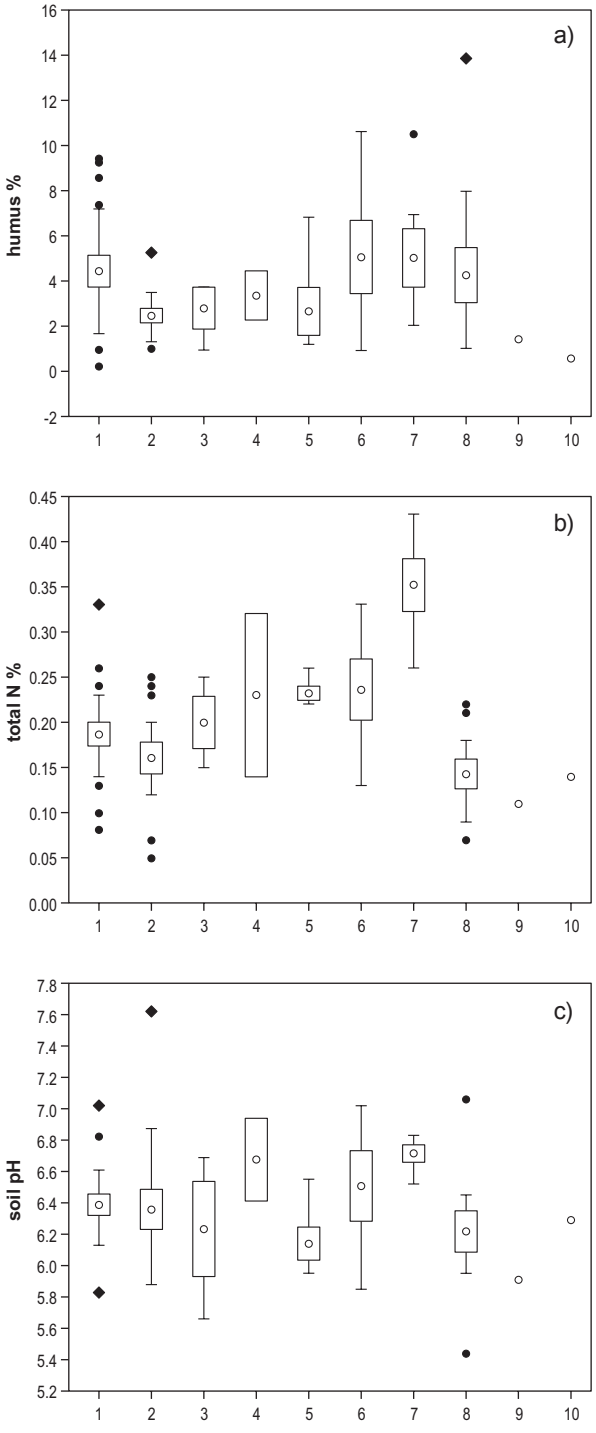

Figure 3: Diagrams for a) humus content, b) total N content and c) pH of soils for the ten studied plant communities.
Slika 3: Grafi za a) vsebnost humusa, b) skupen dušik in c) pH tal v desetih proučevanih rastlinskih združbah.

Numbers represent the following syntaxa:
1 – *Bothriochloetum ischaemi typicum*, 2 – *Bothriochloetum ischaemi asperuletosum cynanchicae*, 3 – *Festuco valesiacae-Stipetum capillatae*, 4 – *Medicagini-Festucetum valesiacae*, 5 – *Trifolio arvensis-Festucetum valesiacae*, 6 – *Chrysopogon gryllus* community, 7 – *Euphorbio myrsinitae-Bohtriochloetum medicaginetosum rhodopaeae*, 8 – *Erysimo-Trifolietum*, 9 – *Poo bulbosae-Achilletum pseudopectinatae*, 10 – *Vulpietum myuri*
○: mean value; □: ± standard error; ┬ ┴: non-outlier range; ●: outliers; ♦: extremes

Distribution: *Bothriochloetum* communities are distributed all over the study area.

Remark: The original diagnosis of this association made by Krist in 1937 was not avilable. In the overview on *Dichanthium* (*Bothriochloa*) *ischaemum* communities in Romania, Pop (1977) did not included any source from this author.

The association *Festuco valesiacae-Stipetum capillatae* represents communities dominated by *Festuca valesiaca* and *Stipa capillata* (Table 3). Total cover varies between 50 and 95%. A total of 113 vascular plants were recorded in this association, with an average of 24 species per relevé. Although both dominant species are hemicryptophytes, the biological spectrum of the association shows a prevalence of therophytes (50%). Hemicryptophytes make up almost all the other half of species (47%). Less numerous are cryptophytes (2%), chamaephytes (0.9%) and other, not specified species (1%). Mediterranean (27%) and Euro-Asiatic (21%) species prevail. Regional characteristics are linked to nine Balkan species.

Ecology: The habitats of this association are distributed between 120 and 330 m a.s.l. altitude and over a wide range of aspects. Soils are shallow, dry (100% of stands), with relatively high humus content and slightly acidic reaction (mean pH 6.23) (Figure 3).

Distribution: Communities of this association are distributed predominantly in the northern part of investigated area.

The association *Medicagini-Festucetum valesiacae* includes closed stands (average vegetation cover 88%), dominated by *Festuca valesiaca* or *Dichanthium* (*Bothriochloa*) *ischaemum* (Table 4). A total of 109 species are recorded within this vegetation type, while the mean species richness per relevé is 35 species. Hemicryptophytes prevail (55%), but with a significant presence of therophytes (43%). Chamaephytes and cryptophytes are represented only by one species each. Mediterranean chorotypes prevail, representing 33% of species, and within this group the sub-Mediterranean species are most common (20% of all species). Balkan endemics are 5.5% of the species of the association.

Ecology: This vegetation type was recorded on slightly inclined, north and west facing slopes. Soil properties show slightly alkaline soil reaction (Figure 3).

Distribution: Stands of association are registered all over the study area.

The association *Trifolio arvensis-Festucetum valesiacae* includes species rich (mean 28.9 species per relevé, total 124 species) dry grasslands dominated by *Festuca valesiaca* (in most relevés). This vegetation type could be considered as transitional between *Festuco-Brometea* and *Koelerio-Corynephoretea* due to its floristic composition and presence of characteristic species from both classes (Table 5). More than half of species are hemicryptophytes (54%), but the therophytes are also numerous (42%). Cryptophytes are 3%, and there is only one species with unidentified life form (0.8%). Euro-Asiatic species prevail (24%) in the floristic composition, followed by Mediterranean (20.2%). Endemic plants are represented by eight Balkan species.

Ecology: This community occupies slightly inclined slopes of various aspects, at altitudes between 120 and 324 m a.s.l. Soils are humus poor with slightly acidic reaction (Figure 3).

Distribution: This association occupies small areas in different parts of the studied region.

A community dominated by *Chrysopogon gryllus* is recognised by the analysis within the *Festucion valesiacae* alliance (Table 6). It remains unclassified as does not contain a well defined group of diagnostic species, as well as heterogenous floristic composition and ecological patterrns. The vegetation has closed horizontal structure, with the highest mean of total coverage among all vegetation units presented here, but low plant diversity. The biological spectrum shows that hemicriptophytes represent 58%, and therophytes 38%, of the community's total species number. More numerous within the community are the Euro-Asiatic (27%) species.

Ecology: This community develops mostly on flat terrains at various altitudes. Soils are of medium depth with very diverse humus content ranging between 0.95 to 10.64%. Soil reaction is slightly acidic (pH 5.85) to neutral (pH 7.02) (Figure 3).

Distribution: *Chrysopogon gryllus* dominated communities were found in all parts of the studied region.

Open dry grasslands on calcareous terrains are classified within the *Euphorbio myrsinitae-Bothriochloetum* association and particularly as a proposed new subassociation, the *medicaginetosum rhodopaeae* (Table 7, Figures 4 and 5). This vegetation is characterised by the absence of any

Figure 4: Stand of *Euphorbio myrsinitis-Bothriochloetum medicaginetosum rhodopaeae* with *Inula aschersoniana* at Karabair hill.
Slika 4: Sestoj asociacije *Euphorbio myrsinitis-Bothriochloetum medicaginetosum rhodopaeae* z vrsto *Inula aschersoniana* na hribu Karabair.

Figure 5 (Slika 5): *Medicago rhodopaea* Velen.

evident dominant species, as well as by high species richness. The biological spectrum is as follows: hemicryptophytes: 64%, therophytes: 29%, cryptophytes and chamaephytes: 4% each. Mediterranean chorotypes represent 28% of the association's species. Endemics are represented by thirteen Balkan and one Bulgarian endemic species.

Ecology: The communities develop on steep slopes with predominantly southern exposition at altitudes between 145 and 356 m a.s.l. Soils are very shallow and the presence of bare rock is common. Humus content is on average 5.04 %, and total nitrogen content is the highest here among the sampled vegetation types (Figure 3).

Distribution: Stands of this subassociation were found in the northwestern part of the Straldzha-Aytos region (Karabair hill, the slopes of Stara Planina Mt., above Shivachevo town and east of Sliven town, Svetiiliski hills and slopes of Sredna gora Mt., close to the town of Nova Zagora). The spatial distribution of this subassociation is linked to Triassic limestones.

The association *Erysimo-Trifolietum* has been thoroughly described by Sopotlieva & Apostolova (2007) (see Table 1 in Sopotlieva & Apostolova 2007). It includes predominantly closed and species rich communities. The dominant species vary among its different stands.

Ecology: This vegetation type occupies the highest altitudes of the study area and it develops on slightly inclined slopes. Total N content is relatively low, while soil reaction varies from medium acidic (5.44) to neutral (7.06) (Figure 3).

Distribution: Most of the stands are in the western part of study area and only scattered stands were found in the eastern part.

The association *Poo bulbosae-Achilletum pseudopectinatae* includes communities with semi-open to closed stands of the Balkan endemic species *Achillea pseudopectinata* (syn. *A. depressa*), co-dominated by *Poa bulbosa* and *Thymus striatus* (see relevés 1–8 in Table 1 in Sopotlieva 2009). Detailed information about this association is published by Sopotlieva (2009).

Ecology: The communities develop on shallow or medium depth dry soils, on predominantly south or west exposed slightly inclined slopes.

Distribution: It is distributed in the northeastern part and specifically on Mala Aytoska Mt. and on hills close to the town of Karnobat. Only one relevé originates from the central part of Straldzha-Aytos region (Konyovo village, Sliven district).

Three stands dominated by *Vulpia myurus*, were classified within the *Vulpietum myuri* association (Table 8). They are characterised by high total cover, but poor species richness (they have the lowest mean number of species per relevé). Hemicryptophytes prevail, being represented by 21 species (55%) and 16 species are therophytes (42%). The majority of species are Euro-Asiatic

(34%), followed by Mediterranean (21%) and European (18%) species.

Ecology: This vegetation type occupies slightly inclined slopes. Soils are dry, shallow or of medium depth, with low humus content (0.62%) and slightly acidic reaction.

Distribution: Stands are distributed in the southern (Zlatari village), eastern (Devetak village) and northern (Lozica village) parts of the study area.

3.3 Environmental and floristic peculiarities of the vegetation types

The biological features such as species richness and total plant cover tend to be more diverse, and split the studied communities in four major groups (Table 9). *Koelerio-Corynephoretea* vegetation, represented by *Vulpietum myuri,* shows the lowest species richness. In contrast, the sub-Mediterranean vegetation of *Helianthemetea guttati,* represented by *Erysimo-Trifolietum,* is the most species rich. Vegetatation coverage has low values for the relatively species rich communities (*Euphorbio myrsinitae-Bothriochloetum*, *Festuco valesiacae-Stipetum capillatae*), while a closed structure prevails in communities composed of tufted grasses (*Chrysopogon gryllus*-community, *Bothriochloetum ischaemi typicum*). Total vegetation cover varies widely within most vegetation types.

The altitudinal range within the study region is not large. However, the lowest altitudes in the lowlands are occupied by ruderal-like communities of the *typicum* subassociation of *Bothriochloetum ischaemi*. Due to widespread agricultural usage of lowland territories, most established seminatural dry grassland types occur on slightly inclined slopes of hills with shallow soils and very similar soil characteristics in terms of pH and total N (Table 9 and Figure 3). Almost all vegetation plots (95%) occur on dry soils. The most common type of land use in the studied grasslands was grazing (82% of plots), with 46% of the active pastures being used at low intensity. Studied grasslands are of secondary origin and have been managed by grazing for long time. Recently, the grazing pressure has reduced considerably and during the field research many of the sampled plots were in abandoned pastures. Low intensity grazing maintains the grasslands in their current state. Rarely, intensive grazing was recorded in *Bothriochloetum* communities and in stands with high abundance of *Festuca valesiaca*. (Figure 6).

Euro-Asiatic and Mediterranean chorotypes prevail in the species composition in all plant communities (Table 10). Usually, these main chorotypes have very similar proportions. A difference of more than 10% between European-Asiatic and Mediterranean elements occur only in two plant associations – *Medicagini-Festucetum* and *Vulpietum myuri*. Adventive and Alpine species appear in species composition accidentally. Endemics are represented by Balkan species.

Hemicryptophytes are the most species rich life form among all studied dry grassland types besides the *Festuco-Stipetum* association. Therophytes have a significant presence within all the identified types, which is a result of the pronounced Mediterranean influence.

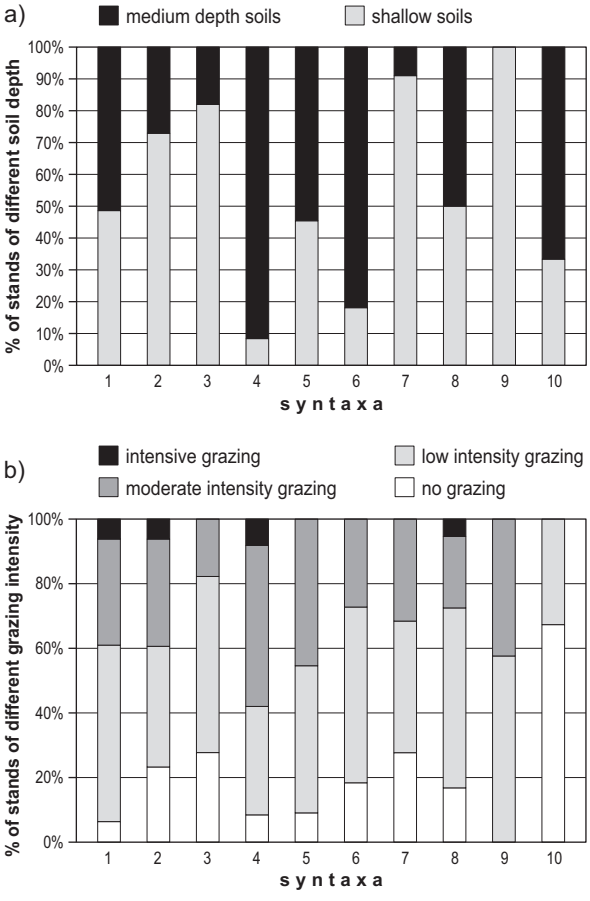

Figure 6: Percentage of a) soil depth categories and b) grazing intensity categories within the ten studied plant communities. Syntaxa are as in Figure 3.

Slika 6: Odstotek a) kategorij globine tal in b) kategorij intenzivnosti paše v desetih proučevanih rastlinskih združbah. Sintaksoni so označeni kot na sliki 3.

4. DISSCUSSION

Dry grasslands in southeastern Bulgaria are represented by Central European vegetation types, such as *Festuco valesiacae-Stipetum capillatae, Medicagini-Festucetum* and *Vulpietum myuri*, as well as vegetation types typical for Southeastern Europe (*Bothriochloetum* and *Chrysopogon gryllus*-communities) and sub-Mediterranean herbaceous vegetation, like *Euphorbio myrsinitae-Bothriochloetum* and *Erysimo-Trifolietum*. Occupying the same territory under a sub-Mediterranean climatic influence, all established communities share similar floristic characteristics (see Table 1). Vegetation types that belong to different classes are rather rich in sub-Mediterranean species and therophytes. We found that sub-Mediterranean chorotypes share high percentage of the species composition in almost all vegetation types, which strongly indicates the influence of the relatively warm climate of this area. Chamaephytes seem to be the prevailing life form traditionally associated with temperate regions, but therophytes also have a significant share and constitute up to half of all species in all associations.

Bothriochloa (*Dichanthium*) *ischaemum* is widespread across Bulgaria and is a typical dominant species of dry grasslands in the lowlands and the lower mountain zone. So far, the association *Bothriochloetum ischaemi* has been recorded in northern (Tzonev 2002) and northeastern Bulgaria (Apostolova & Meshinev 2006). The association is widespread also in Romania (Pop 1977). Our new records from southeastern Bulgaria enlarge its areal to the South. A prevalence of hemicryptophytes is more pronounced in Romanian communities, reaching up to 72%, while the proportion of therophytes is not higher than 20–30% (Pop 1968, 1977; Roman 1974; Pop et al. 2002). The number of therophytes in our samples is higher.

The distribution of *Festuco valesiacae-Stipetum capillatae* is known for the area of Central Europe, from central Germany, Czech Republic and Slovakia to Hungary (Chytrý et al. 2007). This correlates with the position of the association in the classification scheme of Royer (1991) in the "western group associations" of the suballiance *Eu-Festucenion rupicolae* Soó 1971. However, the association is also given for Ukraine, together with other associations dominated by *Stipa capillata* as *Stipetum capillatae* Dziubaltowski 1925, *Jurineo calcareae-Stipetum capillatae* (Kukovitsa et al. 1994) Kukovitsa in V. Solomakha 1996, *Carici humilis-Stipetum capillatae* Tkachenko, Movchan & V. Solomakha 1987 (Solomakha 1996). Communities of *Stipa capillata* co-dominanted by *Festuca valesiaca* and *Bothriochloa* (*Dichanthium) ischaemum* with similar species composition are classified within the association *Stipetum capillatae* (Hueck 1931) Krausch 1961 by Romanian researchers (Sanda et al. 1997, Pop et al. 2002). Horvat et al. (1974) mention the association *Festuca valesiaca-Agropyrum pectinatum-Stipa capillata* Puşcaru-Soroceanu 1963 as part of the steppe vegetation in Dobruja. In our opinion, the studied communities in Bulgaria show a higher degree of floristic similarity with Central European ones than with the steppe communities of Romania. At the same time, our communities contain a significant presence of *Koelerio-Corynephoretea* species and Balkan endemics that distinguishes them from Central European stands.

Another Central European vegetation type recorded in the study area is *Medicagini-Festucetum*. Its position in Royer's syntaxonomical scheme is also in the "western group of associations". However, the same author proposed that some of its stands to be classified within *Salvio-Festucetum pontico-romanicum* Ciocirlan 1968, and therefore to the "southern group of associations", which are distributed in Central and Eastern Romania, Bulgaria and probably part of Ukraine (Royer 1991). In our samples classified within *Medicagini-Festucetum*, the number of character species seems to decrease towards the southern localities. The prevalence of sub-Mediterranean species and the presence of Balkan endemics give reason to propose a new sub-association or variant. However, due to the limited number of relevés and restricted study region, a more precise classification is avoided at this time. These data conclusively demonstrate that the range of the association *Medicagini-Festucetum* reaches Bulgaria. Collection of more vegetation data from Bulgaria and comparison with the communities from southern Romania will allow a better determination of the internal heterogeneity and geographical differentiation within this association.

The proposed new plant association *Trifolio arvensis-Festucetum valesiacae* is a good example of the observed transitional character of dry grassland vegetation in southeastern Bulgaria. Diagnostic species with high fidelity and constancy are considered also as diagnostic for

Festuco-Brometea (*Festuca valesiaca*, *Chondrilla juncea*, *Potentilla neglecta*) or *Koelerio-Corynephoretea* (*Trifolium arvense*, *Rumex acetosella*). In this association, the representation of species typical for *Festucion valesiacae* is poor. On the other hand, there is a significant number of species with high constancy for the class *Koelerio-Corynephoretea* that differentiate the new association from *Festuco valesiacae-Stipetum capillatae* and *Medicagini-Festucetum valesiacae*.

Festuca valesiaca has broad distribution and naturally takes part in many different communities. The new association differs from the other known *Festuca valesiaca* communities described in the literature. Among the species with high constancy in the associations *Galio-Festucetum valesiacae* R. Jovanović 1956, *Festucetum valesiacae* Borisavljević 1955 and *Trifolio-Festucetum valesiacae* Diklić & Nikolić 1972, only *Festuca valesiaca* is found in our data (Jovanović-Dunjić 1956, Borisavljević et al. 1955, Diklić & Nikolić 1972). Constant species of these associations, such as *Potentilla argentea*, *Teucrium chamaedrys*, *Hypericum perforatum*, *Lotus corniculatus* and others, were not found in our communities. The above mentioned associations are rich in mesophilic species missing in our relevés, for example *Fragaria vesca*, *Plantago media*, *Dactylis glomerata*, *Leucanthemum vulgare* and *Festuca pratensis*.

Chrysopogon gryllus is a widely distributed species in Bulgaria and one of the main dominants in the herbaceous vegetation of lowland and lower mountain zones. Its communities are classified within *Festucion valesiacae* and *Chrysopogono grylli-Danthonion calycinae* (Tzonev 2002, Meshinev et al. 2005, Apostolova & Meshinev 2006, Vassilev 2012). The associations *Thymo pannonici-Chrysopogonetum grylli* Doniță et al. 1992, *Chrysopogono–Caricetum humilis* (Soó 1930) Zólyomi 1958 and *Dauco guttati–Chrysopogonetum grylli* Popescu & Sanda 1978, reported for Romania, are assigned to the alliance *Festucion valesiacae* (Sanda et al. 1997, Sanda et al. 1999). *Chrysopogonetum grylli* Soó 1939 (recently considered as a syntaxonomical synonym of *Thymo pannonici–Chrysopogonetum grylli*; Sanda et al. 1999) is known for the many geographically distinguished subassociations (e.g. *oltenicum* Buia et al. (1959) 1960; *dobrogicum* Dihoru 1970; *moldavicum* Bârcă 1975; *campinensis* Borza 1959; *transsilvanicum* Csűrös & Niedermaier 1966; *praemoesicum* Roman 1974; *banaticum* Borza 1962) described by Romanian vegetation scientists.

Chrysopogon gryllus is considered as diagnostic for various syntaxonomical categories by Ilijanić & Topić (1989), who have reviewed its communities in the territory of former Yugoslavia. According to Kojić et al. (1998), this species occurs in many associations within *Festucion valesiacae* (e.g. *Trifolio montani-Chrysopogonetum grylli* Veljović 1967, *Chrysopogono-Festucetum valesiacae* Veljović 1971, *Bromo squarrosi-Chrysopogonetum grylli* Kojić 1959), *Festucion rupicolae* (*Chrysopogonetum pannonicum* Stjepanović-Veseličić 1953, *Chamaecytiso austriacae-Chrysopogonetum grylli* Butorac 1989, *Trifolio campestri-Chrysopogonetum grylli* Butorac 1989, *Thymo-Chrysopogonetum grylli* Stojanović 1983, *Inulo-Chrysopogonetum grylli* Stevanović 1984) and *Chrysopogono-Danthonion calycinae* (*Agrostideto-Chrysopogonetum grylli* Kojić 1959, *Teucrio-Chrysopogonetum grylli* R. Jovanović 1954, *Koelerio gracilis-Chrysopogonetum grylli* Vučković 1985 (Kojić et al. 1998) in Serbia.

Chrysopogon gryllus also has a diagnostic role also in *Erysimo-Trifolietum* Micevski 1977 and *Helianthemo-Euphorbietum thessalae* Micevski 1973 (*Trifolion cherleri, Helianthemetea guttati*) in Macedonia. It is a dominant species in *Nardo-Callunetea*-communities in continental parts of Western Croatia (Ilijanić et al. 1972).

Chrysopogon gryllus has a wide ecological plasticity and its distribution optimum is in the Balkans and Romania (Tzonev 2002). This is a reason why the species is referred to as diagnostic for various syntaxa. It also explains the different approaches for the classification of the communities hosting *Chrysopogon gryllus,* from describing one broad and heterogeneous association (*Thymo pannonici-Chrysopogonetum grylli*) in Romania on the one hand, and on the other hand its use by Serbian researchers to describe many geographically restricted associations that reflect differentiation in environmental characteristics. Our *Chrysopogon gryllus*-dominated communities have diagnostic species for *Festucion valesiacae* and *Festuco–Brometea*, which gave us reason to treat them as subordinated to these higher syntaxa. Significant heterogeneity of the sampled relevés did not allow the identification of a particular association.

Vegetation on calcareous stony terrains in the Straldzha-Aytos region is distinct from the above mentioned vegetation types and rather corresponds to the association *Euphorbio myrsinitae-Bothriochloetum*. Comparison of species composition and constancy classes between stands of

southeastern Bulgarian (Table 7, column A) and eastern Serbian associations (Table 7, column B, according Horvat et al. 1974) shows much similarity. However, the presence of the Bulgarian endemic *Medicago rhodopaea*, justifies the proposal of a new sub-association.

We established two plant associations within the *Trifolion cherleri* alliance, described in detail by Sopotlieva & Apostolova (2007) and Sopotlieva (2009). The position of *Trifolion cherleri* in higher syntaxonomic units is still questionable (Sopotlieva & Apostolova 2007, Ćušterevska et al. 2012) and probably will be solved by a large scale analyses of Balkan dry grasslands (K. Vassilev et al. in prep.).

The *Koelerio-Corynephoretea* class was registered in the study region for the first time in Bulgaria. *Vulpietum myuri* represents pioneer vegetation and was very rarely observed. Similar communities for Romania, Germany and Slovakia have been assigned to *Filagini-Vulpietum* Oberdorfer 1938 (Korneck 1993, Valachovič & Maglocký 1995, Sanda et al. 1999). According to Valachovič & Maglocký (1995) *Vulpietum myuri* is a synonym of this association, but we follow here the view of Sádlo et al. (2007). Recently, the vegetation of *Thero-Airion* was also found in Bulgaria (Pedashenko et al. 2013), which enlarges the area occupied by *Koelerio-Corynephoretea* vegetation.

5. CONCLUSIONS

Dry grasslands in the transitional zone between Continental and Mediterranean regions in southeastern Bulgaria were floristically distinguished in this study and classified within the two main classes of *Festuco-Brometea* and *Helianthemetea guttati*. Sharing the same territory, communities of these classes also share a lot of species, and have similar ratios of hemicryptophytes/therophytes and Euro-Asiatic/Mediterranean species. Both vegetation types occupy mostly shallow and dry soils. There is no significant difference between the associations in terms of soil properties such as pH, humus content, soil moisture, etc.

Classification to certain vegetation types is rather complicated because of the gradual floristic and ecological differentiation between sampled communities. We identified associations known for Central Europe such as *Bothriochloetum ischaemi, Festuco-valesiacae-Stipetum capillatae, Medicagini-Festucetum*, but with the presence of more Mediterranean species and therophytes in the study area. *Trifolio arvensis-Festucetum valesiacae* is established as a new association distributed all over the study area, and probably with widespread occurence in the country.

Saturejion montanae should be considered as more widely distributed in Bulgaria than previously thought. It is confined to calcareous terrains with a lot of rock outcrops that allows for rich biodiversity and endemism. We defined the new subassociation *medicaginetosum rhodopaeae* as an endemic vegetation sub-type within the Balkan association *Euphorbio myrsinitae-Bothriochloetum*.

The class *Koelerio-Corynephoretea* has been sampled for the first time by Sopotlieva (2008), but recently new data were obtained (Pedashenko et al. 2013) that indicate the necessity of further research in the rest of the country.

According to our results, the vegetation at the boundary between the European and Mediterranean biogeographic regions represents widespread syntaxa from both zones. However, in the transitional area the diagnostic species for high rank syntaxa mix. It is highly probable that additional new vegetation types could be found in the study area. Research will be continued in this area to expand the knowledge about the vegetation in the contact zone of these two climate types.

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Table 1: Shortened synoptic table of studied plant communities.
Tabela 1: Skrajšana sinoptična tabela proučevanih rastlinskih združb.

	A						B		C
	a					b	c		d
Number of relevés	**81**	**11**	**12**	**11**	**11**	**22**	**18**	**7**	**3**
Cl. *Festuco-Brometea*									
Petrorhagia prolifera	54	36	58	73	27	9	39	71	33
Thymus striatus	62	82	100	91	45	68	67	100	33
Eryngium campestre	94	82	100	73	100	32	89	43	67
Chondrilla juncea	31	27	33	73	9	23	50	29	33
Dichantium ischaemum	100**	73	58	18	18	64	39	43	33
Astragalus onobrychis	21	18	58	27	36	23	11	71	.
Asperula cynanchica	31	45	58	45	27	59	22	.	.
Chrysopogon gryllus	7	27	25	45	100**	73	33	.	.
Achillea setacea	38	18	42	45	64	9	.	14	.
Centaurea rhenana	10	18	.	9	9	23	22	14	.
Convolvulus cantabrica	6	27	.	9	18	45	22	29	.
All. *Festucion valesiacae*									
Festuca valesiaca	40	55	100	100	64	59	50	57	.
Stipa capillata	2	100**	17	9	9	18	6	14	.
Linaria genistifolia	4	36	.	18	9	5	11	29	.
Teucrium chamaedrys	10	9	33	18	.	14	6	.	.
Ass. *Bothriochloetum ischaemi*									
Rumex pulcher	20**	.	.	.	9	.	.	.	.
Ass. *Festuco valesiacae-Stipetum capillatae*									
Melica transsilvanica	.	27**	.	.	.	.	.	.	.
Alyssum alyssoides	1	27**	8	9	.	5	.	.	.
Ass. *Medicagini-Festucetum valesiacae*									
Medicago falcata	4	.	58**	.	9	.	.	.	.
Ass. *Trifolio arvensis-Festucetum valesiacae*									
Odontites serotina	1	.	.	27**	.	.	.	.	.
Carex praecox	12	.	.	36**	.	.	.	.	.
Potentilla neglecta	25	18	25	73**	9	.	11	57	.
Elymus hispidus	5	27	.	36**	9	.	.	.	.
Herniaria hirsuta	33	55	50	73**	9	14	28	29	.
***Chrysopogon gryllus*-community**									
Nonea pulla	.	.	.	.	18**	.	.	.	.
Galium verum	17	18	50	64	73**	5	33	.	.
All. *Saturejion montana*									
Anthylis vulneraria	.	.	.	.	.	59**	.	.	.
Leontodon crispus	1	.	8	.	.	45**	17	.	.
Melica ciliata	.	.	.	.	9	36**	6	.	.
Rhodax canus	.	.	.	.	.	18**	.	.	.
Achillea clypeolata	1	27	8	18	18	45	.	29	.
Allium flavum	1	18	.	9	.	23	6	.	.
Satureja montana	.	.	.	.	.	9	.	.	.
Ass. *Euphorbio myrsinitae-Bothriochloetum* subass. *medicaginetosum rhodopeae*									
Grimmia pulvinata	.	.	.	.	.	55**	.	.	.
Echinops ritro	1	.	.	.	.	59**	11	.	.
Paronychia cephalotes	.	.	.	.	.	45**	.	.	.
Medicago rhodopaea	.	.	.	.	.	41**	.	.	.

Number of relevés	**81**	**11**	**12**	**11**	**11**	**22**	**18**	**7**	**3**
Weissia wimmeriana	.	.	.	.	.	41**	.	.	.
Sedum acre	5	27	8	.	.	77**	6	14	.
Ajuga chamaepytis	4	.	.	.	.	41**	.	.	.
Inula aschersoniana	.	.	.	.	.	36**	.	.	.
Crupina vulgaris	1	.	.	.	.	32**	.	.	.
Didymodon acutus	.	.	.	.	.	27**	.	.	.
Agropyron cristatum	.	.	.	.	.	27**	.	.	.
Hippocrepis ciliata	.	.	.	.	.	27**	.	.	.
Jurinea consanguinea	.	.	.	.	.	27**	.	.	.
Helianthemum salicifolium	7	9	17	18	.	64**	.	29	.
Linum tenuifolium	.	.	.	.	.	23**	.	.	.
Pleurochaete squarrosa	.	.	.	.	.	23**	.	.	.
Fumana procumbens	.	9	.	.	9	36**	.	.	.
Teucrium polium	20	36	50	36	18	95**	33	57	.
Centaurea ovina subsp. *besserana*	.	.	.	.	.	18**	.	.	.
Koeleria penzesii	.	.	.	.	.	18**	.	.	.
Euphorbia myrsinites	17	27	33	.	.	68**	11	43	.
Paliurus spina-christi	1	.	.	.	9	23**	.	.	.
Koeleria brevis	.	.	.	.	.	14**	.	.	.
Hypericum rumeliacum	4	9	8	.	9	41**	17	14	.
Cl. *Helianthemetea guttati*									
*Arenaria leptoclados**	43	36	17	64	.	32	33	29	33
*Trifolium campestre**	31	18	33	55	36	.	89**	14	.
*Trifolium scabrum**	28	18	50	36	18	18	22	43	.
Psilurus incurvus	11	18	17	.	.	18	61**	.	33
Trachynia distachya	6	9	17	.	.	14	.	.	.
*Arenaria serpyllifolia**	7	.	.	.	.	.	6	.	.
Cynosurus echinatus	9	.	.	.	9	.	11	.	33
*Aira elegantissima**	.	.	.	.	.	.	28**	.	.
All. *Trifolion cherleri*									
Taeniatherum caput-medusae	64	27	25	45	45	9	28	29	67
Trifolium angustifolium	17	9	17	18	27	.	61**	.	33
Erysimum diffusum	1	9	8	9	.	23	28	14	.
*Trifolium arvense**	14	36	8	73	9	.	78**	86**	.
Rumex acetosella	2	.	.	36	27	.	61**	.	33
Trifolium cherleri	1	18	.	.	.	5	28	29	.
Trifolium striatum	19	.	8	27	36	.	28	.	33
Vulpia ciliata	.	.	.	.	9	.	28**	.	.
Logfia minima	.	.	.	.	.	.	33**	14	.
Linaria pelisseriana	.	.	.	.	.	.	22**	.	.
Sedum caespitosum	.	.	8	.	.	.	6	.	.
Ass. *Erysimo diffusi-Trifolietum angustifoli*									
Lotus angustissimus	.	.	.	.	9	.	39**	.	.
Stachys angustifolia	.	.	.	.	.	.	28**	.	.
Jasione heldreichii	.	.	.	.	.	.	22**	.	.
Trifolium strictum	.	.	.	.	.	.	22**	.	.
Hieracium praealtum	2	.	8	.	.	.	28**	.	.
Sanguisorba minor	14	18	25	18	36	50	78**	.	.
Brachythecium albicans	.	.	.	.	.	.	28**	14	.
Achillea crithmifolia	7	.	.	9	9	.	33**	.	.
Agrostis canina	1	.	.	.	.	.	17**	.	.
Vicia grandiflora	2	.	.	.	9	.	22**	.	.
Euphorbia cyparissias	9	.	8	18	.	41	44**	.	.
Dianthus pinifolius	1	.	.	.	.	5	17**	.	.
Hieracium hoppeanum	.	.	.	.	.	.	11**	.	.
Koeleria macrantha	.	.	.	.	.	.	11**	.	.

Number of relevés	81	11	12	11	11	22	18	7	3
Verbascum adrianopolitanum	.	.	.	.	.	.	11**	.	.
Centaurium erythraea	.	.	.	.	.	.	11**	.	.
Gypsophila muralis	.	.	.	.	.	.	11**	.	.
Trifolium diffusum	.	.	.	.	.	.	11**	.	.
Verbascum thapsiforme	.	.	.	.	.	.	11**	.	.
Euphrasia stricta	.	.	.	.	.	.	11**	.	.
Ass. *Poo bulbosae-Achilletum pseudopectinatae*									
Achillea depressa	.	18	.	.	.	.	.	100**	.
Koeleria simonkaii	2	9	.	.	.	5	.	43**	.
Medicago rigidula	30	27	33	18	.	.	.	71**	.
Cl. *Koelerio-Corynephoretea*									
*Poa bulbosa**	57	64	75	64	36	77	78	100	67
Medicago minima	43	36	83**	18	18	50	22	14	.
Syntrichia ruralis	12	27	25	9	9	55	28	29	.
Ceratodon purpureus	7	27	8	18	9	5	39	71**	.
Centaurea diffusa	33	27	50	18	9	.	11	43	33
Anthemis ruthenica	21	18	8	18	.	.	61**	57	.
Bombycilaena erecta	17	9	33	.	.	50**	28	.	.
Apera spica-venti	7	9	.	18	9	.	.	14	67
Acinos arvensis	.	9	.	.	.	32**	6	.	.
Scleranthus annuus	2	.	8	.	.	50**	.	.	.
Sideritis montana	1	18	.	.	.	73**	11	14	.
Sedum acre	5	27	8	.	.	77**	6	14	.
Cerastium pumilum	20	.	.	45	27	9	17	.	.
Filago lutescens	7	18	.	9	.	.	6	14	.
All. *Thero-Airion*									
Scleranthus perennis	11	27	8	27	9	.	44	71**	33
Dasypyrum villosum	27	18	25	18	18	.	11	14	33
Potentilla argentea	5	.	.	18	27	.	33	.	33
Filago vulgaris	17	9	.	9	18	.	22	.	33
Ass. *Vulpietum myuri*									
Vulpia myurus	21	18	8	9	9	5	39	14	100**
Other species (occuring > 7 syntaxa)									
Plantago lanceolata	65	9	58	73	45	9	61	29	33
Bromus squarrosus	27	36	42	27	9	45	39	29	33
Crepis setosa	59	36	50	45	64	32	50	57	100
Potentilla inclinata	23	18	42	27	36	36	28	14	.
Koeleria nitidula	6	36	8	45	27	50	50	14	.
Xeranthemum annuum	12	45	8	9	9	27	11	29	.
Erodium cicutarium	12	9	25	27	9	.	22	14	.
Veronica arvensis	33	36	17	9	9	5	17	14	.
Galium tenuissimum	20	9	17	36	18	5	28	43	.
Aegilops triuncialis	23	.	25	9	27	9	6	14	33
Centaurea caliacrae	6	9	33	9	9	5	.	43	33
Carduus nutans	15	.	25	18	27	9	6	.	33
Bromus tectorum	4	27	8	9	9	.	11	14	.
Erodium cicutarium	12	9	25	27	9	.	22	14	.

Percentage constancies are given. Superscript symbol (**) present phi-values above 0.30 (only species with a statistically significant affinity to a cluster according to Fisher's exact test with P <0.01 are included). Species affiliation to alliances and classes follow literature (see text). Superscript symbol (*) shows species considered as diagnostic for both *Helianthemetea guttati* and *Koelerio-Corynephoretea*. On the association level species are arranged according decreasing phi-values.

Main groups: A - class *Festuco-Brometea*; B – class *Helianthemetea guttati*; C – class *Koelerio-Corynephoretea*
subgroups: a – alliance *Festucion valesiacae*; b – alliance *Saturejion montanae*; c – alliance *Trifolion cherleri*; d – alliance *Thero-Airion*

Table 2: Relevés of the association *Bothriochloetum ischaemi* (Krist. 1937) I. Pop 1977.

Life forms	Chorotypes	No. of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	Constancy
		altitude [m]	125	259	225	162	161	130	202	176	155	217	188	285	286	88	220	227	278	356	230	275	186	351	220	217	157	302	243	158	179	189	229	111	228	
		aspect	S	E	N	SW	.	.	NE	.	E	W	E	S	W	W	W	W	SW	.	N	E	N	SE	E	W	W	W	W	N	E	N	W	NE	W	
		cover [%]	75	95	75	95	90	85	100	98	90	70	90	85	70	95	90	100	90	90	90	90	90	85	90	100	95	100	90	90	90	90	95	95	95	
		number of species	25	26	26	30	23	23	25	29	22	21	23	40	22	20	18	20	23	24	20	24	20	33	23	13	21	23	19	24	23	25	28	20	18	
																		typicum																		
		Character species for the association																																		
H	smed-as	*Dichanthium ischaemum*	+	4	2a	1	2b	4	4	2a	+	+	+	4	3	2b	1	2a	1	+	3	+	+	2a	2b	+	4	4	4	+	4	2a	+	2b	3	V
		Differential species for the subassociations																																		
Th	eur-as	*Crepis setosa*	.	.	+	+	+	+	+	r	+	+	+	.	+	+	1	+	+	+	+	+	+	+	.	.	1	.	+	1	+	+	+	+	+	V
H	cosm	*Cynodon dactylon*	+	1	1	+	1	+	+	1	2b	.	1	+	.	2b	+	.	.	4	.	1	+	1	+	.	1	.	.	2a	+	1	.	.	.	IV
H	eur-as	*Lolium perenne*	.	.	.	2a	.	.	.	.	2b	+	4	.	+	3	.	+	3	1	1	+	2a	.	1	+	+	+	+	2a	.	.	2b	.	.	IV
H	submed	*Achillea setacea*	.	.	+	.	+	.	+	.	.	.	2b	.	.	+	.	.	+	+	+	+	+	.	2a	.	1	+	1	1	+	+	+	2a	.	III
H	eur-as	*Rumex pulcher*	+	.	.	+	.	.	.	r	+	.	+	.	.	.	.	.	r	r	.	.	r	.	+	.	r	.	r	.	.	.	r	+	r	II
H	eur-med	*Carduus nutans*	+	.	.	r	.	.	.	.	.	.	.	.	r	.	r	.	.	r	.	+	.	.	r	.	.	r	.	.	.	.	r	.	.	II
Th	eur-as	*Bromus arvensis*	.	.	.	.	+	.	2a	.	.	.	+	.	+	.	.	.	+	1	.	.	+	2b	+	.	.	.	+	.	.	.	.	2b	2a	II
H	eur-sib	(S) *Trifolium repens*	.	.	.	.	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	I
H	eur-med	*Asperula cynanchica*	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I
Th	eur-sib	*Trifolium arvense*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th	submed	*Bromus squarrosus*	.	.	.	.	.	r	.	.	.	r	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	submed	*Euphorbia myrsinites*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	pont-med	*Teucrium polium*	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	I
Th	Nam(adv)	*Conyza canadensis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	pont	*Koeleria nitidula*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	pont	*Convolvulus cantabrica*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	temp	*Ceratodon purpureus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	pont-med	*Chrysopogon gryllus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	eur-med	*Minuartia caespitosa*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th	submed	*Helianthemum salicifolium*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		Festucion valesiasacae																																		
H	pont	*Festuca valesiaca*	3	+	1	+	+	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Th	eur-as	*Medicago minima*	.	1	.	+	+	+	.	4	.	+	1	+	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	+	.	.	.	.	II
H	eur-as	*Astragalus onobrychis*	.	r	.	.	.	.	.	r	.	.	.	.	.	.	.	.	r	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	I
H	bal-dac	*Dianthus pallens*	.	.	.	.	+	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I
Th	submed	*Xeranthemum annuum*	.	+	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	eur-as	*Medicago falcata*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	I
H	eur-sib	*Scabiosa ochroleuca*	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	submed	*Teucrium chamaedrys*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	pont-sib	*Linaria genistifolia*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		Festuco-Brometea																																		
H	pont-med	*Eryngium campestre*	2a	+	+	+	+	+	r	+	+	1	+	1	1	+	+	1	+	1	+	+	+	+	+	+	+	+	+	1	1	+	+	+	+	V
Th	pont-med	*Petrorhagia prolifera*	+	+	+	.	2m	+	.	.	+	+	+	.	+	.	+	+	.	+	+	+	+	.	.	+	+	.	+	+	.	r	+	+	.	IV
H	submed	*Thymus striatus*	2a	+	2a	+	.	.	1	.	.	1	.	2a	+	.	1	2b	.	.	.	.	.	+	.	.	.	.	+	.	1	2a	2a	.	2a	III
H	eur-sib	*Chondrilla juncea*	.	.	r	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	r	+	.	.	II
H	eur-as	*Galium verum*	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	I
H	pann-bal	*Achillea crithmifolia*	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	subboreal	*Sanguisorba minor*	.	+	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	I
Th	submed	*Xeranthemum cylindraceum*	.	.	.	.	.	.	2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	I
H	cosm	*Poa angustifolia*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2m	.	.	.	.	.	.	.	1	1	.	I
Th	eur-med	*Alyssum desertorum*	.	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	submed	*Centaurea rhenana*	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	eur	*Euphorbia cyparissias*	+	.	+	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	submed	*Alyssum hirsutum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	I
H	eur-med	*Salvia pratensis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	r	.	.	.	.	I
H	bal-anat	*Scabiosa argentea*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	I
H	eur	*Erysimum diffusum*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I

Tabela 2: Popisi asociacije *Bothriochloetum ischaemi* (Krist. 1937) I. Pop 1977.

	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	
	187	227	339	253	122	238	263	185	155	157	181	210	148	261	242	155	281	155	215	260	235	261	330	265	252	170	227	220	191	232	272	246	190	130	167	333	260	224	162	127	199	324	184	184	232	295	228	255	Constancy
	S	W	SE	E	E	S	S	S	S	E	S	N	NW	E	SW	W	W	W	N	SE	S	S	S	N	NW	E	W	S	NE	E	SE	SW	NW	.	.	SW	S	N	S	W	E	S	SW	N	S	S	S	E	
	95	90	90	85	90	85	90	100	75	90	85	90	95	90	85	85	90	75	100	95	75	75	75	95	85	90	80	95	85	80	85	70	90	80	100	90	95	95	100	95	95	100	95	90	95	90	80	80	
	20	24	24	24	22	19	16	23	23	24	30	25	28	21	28	41	36	34	34	26	27	28	29	23	26	29	19	24	25	21	22	20	20	18	13	30	26	14	22	25	10	23	34	20	14	19	23	25	
	asperuletosum cynanchicae																																															
	4	2a	+	+	4	4	2a	2m	2b	2b	2a	2a	+	1	3	4	3	3	2b	1	2a	2b	2a	r	r	4	3	3	2a	r	3	2a	+	+	5	4	1	+	2a	3	5	5	5	+	5	4	3	4	V
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	.	+	2a	2b	2a	1	2a	.	1	2b	2a	+	1	2a	2b	1	2b	2a	+	.	2b	2a	2a	.	+	2a	2a	+	3	2b	2b	2b	.	.	.	1	+	.	.	.	.	.	.	+	+	.	1	1	IV
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H	eur-sib	*Knautia arvensis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	.	.	.	I
H	eur-med	*Artemisia santonicum* s. *patens*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		Koelerio-Corynephoretea																																		
H	eur-as	*Poa bulbosa*	2b	1	2b	+	3	1	.	2b	3	3	.	.	1	.	2a	+	2a	.	2b	4	.	+	2a	1	.	.	2a	.	.	2a	2a	.	1	IV
Th	eur-as	*Arenaria leptoclados*	+	+	+	.	.	.	.	2b	.	+	1	2m	.	.	+	.	.	+	.	+	.	.	.	.	1	.	.	+	+	+	.	.	.	III
H	pont-med	*Centaurea diffusa*	.	+	r	.	+	.	.	.	+	.	1	r	+	+	.	.	+	.	+	.	.	+	.	.	r	.	.	.	.	.	.	.	.	II
Th	eur-med	*Trifolium campestre*	.	.	.	.	.	+	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	+	1	.	.	II
Th	submed	*Anthemis ruthenica*	+	.	+	.	+	.	.	r	+	+	+	.	.	.	.	r	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Th	eur-as	*Filago vulgaris*	.	.	+	+	.	.	.	.	.	.	.	r	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	+	II
Th	subboreal	*Vulpia myurus*	.	.	.	.	.	+	.	2a	.	.	.	+	1	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	.	I
Th	med-as	*Trifolium scabrum*	.	.	+	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	I
Th	eur-med	*Bombycilaena erecta*	+	.	+	.	.	.	.	r	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	eur-as	*Arenaria serpyllifolia*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	I
Th	boreal	*Filago lutescens*	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	submed	*Scleranthus polycarpos*	.	.	.	.	1	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	subboreal	*Erodium cicutarium*	.	.	.	.	+	.	.	2b	.	.	+	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	submed	*Psilurus incurvus*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	eur-med	*Scleranthus perennis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	eur-submed	*Rumex acetosella*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	cosm; temp	*Syntrichia ruralis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th	submed	*Silene subconica*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		Other species																																		
H	cosm	*Plantago lanceolata*	+	.	+	+	+	.	+	r	1	.	2b	.	.	1	.	+	+	+	+	+	+	+	+	.	.	+	+	+	+	+	+	+	+	IV
Th	eur-as	*Taeniatherum caput-medusae*	.	2a	.	2b	2m	.	2a	r	+	.	+	+	+	1	2b	+	+	.	2a	.	3	2a	1	5	+	+	2m	2b	.	2m	+	2m	2a	IV
H	eur-sib	*Cichorium intybus*	+	.	r	+	.	.	.	.	1	.	r	.	+	+	.	.	+	r	+	.	+	.	.	+	r	.	.	+	.	r	.	.	+	III
Th	eur-as	*Herniaria hirsuta*	.	.	+	.	+	.	.	r	.	.	.	.	.	+	.	.	.	.	.	+	+	.	.	.	+	.	+	.	+	.	.	+	.	.	II
H	subboreal	*Potentilla neglecta*	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	.	+	.	II
Th	eur-med	*Medicago rigidula*	.	.	.	2b	.	.	.	2b	.	2a	+	+	.	.	1	.	.	.	2a	1	.	.	.	.	.	.	.	.	.	+	.	1	.	.	II
Th	eur-sib	*Veronica arvensis*	.	+	.	+	1	.	.	.	.	.	1	+	.	+	.	.	.	.	.	+	.	.	1	.	.	.	.	.	+	+	+	.	.	II
H	submed	*Dasypyrum villosum*	.	+	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	2a	.	.	+	.	.	.	+	1	+	+	.	.	.	.	.	II
H	eur-as	*Potentilla inclinata*	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	+	.	.	+	.	.	.	+	.	.	+	.	+	.	.	+	.	.	II
Th	eur-as	*Aegilops triuncialis*	.	.	.	.	.	.	.	+	.	.	.	.	2a	.	.	4	.	1	.	.	.	+	.	+	.	1	+	.	.	.	.	.	.	II
Th	submed	*Carthamus lanatus*	1	.	.	3	r	.	+	+	1	.	.	.	.	.	r	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Th	eur-med	*Trifolium striatum*	.	1	.	.	.	+	.	.	+	.	+	.	+	.	2a	.	.	+	.	.	.	.	.	+	.	.	.	.	.	2a	.	.	.	II
H	eur-as	*Dactylis glomerata*	.	+	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	r	.	.	.	+	.	2a	.	+	+	.	+	.	.	2a	1	.	II
H	cosm	*Convolvulus arvensis*	.	.	.	.	.	.	.	+	r	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	+	.	+	+	+	.	II
H	eur-med	*Lotus corniculatus*	.	.	.	.	.	.	+	.	+	.	.	.	.	.	r	.	+	.	+	.	.	+	+	.	.	.	.	+	.	1	.	+	.	II
Th	med	*Trifolium angustifolium*	+	.	.	+	.	.	+	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	r	.	.	.	II
Th	pont-as	*Galium tenuissimum*	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	+	.	.	.	.	+	2m	I
Th	eur-med	*Cerastium pumilum*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1	.	+	.	.	1	.	.	.	.	.	.	+	.	.	I
Th	submed	*Nigella arvensis*	.	+	.	.	.	.	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	r	.	+	.	+	.	I
Th	med	*Trifolium retusum*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	bal	*Centaurea caliacrae*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	I
H	eur-as	*Astragalus hamosus*	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	boreal	*Setaria viridis*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	eur	*Carduus acanthoides*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	I
Th	med	*Trifolium setiferum*	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	submed	*Trifolium pallidum*	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	eur-as	*Ononis spinosa*	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	I
H	eur-sib	*Carex praecox*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	2m	.	.	I
H	submed	*Cynosurus echinatus*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	2m	.	I
H	pont-Cas	(S) *Elymus hispidus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2m	.	.	.	I
Th	eur-as	*Geranium rotundifolium*	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	boreal	*Bromus mollis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	I
Th	eur-med	*Logfia arvensis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	boreal	*Bromus tectorum*	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	submed	*Alyssum strigosum*	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	submed	*Velezia rigida*	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	cosm	(S) *Anagallis arvensis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	I

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H	eur-submed	*Achillea collina*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	I
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Th	eur-as	*Daucus carota*	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	med	*Trifolium echinatum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	I
H	eur-sib	*Anthemis tinctoria*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I
Th	eur-med	*Vicia hirsuta*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	I
Th	med-as	*Trachynia distachya*	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	cosm	*Chenopodium album*	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	med-Cas	*Bromus japonicus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2m	2m	.	.	+	.	.	.	.	I
Th	med	*Sherardia arvensis*	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	I
Th	eur-as	*Torilis arvensis*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	r	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	I
Th	med	*Aegilops geniculata*	.	.	.	3	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	cosm	*Capsella bursa-pastoris*	.	.	.	.	.	.	.	r	.	+	.	.	+	.	.	+	.	.	.	+	.	.	1	.	.	.	.	.	.	.	.	.	.	I
Th	eur-as	*Torilis nodosa*	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	I
H		(S) *Taraxacum* sp.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	I
H	eur-submed	*Phleum pratense*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	2m	.	.	I
Th	eur	*Dianthus armeria*	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	I
H	submed	*Rorippa thracica*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	2m	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	eur-as	*Medicago lupulina*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	I
Th	pont-med	(S) *Bupleurum commutatum*	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	I
Th	submed	*Trifolium incarnatum*	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	eur-med	*Centaurea solstitialis*	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	+	I
Th	cosm	*Polygonum aviculare*	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	+	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	I
H	cosm	*Verbena officinalis*	.	.	.	.	.	+	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	med	*Bupleurum flavum*	.	.	.	.	.	+	2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	pont-med	*Cephalaria transsylvanica*	.	.	.	.	.	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Th	eur-as	*Phleum subulatum*	.	.	.	+	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	+	.	.	.	2m	1	.	.	.	.	2a	.	I
H	pont	*Potentilla argentea*	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2a	.	.	I
H	submed	*Marrubium peregrinum*	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	I
Th	subboreal	*Apera spica-venti*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	+	r	.	.	.	.	.	I
H	boreal	*Hordeum murinum*	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
H	pont-med	*Ajuga chamaepytis*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	I
H	eur-med	*Agrimonia eupatoria*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	I
H	eur-sib	*Inula hirta*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	I
H	med	*Scorzonera laciniata*	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	I
H	eur-med	*Hypochaeris radicata*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	eur-med	*Sedum acre*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	med	*Euphorbia niciciana*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch	alp-med	*Helianthemum nummularium*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th	subboreal	*Tragus racemosus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th	med-Cas	*Cruciata pedemontana*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	bal	*Hypericum rumeliacum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th	submed	*Sideritis montana*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th	med	*Scolymus hispanicus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	boreal	*Rumex crispus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	bal	*Peucedanum vitijugum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H	pont-med	*Achillea coarctata*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th	med	*Linum bienne*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th	eur-med	*Bilderdykia dumetorum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

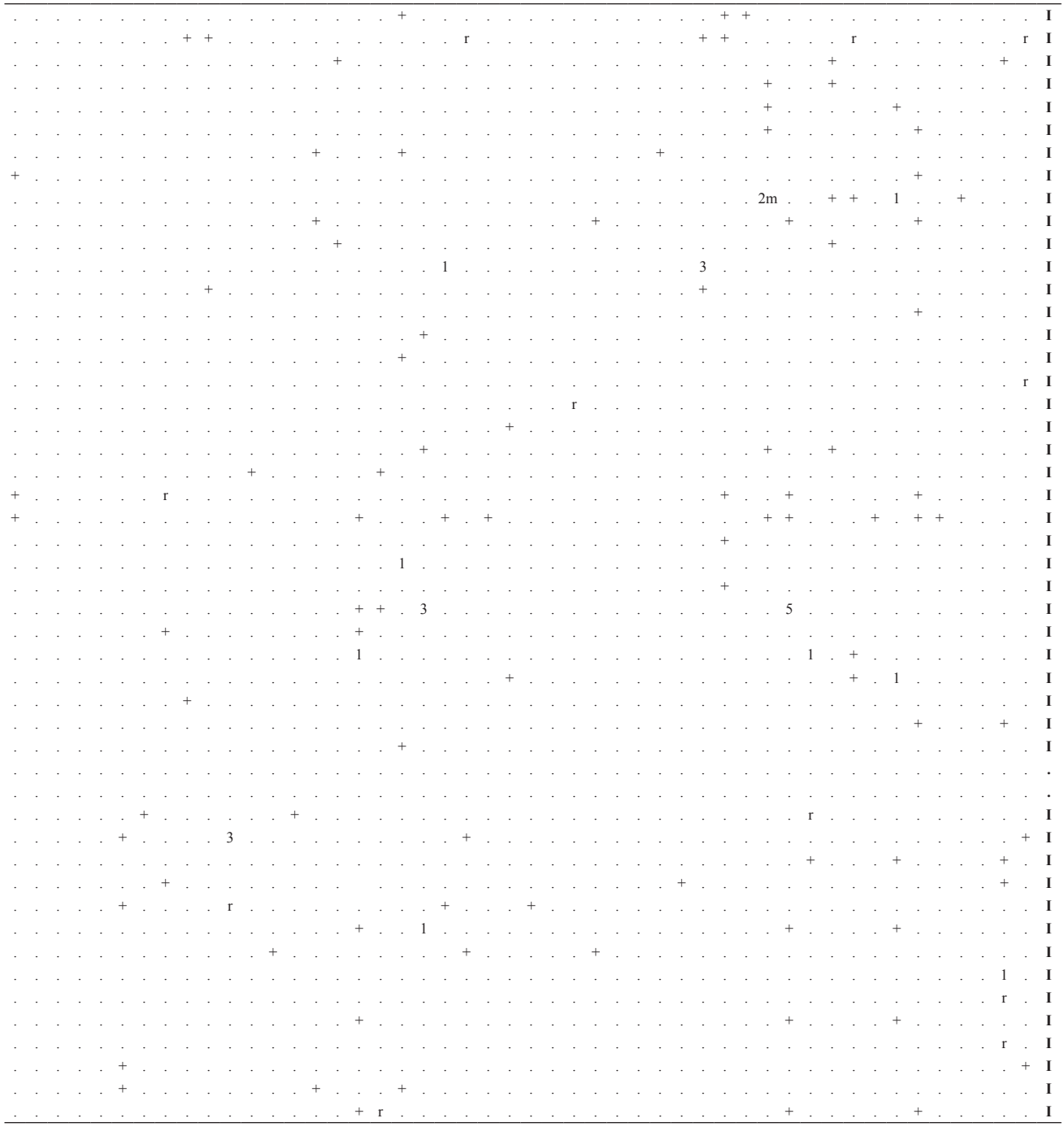

Table 3: Relevés of the association *Festuco valesiacae-Stipetum capillatae* Sillinger 1930.
Tabela 3: Popisi asociacije *Festuco valesiacae-Stipetum capillatae* Sillinger 1930.

Life forms	Chorotypes	No. of relevé	1	2	3	4	5	6	7	8	9	10	11	Constancy
		altitude [m]	284	208	307	168	212	255	332	278	227	258	123	
		aspect	E	N	SE	NE	NE	S	S	S	S	W	S	
		cover [%]	75	85	85	95	80	65	65	50	85	75	90	
		number of species	29	20	25	21	14	31	33	22	20	36	13	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Character species for the association												
H	pont-med	*Stipa capillata*	2b	+	+	3	4	+	4	2a	4	3	4	**V**
H	pont	*Festuca valesiaca*	.	2b	2a	.	2b	2b	+	+	.	.	.	**III**
		Festucion valesiacae												
H	smed-as	*Dichanthium ischaemum*	2b	1	1	3	+	.	.	.	2a	2a	+	**IV**
H	eur-med	*Asperula cynanchica*	+	+	.	.	2a	1	.	.	1	.	.	**III**
Th	submed	*Xeranthemum annuum*	.	.	+	1	.	.	+	.	+	+	.	**III**
H	pont-med	*Teucrium polium*	.	.	.	.	.	.	+	.	1	1	+	**II**
Th	eur-as	*Medicago minima*	.	.	.	.	.	.	+	+	+	1	.	**II**
H	pont-med	*Chrysopogon gryllus*	.	.	+	.	.	2a	.	.	.	.	+	**II**
H	submed	*Euphorbia myrsinites*	.	.	+	.	.	.	.	+	.	+	.	**II**
H	pont-sib	*Linaria genistifolia*	.	.	.	r	.	.	+	.	.	r	r	**II**
H	eur-as	*Astragalus onobrychis*	.	.	+	.	.	.	+	.	.	.	.	**I**
Th	submed	*Helianthemum salicifolium*	.	.	.	+	.	.	.	.	.	.	.	**I**
H	submed	*Teucrium chamaedrys*	.	.	.	.	.	.	.	.	2a	.	.	**I**
		Festuco-Brometea												
H	submed	*Thymus striatus*	1	1	2a	.	1	2a	+	1	.	1	+	**V**
H	pont-med	*Eryngium campestre*	1	2a	+	1	+	1	+	.	+	.	+	**V**
Th	pont-med	*Petrorhagia prolifera*	+	.	.	.	.	+	.	+	.	+	.	**II**
H	eur-sib	*Chondrilla juncea*	.	.	+	.	.	+	.	+	.	.	.	**II**
H	pont	*Convolvulus cantabrica*	1	.	.	.	.	.	.	.	2a	1	.	**II**
H	bal	*Achillea clypeolata*	1	.	.	.	.	1	+	.	.	.	.	**II**
H	submed	*Achillea setacea*	.	1	.	.	+	.	.	.	.	.	.	**I**
H	eur-as	*Galium verum*	.	2a	.	.	.	.	.	.	.	+	.	**I**
H	subboreal	*Potentilla neglecta*	.	2a	.	.	+	.	.	.	.	.	.	**I**
H	submed	*Centaurea rhenana*	.	.	+	.	.	.	.	.	.	+	.	**I**
H	bal-anat	*Scabiosa argentea*	.	.	.	+	.	.	.	.	.	.	.	**I**
Th	eur-med	*Alyssum desertorum*	.	+	.	.	.	.	.	.	.	.	.	**I**
K	med	*Allium flavum*	.	.	.	+	.	.	.	.	.	+	.	**I**
H	cosm	*Poa angustifolia*	.	+	.	.	.	.	.	.	.	.	.	**I**
H	eur	*Erysimum diffusum*	+	.	.	.	.	.	.	.	.	.	.	**I**
Ch	pont-med	*Fumana procumbens*	.	.	.	.	.	+	.	.	.	.	.	**I**
		Koelerio-Corynephoretea												
H	eur-as	*Poa bulbosa*	.	1	3	.	.	1	1	1	.	2b	+	**IV**
Th	eur-sib	*Trifolium arvense*	.	.	+	.	.	.	+	.	.	1	+	**II**
Th	eur-as	*Arenaria leptoclados*	1	.	.	2a	.	+	.	.	.	1	.	**II**
Th	eur-sib	*Veronica arvensis*	+	+	.	+	.	.	+	.	.	.	.	**II**
Th	eur-med	*Alyssum alyssoides*	+	.	.	.	.	.	+	+	.	.	.	**II**
H	eur-med	*Scleranthus perennis*	.	.	3	.	.	.	1	+	.	.	.	**II**
Th	med-as	*Trifolium scabrum*	.	.	+	+	.	.	.	.	.	.	.	**II**
Th	boreal	*Bromus tectorum*	.	.	.	.	.	.	+	+	.	+	.	**II**
Th	submed	*Silene subconica*	.	.	r	.	.	.	+	+	.	+	.	**II**

		No. of relevé	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	
H	cosm;temp	*Ceratodon purpureus*	.	.	2a	.	.	+	.	.	.	.	1	**II**
Th	pont-med	*Centaurea diffusa*	.	.	.	.	.	r	+	.	r	.	.	**II**
H	eur-med	*Sedum acre*	.	.	+	.	.	.	.	+	.	+	.	**II**
H	cosm;temp	*Syntrichia ruralis*	.	.	+	+	.	.	.	.	.	+	.	**II**
Th	eur-med	*Trifolium campestre*	+	.	.	.	.	1	.	.	.	.	.	**I**
Th	subboreal	*Vulpia myurus*	+	+	.	.	.	.	.	.	.	.	.	**I**
Th	boreal	*Filago lutescens*	+	.	.	.	.	.	.	+	.	.	.	**I**
Th	submed	*Psilurus incurvus*	.	+	.	.	.	.	+	.	.	.	.	**I**
Th	submed	*Anthemis ruthenica*	.	.	.	.	.	.	+	+	.	.	.	**I**
Th	subboreal	*Apera spica-venti*	.	.	.	+	.	.	.	.	.	.	.	**I**
Th	subboreal	*Erodium cicutarium*	.	.	.	.	.	.	+	.	.	.	.	**I**
Th	eur-as	*Filago vulgaris*	+	.	.	.	.	.	.	.	.	.	.	**I**
Th	eur-as	*Herniaria glabra*	.	.	.	.	.	.	+	.	.	.	.	**I**
H	eur-as	*Phleum phleoides*	.	.	.	.	+	.	.	.	.	.	.	**I**
Th	eur-med	*Bombycilaena erecta*	.	.	.	.	.	.	.	.	.	+	.	**I**
		Other species												
Th	eur-as	*Herniaria hirsuta*	.	+	.	+	+	+	+	.	.	.	+	**III**
Th	eur-as	*Taeniatherum caput-medusae*	1	.	r	.	.	.	+	.	.	.	.	**II**
H	pont-Cas	(S) *Elymus hispidus*	.	+	.	+	2a	.	.	.	.	.	.	**II**
Th	submed	*Bromus squarrosus*	.	.	r	.	.	.	+	+	.	+	.	**II**
Th	eur-as	*Crepis setosa*	+	.	+	.	.	.	.	.	+	+	.	**II**
H	cosm	*Convolvulus arvensis*	+	+	.	.	+	+	.	.	.	.	.	**II**
H	submed	*Marrubium peregrinum*	+	2a	.	.	+	.	.	.	.	.	.	**II**
H	pont	*Koeleria nitidula*	.	.	.	.	.	1	1	2a	.	+	.	**II**
Th	eur-med	*Medicago rigidula*	.	.	+	.	.	+	.	+	.	.	.	**II**
Th	boreal	*Setaria viridis*	+	.	.	.	.	+	+	.	.	.	.	**II**
H	bal-dac	*Melica transsilvanica*	.	r	.	.	r	.	.	.	.	+	.	**I**

Table 4: Relevés of the association *Medicagini-Festucetum valesiacae* Wagner 1941.
Tabela 4: Popisi asociacije *Medicagini-Festucetum valesiacae* Wagner 1941.

Life forms	Chorotypes	No. of relevé	1	2	3	4	5	6	7	8	9	10	11	12	Constancy
		altitude [m]	194	200	199	207	115	269	225	228	329	273	253	165	
		aspect	W	N	W	N	NW	SE	N	N	W	W	N	W	
		cover [%]	95	85	90	85	95	75	85	95	75	85	95	90	
		number of species	21	31	21	25	22	23	23	25	30	24	23	29	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		Character species for the association													
Th	eur-as	*Medicago minima*	2b	1	.	+	2a	1	.	+	+	+	+	+	**V**
H	eur-as	*Poa bulbosa*	1	1	.	.	+	2m	2a	.	2a	.	2a	3	**IV**
H	eur-as	*Medicago falcata*	+	+	+	+	+	+	.	+	.	.	.	.	**III**
H	eur-as	*Astragalus onobrychis*	.	.	+	.	+	+	.	+	+	+	2a	1	**III**
		Festucion valesiacae													
H	pont	*Festuca valesiaca*	2b	2a	3	2b	3	2b	3	5	2b	4	4	3	**V**
H	eur-med	*Asperula cynanchica*	+	+	+	.	+	+	.	.	+	+	.	.	**III**
H	Smed-as	*Dichanthium ischaemum*	2b	2a	.	2b	2b	1	.	.	.	2a	.	r	**III**
H	pont-med	*Teucrium polium*	+	.	.	2a	.	1	.	+	.	+	+	.	**III**
H	submed	*Teucrium chamaedrys*	.	.	.	+	.	+	.	+	.	+	.	.	**II**
H	submed	*Euphorbia myrsinites*	.	.	.	.	.	.	.	r	+	+	+	.	**II**
Th	submed	*Helianthemum salicifolium*	.	.	.	.	.	.	.	.	+	.	1	.	**I**
H	pont-med	*Stipa capillata*	.	.	.	.	.	.	.	.	.	+	+	.	**I**
Th	submed	*Xeranthemum annuum*	.	+	.	.	.	.	.	.	.	.	.	.	**I**
H	eur	*Euphorbia cyparisias*	.	.	.	.	.	.	1	.	.	.	.	.	**I**
		Festuco-Brometea													
H	pont-med	*Eryngium campestre*	1	1	+	+	+	+	1	r	+	+	+	+	**V**
H	submed	*Thymus striatus*	1	+	1	2a	2b	+	+	1	2b	1	+	2a	**V**
Th	pont-med	*Petrorhagia prolifera*	+	+	+	.	.	.	+	.	+	.	+	+	**III**
H	submed	*Achillea setacea*	.	1	.	.	+	.	+	+	.	.	+	.	**III**
H	eur-as	*Galium verum*	.	.	+	.	1	.	.	1	.	1	+	+	**III**
H	pont-med	*Chrysopogon gryllus*	.	.	2b	1	.	.	.	+	.	.	.	.	**II**
H	eur-sib	*Chondrilla juncea*	.	.	.	.	.	.	r	.	.	r	+	r	**II**
H	subboreal	*Sanguisorba minor*	.	r	.	+	.	.	.	+	.	.	.	.	**II**
Th	eur-med	*Alyssum desertorum*	.	+	.	.	.	.	+	.	+	.	.	.	**II**
H	subboreal	*Potentilla neglecta*	.	.	+	.	.	.	+	.	.	.	.	+	**II**
H	bal	*Achillea clypeolata*	+	.	.	.	.	.	.	.	.	.	.	.	**I**
H	bal-anat	*Scabiosa argentea*	.	.	.	+	.	.	.	.	.	.	.	.	**I**
H		(S) *Hieracium praealtum*	.	.	.	+	.	.	.	.	.	.	.	.	**I**
Th	eur-med	*Trifolium striatum*	.	+	.	.	.	.	.	.	.	.	.	.	**I**
Ch	alp-med	*Helianthemum nummularium*	.	.	.	.	.	.	2a	.	.	.	.	.	**I**
H	eur	*Erysimum diffusum*	.	.	.	.	.	.	.	.	+	.	.	.	**I**
		Koelerio-Corynephoretea													
H	pont-med	*Centaurea diffusa*	r	+	.	+	+	+	.	.	+	.	.	.	**III**
Th	med-as	*Trifolium scabrum*	.	.	.	.	+	.	1	+	+	1	+	.	**III**
Th	eur-med	*Bombycilaena erecta*	+	.	.	.	.	+	+	+	.	.	.	.	**II**
Th	eur-med	*Trifolium campestre*	.	+	.	+	.	.	.	+	.	+	.	.	**II**
Th	subboreal	*Erodium cicutarium*	.	+	.	.	.	.	.	.	+	.	.	+	**II**
H	cosm; temp	*Syntrichia ruralis*	.	.	.	.	.	+	.	+	.	.	.	1	**II**
Th	submed	*Psilurus incurvus*	.	.	.	.	.	.	2m	.	+	.	.	.	**I**
Th	eur-med	*Alyssum alyssoides*	+	.	.	.	.	.	.	.	.	.	.	.	**I**

		No. of relevé	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
Th	eur-sib	*Trifolium arvense*	.	.	+	.	.	.	.	.	.	.	.	.	**I**
H	eur-med	*Sedum acre*	.	.	.	.	.	+	.	.	.	.	.	.	**I**
Th	submed	*Anthemis ruthenica*	.	.	.	.	.	.	1	.	.	.	.	.	**I**
Th	subboreal	*Vulpia myurus*	.	.	.	.	.	.	2m	.	.	.	.	.	**I**
Th	boreal	*Bromus tectorum*	.	.	.	.	.	.	.	.	1	.	.	.	**I**
Th	eur-sib	*Veronica arvensis*	.	.	.	.	.	.	.	.	+	.	.	+	**I**
Th	submed	*Silene subconica*	.	.	.	.	.	.	.	.	+	.	.	.	**I**
Th	eur-as	*Arenaria leptoclados*	.	.	.	.	.	.	.	.	+	.	.	+	**I**
Th	eur-sib	*Scleranthus annuus*	.	.	.	.	.	.	.	.	.	+	.	.	**I**
H	eur-med	*Scleranthus perennis*	.	.	.	.	.	.	.	.	.	.	+	.	**I**
H	cosm; temp	*Ceratodon purpureus*	.	.	.	.	.	.	.	.	.	.	.	1	**I**
		Other species													
H	cosm	*Plantago lanceolata*	.	+	.	+	1	.	+	+	.	+	.	+	**III**
Th	eur-med	*Crepis setosa*	+	+	.	.	.	.	+	+	.	.	+	+	**III**
H	eur-as	*Potentilla inclinata*	+	.	.	.	+	.	.	+	+	.	+	.	**III**
Th	eur-as	*Herniaria hirsuta*	.	+	.	.	+	+	.	.	+	.	+	+	**III**
Th	submed	*Bromus squarrosus*	.	+	.	.	+	.	.	.	2a	+	.	+	**III**
Th	eur-med	*Medicago rigidula*	1	1	.	.	+	.	.	.	.	.	.	1	**II**
Th	eur-as	*Taeniatherum caput-medusae*	.	1	.	.	+	.	+	.	.	.	.	.	**II**
H	submed	*Dasypyrum villosum*	.	r	.	.	.	.	.	.	+	.	+	.	**II**
H	eur-med	*Carduus nutans*	.	+	.	.	.	.	.	.	+	.	+	.	**II**
H	eur-sib	*Cichorium inthybus*	.	.	.	.	.	.	+	.	.	r	.	r	**II**
Th	eur-as	*Aegilops triuncialis*	.	+	.	.	.	1	.	.	+	.	.	.	**II**
Th	bal	*Centaurea caliacrae*	.	.	+	.	.	.	.	.	+	+	.	1	**II**

Table 5: Relevés of the association *Trifolio arvensis-Festucetum valesiacae* Sopotlieva & Apostolova 2013.
Tabela 5: Popisi asociacije *Trifolio arvensis-Festucetum valesiacae* Sopotlieva & Apostolova 2013.

Life forms	Chorotypes	No. of relevé	1	2	3	4	5	6	7	8	9	10	11	Constancy
		altitude [m]	168	259	337	245	292	333	268	199	150	324	284	
		aspect	SE	N	NE	N	NE	S	N	W	NW	SW	W	
		cover [%]	95	95	95	85	85	90	95	90	85	85	90	
		number of species	23	27	25	35	42	28	31	22	33	26	26	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Diagnostic species for the association												
H	subboreal	*Potentilla neglecta*	.	+	+	+	+	.	+	+	.	+	+	**IV**
Th	eur-as	*Herniaria hirsuta*	.	.	+	+	+	+	+	+	+	+	.	**IV**
H	eur-sib	*Chondrilla juncea*	.	+	+	r	+	+	+	.	.	+	+	**IV**
K	pont-submed	*Ornithogalum umbellatum*	.	+	r	.	.	+	.	+	1	.	.	**III**
Th	eur	*Odontites serotina*	.	+	.	+	+	.	.		.	.	.	**II**
		Festucion valesiasacae												
H	pont	*Festuca valesiaca*	3	5	4	3	3	4	4	4	2b	3	4	**V**
H	eur-med	*Asperula cynanchica*	.	.	.	1	+	.	+	+	.	.	+	**III**
H	pont-med	*Chrysopogon gryllus*	1	.	.	.	.	.	.	+	r	2a	+	**III**
H	pont-med	*Teucrium polium*	+	.	.	.	2a	+	.	.	.	+	.	**II**
H	eur-as	*Astragalus onobrychis*	.	.	.	.	1	2b	.	2a	.	.	.	**II**
H	smed-as	*Dichanthium ischaemum*	+	.	.	.	.	.	.	.	.	.	+	**I**
Th	eur-as	*Medicago minima*	2a	.	+	.	.	.	.	.	.	.	.	**I**
Th	submed	*Helianthemum salicifolium*	.	.	.	.	.	.	.	.	1	1	.	**I**
H	eur	*Euphorbia cyparissias*	r	.	1	.	.	.	.	.	.	.	.	**I**
H	submed	*Teucrium chamaedrys*	.	+	.	.	.	.	.	.	.	+	.	**I**
H	pont-sib	*Linaria genistifolia*	.	.	.	.	+	+	.	.	.	.	.	**I**
H	med	*Plantago subulata*	.	.	1	.	.	.	.	.	.	.	.	**I**
Th	submed	*Xeranthemum annuum*	.	r	.	.	.	.	.	.	.	.	.	**I**
H	pont-med	*Stipa capillata*	.	.	.	.	.	.	.	.	r	.	.	**I**
		Festuco-Brometea												
H	submed	*Thymus striatus*	+	.	2a	+	1	+	2a	2a	+	2a	2a	**V**
H	pont-med	*Eryngium campestre*	.	+	+	.	+	1	1	+	+	.	+	**IV**
Th	pont-med	*Petrorhagia prolifera*	+	+	.	+	+	.	+	.	+	+	+	**IV**
H	cosm	*Plantago lanceolata*	.	+	2a	1	+	.	1	.	+	+	+	**IV**
H	eur-as	*Galium verum*	2a	2a	.	2b	+	.	1	+	2a	.	.	**IV**
H	submed	*Achillea setacea*	+	1	.	.	.	.	+	+	+	.	.	**III**
H	bal	*Achillea clypeolata*	.	.	.	1	1	.	.	.	.	.	.	**I**
H	submed	*Centaurea rhenana*	.	.	r	.	.	.	.	.	.	.	.	**I**
Th	submed	*Xeranthemum cylindraceum*	1	.	.	.	.	+	.	.	.	.	.	**I**
H	bal-anat	*Scabiosa argentea*	.	.	.	.	+	.	.	.	.	.	.	**I**
H	pann-bal	*Achillea crithmifolia*	.	.	+	.	.	.	.	.	.	.	.	**I**
Th	eur-med	*Alyssum desertorum*	+	.	.	.	.	.	.	.	.	.	.	**I**
Th	submed	*Alyssum hirsutum*	.	+	.	+	.	.	.	.	.	.	.	**I**
K	med	*Allium flavum*	.	.	.	.	.	.	.	.	r	.	.	**I**
H	pont	*Convolvulus cantabrica*	.	.	.	.	.	.	.	.	.	+	.	**I**
H	cosm	*Hypericum perforatum*	.	.	.	.	.	.	.	.	+	.	.	**I**
H	eur	*Erysimum diffusum*	.	.	.	.	.	.	.	.	.	r	.	**I**
		Koelerio-Corynephoretea												
Th	eur-sib	*Trifolium arvense*	.	.	+	+	+	+	+	.	r	1	1	**IV**
H	eur-as	*Poa bulbosa*	.	.	1	.	1	+	+	.	2a	2a	+	**IV**

		No. of relevé	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	
Th	eur-as	*Arenaria leptoclados*	+	.	+	+	+	+	+	.	+	.	.	**IV**
Th	eur-med	*Trifolium campestre*	.	.	.	1	+	.	+	.	+	+	1	**III**
Th	eur-as	*Taeniatherum caput-medusae*	+	+	.	+	+	.	+	.	.	.	.	**III**
Th	med-as	*Trifolium scabrum*	.	.	.	+	+	+	.	+	.	.	.	**II**
H	eur-submed	*Rumex acetosella*	.	.	.	+	+	.	+	.	.	.	+	**II**
H	eur-med	*Scleranthus perennis*	.	.	.	.	+	+	.	.	.	.	1	**II**
Th	eur-med	*Trifolium striatum*	.	.	.	+	.	.	+	.	.	.	+	**II**
Th	subboreal	*Erodium cicutarium*	.	.	.	.	r	+	+	.	.	.	.	**II**
Th	submed	*Anthemis ruthenica*	.	.	r	.	.	.	+	.	r	.	.	**I**
Th	pont-med	*Centaurea diffusa*	.	.	.	.	1	.	+	.	.	.	.	**I**
H	cosm;temp	*Ceratodon purpureus*	.	.	.	.	.	+	.	.	.	.	+	**I**
H	eur-as	*Phleum phleoides*	.	.	.	.	.	.	.	.	.	+	+	**I**
Th	eur-sib	*Veronica arvensis*	.	+	.	.	.	.	.	.	.	.	.	**I**
Th	subboreal	*Vulpia myurus*	.	.	.	.	+	.	.	.	.	.	.	**I**
Th	boreal	*Filago lutescens*	.	.	r	.	.	.	.	.	.	.	.	**I**
Th	boreal	*Bromus tectorum*	.	+	.	.	.	.	.	.	.	.	.	**I**
Th	submed	*Scleranthus polycarpos*	.	.	+	.	.	.	.	.	.	.	.	**I**
Th	eur-med	*Alyssum alyssoides*	.	.	.	.	.	+	.	.	.	.	.	**I**
Th	subboreal	*Apera spica-venti*	.	.	.	.	.	.	+	.	.	.	.	**I**
Th	eur-as	*Filago vulgaris*	.	.	.	.	.	.	.	.	.	.	+	**I**
H	cosm;temp	*Syntrichia ruralis*	.	.	.	.	+	.	.	.	.	.	.	**I**
		Other species												
Th	eur-as	*Crepis setosa*	+	.	+	.	.	.	+	r	.	.	+	**III**
H	pont	*Koeleria nitidula*	.	+	+	.	+	.	.	.	2b	+	.	**III**
Th	eur-med	*Cerastium pumilum*	+	+	.	.	+	.	+	.	.	.	+	**III**
H	pont-Cas	(S) *Elymus hispidus*	.	+	.	.	.	.	.	.	2a	+	+	**II**
Th	submed	*Bromus squarrosus*	.	.	+	.	+	+	.	.	.	.	.	**II**
H	eur-as	*Potentilla inclinata*	.	.	.	+	.	+	.	.	.	.	+	**II**
H	cosm	*Convolvulus arvensis*	.	+	.	.	.	+	+	.	.	.	.	**II**
Th	med	*Trifolium retusum*	.	.	2a	+	+	.	.	.	.	.	.	**II**
Th	pont-Cas	*Galium tenuissimum*	.	.	.	+	.	.	+	.	+	+	.	**II**
H	eur-sib	*Carex praecox*	.	.	.	1	.	.	+	.	r	2m	.	**II**
Th	eur-as	*Erysimum repandum*	.	.	.	+	+	+	.	.	.	.	.	**II**
Th	submed	*Trifolium pallidum*	+	.	.	+	+	.	.	.	.	.	.	**II**
H	eur-as	*Echium vulgare*	.	.	r	r	.	.	.	.	r	r	.	**II**
Th	med	*Trifolium setiferum*	.	.	.	.	.	.	.	+	+	+	.	**I**

Table 6: Relevés of the community of *Chrysopogon gryllus.*
Tabela 6: Popisi združbe *Chrysopogon gryllus.*

Life forms	Chorotypes	No. of relevé	1	2	3	4	5	6	7	8	9	10	11	Constancy
		altitude [m]	179	190	165	195	235	165	191	128	369	316	315	
		aspect	S	N	W	.	NE	.	NW	N	N	NW	S	
		cover [%]	100	100	95	95	100	100	95	100	100	95	85	
		number of species	17	22	18	18	20	14	20	25	28	27	38	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
H	pont-med	*Chrysopogon gryllus*	5	4	3	3	3	2a	4	1	2b	+	3	**V**
		Festucion valesiacae												
H	pont-med	*Eryngium campestre*	r	+	+	1	+	1	+	+	+	+	+	**V**
H	submed	*Achillea setacea*	+	.	+	+	+	.	+	.	+	+	.	**IV**
H	pont-med	*Festuca valesiaca*	.	2a	2b	.	4	.	+	2m	.	+	1	**IV**
H	eur-med	*Asperula cynanchica*	.	+	+	.	.	.	.	.	.	r	.	**II**
H	eur-as	*Astragalus onobrychis*	.	+	1	.	.	.	.	.	.	2a	+	**II**
H	bal-dac	*Dianthus pallens*	+	.	+	+	.	.	.	.	.	.	.	**II**
Th	submed	*Xeranthemum annuum*	.	.	.	.	.	.	.	.	.	.	+	**I**
H	pont-sib	*Linaria genistifolia*	.	.	.	.	.	.	.	.	.	+	.	**I**
H	pont-med	*Stipa capillata*	.	.	.	.	.	.	.	.	.	.	2a	**I**
H	pont-med	*Teucrium polium*	.	+	.	.	.	.	.	.	.	.	+	**I**
H	smed-as	*Dichanthium ischaemum*	r	.	.	.	.	.	.	.	.	.	+	**I**
H	bal-dac	*Achillea clypeolata*	.	r	.	.	.	.	.	.	.	.	1	**I**
		Festuco-Brometea												
H	eur-as	*Galium verum*	+	.	2a	.	2b	+	+	+	+	+	.	**IV**
H	submed	*Thymus striatus*	.	.	+	+	.	.	+	+	.	.	2a	**III**
H	cosm	*Plantago lanceolata*	.	.	+	.	.	.	+	+	+	+	.	**III**
H	pont	*Potentilla argentea*	.	.	.	.	.	1	+	.	+	.	.	**II**
H	subboreal	*Sanguisorba minor*	.	+	.	.	.	.	.	.	+	1	+	**II**
Th	pont-med	*Petrorhagia prolifera*	+	.	+	.	.	.	.	.	.	.	+	**II**
H	subboreal	*Potentilla neglecta*	.	.	.	.	.	.	.	1	.	.	.	**I**
Th	submed	*Xeranthemum cylindraceum*	.	.	.	+	.	+	.	.	.	.	.	**I**
H	eur-sib	*Chondrilla juncea*	.	.	.	.	.	.	.	.	+	.	.	**I**
H	eur-submed	*Melica ciliata*	r	.	.	.	.	.	.	.	.	.	.	**I**
H	pont	*Convolvulus cantabrica*	.	+	.	.	.	.	.	.	.	.	+	**I**
H	submed	*Centaurea rhenana*	.	+	.	.	.	.	.	.	.	.	.	**I**
		Other species												
Th	eur-as	*Crepis setosa*	.	.	+	.	+	+	1	+	+	.	+	**IV**
Th	eur-as	*Taeniatherum caput-medusae*	+	.	.	+	2m	.	.	.	+	+	.	**III**
H	eur-as	*Dactylis glomerata*	.	.	.	2a	+	.	.	3	2a	.	.	**II**
H	eur-med	*Lotus corniculatus*	.	.	.	r	+	.	.	.	+	2a	.	**II**
H	eur-submed	*Rumex acetosella*	.	.	.	.	.	.	+	+	+	.	.	**II**
Th	eur-med	*Trifolium striatum*	.	.	+	.	2a	+	.	3	.	.	.	**II**
H	eur-as	*Lolium perenne*	.	.	.	+	+	.	.	+	.	2m	.	**II**
K	pont-submed	*Ornithogalum umbellatum*	.	+	.	.	.	.	.	+	r	.	.	**II**
Th	eur-med	*Trifolium campestre*	.	.	1	.	+	.	.	.	.	+	1	**II**
H	eur-as	*Potentilla inclinata*	.	+	.	+	+	.	+	.	.	.	.	**II**
Th	eur-med	*Cerastium pumilum*	.	.	.	.	+	.	+	+	.	.	.	**II**
H	eur-med	*Carduus nutans*	.	.	r	.	.	.	r	.	.	r	.	**II**
H	eur-as	*Poa bulbosa*	.	+	.	.	.	.	.	+	.	2a	1	**II**
H	pont	*Koeleria nitidula*	.	+	.	.	.	.	.	1	.	.	+	**II**
Th	eur-as	*Aegilops triuncialis*	+	2m	.	.	.	.	.	.	.	2m	.	**II**
Th	med	*Trifolium angustifolium*	.	+	+	.	1	.	.	.	.	.	.	**II**

Table 7: Relevés of the association *Euphorbio myrsinitae-Bothriochloetum ischaemi* R. Jovanović 1955 subass. *medicaginetosum rhodopaeae* Sopotlieva & Apostolova 2013.
Tabela 7: Popisi asociacije *Euphorbio myrsinitae-Bothriochloetum ischaemi* R. Jovanović 1955 subass. *medicaginetosum rhodopaeae* Sopotlieva & Apostolova 2013.

Life forms	Chorotypes	No. of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Constancy	
		altitude [m]	275	332	176	180	356	350	257	332	332	202	235	296	185	311	298	222	252	340	245	324	240	255		
		aspect	S	NE	S	S	E	W	S	.	N	E	SE	S	NW	S	SW	SE	S	SW	S	S	S	S		
		cover [%]	85	60	85	55	65	85	75	70	95	75	85	85	65	75	85	85	45	70	75	55	65	55		
		number of species	23	25	33	25	23	39	24	28	36	35	28	35	36	35	32	29	21	38	39	27	28	22	A	B
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
		Character species for the association																								
H	submed	*Euphorbia myrsinites*	+	.	+	+	.	.	.	.	.	+	+	.	+	+	+	r	+	+	+	+	r	+	IV	V
Th	submed	*Sideritis montana*	.	2a	+	+	+	+	2a	1	2b	1	1	1	1	+	2a	.	.	1	1	.	.	.	IV	III
Ch	pont-med	*Fumana procumbens*	.	+	.	.	1	.	.	+	.	.	.	1	.	2a	.	1	+	.	.	.	.	+	II	IV
H	submed	*Centaurea rhenana*	.	.	.	r	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	II	IV
H	med	*Haplophyllum suaveolens*	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	I	II
Th	eur-as	*Aegilops triuncialis*	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2b	.	.	I	II
		Differential species for the subassociation																								
H	eur-med	*Sedum acre*	1	+	+	+	.	1	.	+	+	1	+	2a	+	+	+	.	.	1	1	.	+	1	IV	.
Th	submed	*Helianthemum salicifolium*	+	+	.	.	.	+	+	+	1	1	+	+	1	+	1	.	.	1	1	.	.	.	IV	.
H	eur-sib	*Echinops ritro*	+	r	+	+	+	.	.	+	r	+	+	+	.	.	.	+	+	.	+	.	.	.	III	.
H	temp	*Grimmia pulvinata*	+	1	.	+	+	.	.	1	.	.	.	+	2a	+	.	.	+	1	1	.	.	+	III	.
H	pont	*Paronychia cephalotes*	+	.	+	2a	.	.	.	.	.	1	1	1	.	1	.	.	+	2b	+	.	.	.	III	.
H	subalp	*Weissia wimmeriana*	.	1	.	1	.	.	.	1	+	1	.	+	.	.	.	.	+	1	1	.	.	.	III	.
H	pont-med	*Ajuga chamaepytis*	.	+	+	.	.	+	+	.	.	.	+	1	.	+	2a	.	.	+	.	.	.	.	III	.
H	bul	*Medicago rhodopaea*	1	.	.	.	+	.	.	+	.	.	+	1	2a	2a	.	+	.	.	1	.	.	.	III	.
H	pont	*Koeleria nitidula*	.	r	.	+	.	+	+	.	+	1	.	.	2m	.	.	2a	+	.	1	.	1	.	III	.
Th	eur-sib	*Scleranthus annuus*	.	.	.	1	.	+	1	.	.	.	1	+	+	.	+	.	.	+	.	+	1	+	III	.
Th	eur-med	*Bombycilaena erecta*	.	.	+	.	.	+	+	.	.	.	+	.	+	.	+	.	.	+	1	1	+	+	III	.
H	bal	*Hypericum rumeliacum*	.	.	.	.	.	.	+	.	.	.	.	+	+	+	.	+	.	+	r	1	r	.	III	.
H	eur-med	*Minuartia caespitosa*	.	+	.	.	+	2a	.	+	+	+	.	.	.	.	.	.	+	.	.	.	.	.	II	.
H	submed	*Didymodon acutus*	.	1	.	.	1	+	.	1	+	.	.	1	.	.	.	.	.	.	.	.	.	.	II	.
Th	submed	*Hippocrepis ciliata*	.	.	.	+	.	.	.	.	.	+	+	.	2m	.	+	+	.	.	.	.	.	.	II	.
Th	submed	*Crupina vulgaris*	.	.	+	.	.	.	+	.	.	+	.	+	+	.	+	.	.	+	.	.	.	.	II	.
H	bal	*Inula aschersoniana*	+	.	+	+	.	.	.	.	.	1	.	.	.	.	.	.	+	r	+	1	.	.	II	.
H	submed	*Pleurochaete squarrosa*	.	.	2a	.	.	.	.	.	.	.	.	.	1	.	+	.	.	+	1	.	.	.	II	.
H	pont	*Centaurea ovina* ssp. *besserana*	+	.	.	.	.	.	.	.	.	.	1	+	.	+	.	.	.	.	.	.	.	.	I	.
H	pont-med	*Koeleria brevis*	.	2a	.	.	2m	.	.	2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	.

		No. of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
		Saturejon montanae																								
H	eur-med	*Anthylis vulneraria*	.	+	+	1	2a	+	.	1	r	1	.	+	.	2a	.	.	+	+	1	.	.	.	**III**	**.**
H	pont-med	*Leontodon crispus*	+	.	1	.	r	r	.	.	.	1	r	.	+	r	.	.	.	+	+	.	.	.	**III**	**II**
H	pont	*Convolvulus cantabrica*	.	.	.	.	.	+	2a	+	+	.	.	1	+	.	+	.	.	1	+	r	.	.	**III**	**II**
H	bal	*Achillea clypeolata*	.	.	+	.	.	.	.	+	.	.	.	+	r	+	+	2a	r	.	+	1	.	.	**III**	**III**
H	eur-submed	*Melica ciliata*	+	.	+	.	.	.	.	.	.	+	.	.	2m	+	r	.	.	.	r	+	.	.	**II**	**V**
H	eur	*Erysimum diffusum*	.	.	+	.	.	r	.	.	.	+	.	r	.	.	.	+	.	.	.	.	.	.	**II**	**II**
K	med	*Allium flavum*	+	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	**II**	**V**
Ch	pont	*Rhodax canus*	.	.	.	2a	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	**I**	**I**
Ch	pont-med	*Satureja montana*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2b	+	.	.	.	.	.	**I**	**IV**
H	eur-as	*Galium album*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	**I**	**.**
H	submed	(S) *Onobrychis alba*	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	**I**	**II**
		Festuco-Brometea																								
H	pont-med	*Teucrium polium*	1	+	+	1	+	+	.	1	+	1	2a	1	2a	2a	+	+	+	1	+	1	3	1	**V**	**IV**
H	smed-as	*Dichanthium ischaemum*	1	.	.	.	+	+	.	+	+	.	2b	2b	.	+	3	+	.	2a	.	2b	2a	3	**IV**	**IV**
H	pont-med	*Chrysopogon gryllus*	+	2a	1	1	+	.	2a	1	.	+	+	.	2b	r	.	2a	+	2a	2a	.	1	.	**IV**	**.**
H	submed	*Thymus striatus*	.	+	1	1	+	+	.	+	2a	1	+	+	.	.	2a	+	.	.	1	1	1	.	**IV**	**.**
H	pont	*Festuca valesiaca*	2a	2a	2a	.	2m	3	.	2a	4	1	.	+	+	+	.	.	.	.	2a	.	+	.	**III**	**.**
H	subboreal	*Sanguisorba minor*	.	+	.	+	.	.	+	+	r	.	.	+	+	.	1	1	.	+	+	.	.	.	**III**	**III**
H	eur	*Euphorbia cyparissias*	+	+	.	+	+	+	.	+	1	.	.	.	.	+	+	.	.	.	.	.	.	.	**III**	**II**
H	eur-med	*Asperula cynanchica*	+	+	+	+	+	.	.	.	r	.	+	+	.	+	.	.	+	.	+	.	+	+	**III**	**IV**
H	pont-med	*Eryngium campestre*	.	.	.	.	.	+	+	.	+	.	.	.	+	.	.	+	.	.	.	+	.	+	**II**	**II**
H	eur-as	*Astragalus onobrychis*	.	r	.	.	.	+	.	.	2a	.	.	.	.	.	.	.	.	.	.	.	+	+	**II**	**II**
H	eur-sib	*Chondrilla juncea*	.	.	.	+	.	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	r	+	**II**	**.**
H	pont-med	*Linum tenuifolium*	.	.	+	.	.	.	+	+	.	.	.	.	2m	.	.	+	.	.	.	.	.	.	**II**	**.**
H	pont-med	*Alyssum tortuosum*	1	.	.	1	.	.	.	.	.	1	2a	.	.	.	.	.	+	.	+	1	.	2b	**II**	**.**
H	submed-sib	*Jurinea consanguinea*	.	.	+	.	+	.	.	.	.	+	.	.	.	r	.	r	r	.	.	.	.	.	**II**	**.**
H	eur-pont	*Agropyron cristatum*	3	.	2a	.	.	.	.	.	.	2m	2m	.	2m	.	.	.	.	+	.	.	.	.	**II**	**.**
H	pont-med	*Stipa capillata*	.	.	.	.	.	.	.	.	.	.	.	+	r	2a	r	.	.	.	.	.	.	.	**I**	**II**
Th	eur-med	*Alyssum desertorum*	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	**I**	**.**
H	submed	*Achillea setacea*	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	**I**	**.**
H	cosm	*Plantago lanceolata*	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	**I**	**.**
H	pont-submed	*Silene bupleuroides*	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	r	.	.	.	**I**	**.**
H	eur-OT	*Salvia nemorosa*	.	.	.	.	.	.	.	.	2a	.	.	.	.	.	.	.	.	.	.	.	.	.	**I**	**.**
H	eur-as	*Galium verum*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	**I**	**.**
H	cosm	*Hypericum perforatum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	**I**	**.**
H	eur-med	*Inula oculus-christi*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	**I**	**.**

		No. of relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
H	pont-sib	*Linaria genistifolia*	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	**I**	**.**
		Other species																								
H	eur-as	*Poa bulbosa*	.	+	2a	1	+	2m	.	+	1	1	+	1	+	.	1	.	.	+	+	1	2a	2a	**IV**	**.**
H	cosm	*Syntrichia ruralis*	.	1	.	.	+	+	.	1	+	.	2a	+	1	+	+	.	.	1	.	.	.	+	**III**	**.**
Th	eur-as	*Medicago minima*	.	.	+	+	.	+	1	.	2a	1	.	.	+	.	.	1	.	.	+	2a	.	r	**III**	**.**
Th	submed	*Bromus squarrosus*	.	.	.	+	.	+	r	.	+	+	.	.	.	.	+	.	.	+	.	+	+	+	**III**	**II**
Th	eur-med	*Acinos arvensis*	.	.	+	.	.	+	.	.	.	+	.	.	.	.	+	1	.	+	.	.	.	r	**II**	**II**
H	eur-as	*Potentilla inclinata*	+	.	.	.	.	.	.	.	+	.	.	+	.	+	+	+	.	+	.	+	.	.	**II**	**.**
Th	eur-med	*Crepis setosa*	.	.	+	.	.	+	.	.	+	.	+	.	+	.	+	.	.	.	+	.	.	.	**II**	**.**
K	eur-Nam	*Allium vineale*	.	.	.	.	.	.	.	.	.	.	+	.	r	+	.	.	.	+	.	.	+	.	**II**	**.**
Th	eur-as	*Arenaria leptoclados*	.	+	+	.	.	.	+	.	+	.	.	.	1	.	.	.	.	.	.	+	+	.	**II**	**.**
Th	submed	*Xeranthemum annuum*	.	.	.	.	.	.	.	.	.	.	+	+	.	1	2a	.	.	1	.	.	+	.	**II**	**.**
H	med	*Plantago subulata*	.	+	.	.	+	+	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	**II**	**.**
Ch	eur-as	*Paliurus spina-christi*	r	.	.	.	.	.	.	.	.	r	.	.	.	r	.	r	.	.	r	.	.	.	**II**	**.**
K	pont-submed	*Ornithogalum umbellatum*	.	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	**I**	**.**
H		*Koeleria penzesii*	+	.	.	.	.	.	.	.	.	.	.	1	.	+	.	.	.	1	.	.	.	.	**I**	**.**
Th	Ap-Bal	*Orlaya grandiflora*	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	+	.	r	r	.	.	.	**I**	**.**
Th	med-as	*Trifolium scabrum*	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	.	+	.	.	.	.	**I**	**.**
H	med	*Potentilla pedata*	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	**I**	**.**
Th	med-as	*Trachynia distachya*	.	.	.	.	.	.	.	.	.	.	.	1	.	+	.	.	.	.	+	.	.	.	**I**	**.**
Th	med	*Ziziphora capitata*	.	.	.	.	.	.	+	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	**I**	**.**
Th	submed	*Silene subconica*	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	**I**	**.**
Th	eur-as	*Herniaria hirsuta*	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	**I**	**.**
H	submed	*Teucrium chamaedrys*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	r	.	.	**I**	**III**
Th	med	*Linum bienne*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	+	**I**	**.**
Th	submed	*Psilurus incurvus*	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	r	.	2a	+	.	**I**	**.**

Table 8: Relevés of the association *Vulpietum myuri* Philippi 1973.
Tabela 8: Popisi asociacije *Vulpietum myuri* Philippi 1973.

Localities: 1. E from Zlatari village, 29. 06. 2004; 2. Lozitsa village, 42.72499 N, 26.77974 E, 26. 06. 2005; 3. E from Devetak village, 42.57002 N, 26.84377 E, 23. 06. 2005.

Life forms	Chorotypes	No. of relevé	1	2	3	Constancy
		altitude [m]	268	203	230	
		aspect	E	NE	W	
		cover [%]	95	95	90	
		number of species	13	13	20	
1	2	3	4	5	6	7
		Character species for the association, *Thero-Airion*				
Th	subboreal	*Vulpia myurus*	5	4	3	**V**
Th	eur-as	*Filago vulgaris*	.	+	.	**II**
H	submed	*Dasypyrum villosum*	.	.	+	**II**
H	eur-med	*Scleranthus perennis*	.	.	2b	**II**
H	pont	*Potentilla argentea*	+	.	.	**II**
Th	eur-med	*Trifolium striatum*	.	.	+	**II**
		Koelerio-Corynephoretea				
H	eur-as	*Poa bulbosa*	+	.	2b	**IV**
Th	subboreal	*Apera spica-venti*	1	2m	.	**IV**
H	pont-med	*Centaurea diffusa*	.	r	.	**II**
H	eur-submed	*Rumex acetosella*	1	.	.	**II**
Th	eur-as	*Arenaria leptoclados*	.	.	1	**II**
		Other species				
Th	eur-as	*Crepis setosa*	r	2a	+	**V**
Th	eur-as	*Taeniatherum caput-medusae*	1	+	.	**IV**
H	pont-med	*Eryngium campestre*	+	.	+	**IV**
H	eur-as	*Anthoxanthum odoratum*	+	.	.	**II**
H	eur-med	*Hypochaeris radicata*	+	.	.	**II**
H	eur-sib	*Chondrilla juncea*	+	.	.	**II**
H	submed	*Cynosurus echinatus*	+	.	.	**II**
Ch	submed	*Rosa canina*	+	.	.	**II**
Th	eur-as	*Bromus arvensis*	.	+	.	**II**
Th	eur-as	*Daucus carota*	.	+	.	**II**
H	eur-as	*Cirsium arvense*	.	r	.	**II**
H	eur-as	*Lolium perenne*	.	2m	.	**II**
H		*Pohlia sp.*	.	+	.	**II**
Th	eur-med	*Centaurea cyanus*	.	r	.	**II**
H	cosm	*Convolvulus arvensis*	.	+	.	**II**
H	smed-as	*Dichanthium ischaemum*	.	.	+	**II**
Th	bal	*Centaurea caliacrae*	.	.	+	**II**
Th	pont-med	*Petrorhagia prolifera*	.	.	+	**II**
H	submed	*Thymus striatus*	.	.	2a	**II**
Th	submed	*Psilurus incurvus*	.	.	+	**II**
Th	med	*Trifolium angustifolium*	.	.	+	**II**
H	cosm	*Plantago lanceolata*	.	.	+	**II**
Th	eur-as	*Aegilops triuncialis*	.	.	+	**II**
H	eur-med	*Carduus nutans*	.	.	+	**II**
H	eur-med	*Trifolium hybridum*	.	.	1	**II**
H	submed	(S) *Onobrychis alba*	.	.	1	**II**
Th	submed	*Bromus squarrosus*	.	.	+	**II**

Table 9: Ecological characteristics of the ten dry-grassland vegetation types. Means and standard deviations are given. Different letters indicate significant differences between communities at α = 0.05 from Tukey's HSD test; *p*-values derived from ANOVAs. Abreviations are as in Figure 3.

Tabela 9: Ekološke značilnosti desetih vegetacijskih tipov suhih travišč. Prikazana so povprečja in standardni odkloni. Različne črke kažejo statistično značilne razlike med združbami pri α = 0,05 v Tukeyevem HSD testu; p vrednosti so dobljene z testom ANOVA. Okrajšave so kot na sliki 3.

	Bot. isch. subass. typicum	Bot. isch. subass. asp. cyn.	Fest. val.-St. cap.	Med.-Fest. val.	Trif. arv.-Fest. val.	Chys. gr.-comm.	Euph. myr.-Bot. isch. subass. med. rhod.	Erys. dif.-Trif. ang.	Poo. bul.-Ach. pseud.	Vulp. myuri	*p*
Number of relevés	**33**	**48**	**11**	**12**	**11**	**11**	**22**	**18**	**7**	**3**	
Altitude [m]	213±64^{a}	222±56^{a}	241±61^{abc}	221±56^{ab}	262±66^{abc}	223±77^{abc}	273±58^{bc}	294±39^{c}	242±88^{abc}	234±33^{abc}	<0.001
Slope [°]	8 ± 6^{a}	11±7^{a}	13±8^{ab}	12±6^{ab}	11±7^{ab}	9±8^{a}	18±8^{b}	7±6^{a}	13±5^{ab}	10±8^{ab}	<0.001
Species richness [number]	23.5±4.8^{ab}	24.0±6.0^{ab}	24.0±7.5^{abc}	24.8±3.4^{abcd}	28.9±5.9^{bcd}	22.5±6.7^{ab}	30.0±5.9^{cd}	31.4±5.6^{d}	24.6±5.3^{abcd}	15.3±4.0^{a}	<0.001
Total cover [%]	90±8^{a}	88±8^{ab}	77±13^{cd}	88±7^{abc}	90±4^{ab}	97±5^{a}	73±13^{d}	87±7^{abc}	77±11^{bcd}	93±3^{abc}	<0.001

Table 10: Percentage of chorotypes and main life forms in the species composition of the nine studied plant associations. Abreviations are as in Figure 3.

Table 10: Odstotek horotipov in glavnih življenskih oblik v vrstni sestavi devetih proučevanih rastlinskih asociacijah. Okrajšave so kot na sliki 3.

	Bot. isch.	Fest. val.-St. cap.	Med.-Fest. val.	Trif. arv.-Fest. val.	Chys. gr.-comm.	Euph. myr.-Bot. isch. subass. med. rhod.	Erys. dif.-Trif. ang.	Poo. bul.-Ach. pseud.	Vulp. myuri
Number of relevés	**81**	**11**	**12**	**11**	**11**	**22**	**18**	**7**	**3**
Total no. of species	**239**	**113**	**109**	**124**	**124**	**130**	**161**	**77**	**38**
Chorotypes									
Adv	0.8%	1.8%	0.9%	0.8%	0.8%	-	-	-	-
Alp	0.8%	-	0.9%	-	0.8%	0.8%	0.6%	-	-
Bal	6.1%	6.2%	5.5%	6.5%	4.8%	10.0%	5.6%	9.1%	2.6%
Boreal	5.9%	8.9%	6.4%	7.3%	6.5%	2.3%	6.2%	11.7%	5.3%
Bul	-	-	-	-	-	0.8%	-	-	-
Cosm	4.6%	4.4%	4.6%	5.7%	5.7%	2.3%	3.7%	6.5%	5.3%
Eur	19.3%	15.0%	17.4%	19.4%	18.6%	15.4%	18.6%	13.0%	18.4%
Eur-As	25.5%	21.2%	16.5%	24.2%	27.4%	20.0%	23.0%	22.1%	34.2%
Med	23.9%	27.4%	33.0%	20.2%	19.4%	27.7%	29.8%	20.8%	21.1%
Pont	9.6%	14.2%	12.8%	13.7%	15.3%	18.5%	10.6%	16.9%	10.5%
Unknown	2.9%	0.9%	1.8%	2.4%	0.8%	2.3%	1.9%	-	2.6%
Life forms									
Hemicryptophytes	50.2%	46.9%	55.1%	54.0%	58.0%	63.9%	54.0%	50.1%	55.3%
Therophytes	46.4%	49.5%	43.1%	41.9%	37.9%	28.5%	42.2%	46.8%	42.1%

APPENDIX

Table 2: Relevés of the association *Bothriochloetum ischaemi* (Krist. 1937) I. Pop 1977.

Species occurring in 2 or fewer relevés: *Chamomilla recutita* (Th, Eur-As, 13:+, 43:+); *Verbascum banaticum* (H, Bal-Dac, 4:+, 60:r); *Tribulus terrestris* (Th, Eur-As, 1:+, 55:+); *Consolida regalis* (Th, Eur-Med, 22:+, 75:+); *Goniolimon collinum* (H, Pont, 1:r); *Myosotis stricta* (Th, Eur-As, 12:+, 51:+); *Lathyrus nissolia* (Th, Eur-sMed, 22:+, 75:+); *Trifolium hybridum* (H, Eur-Med, 16:2a, 60:2a); *Matricaria trichophylla* (Th, Med, 75:+, 76:+); *Crepis sancta* (Th, subMed, 10:r); *Plantago major* (H, Boreal, 17:r); *Achillea clypeolata* (H, Bal, 12:+); *Astracantha thracica* (Ch, Bal, 13:r); (S) *Vicia pannonica* (Th, Eur-Med, 26:r); *Trifolium suffocatum* (Th, subMed, 3:+); *Homalothecium lutescens* (H, 30:3); *Achillea nobilis* (H, Eur-As, 1:2b); *Silene conica* (Th, subMed-As, 12:+); *Verbascum xanthophoeniceum* (H, Bal-Anat, 16:r); *Sisymbrium orientale* (Th, Eur-As, 8:r); *Galium verticillatum* (Th, Med-As, 4:+); *Falcaria vulgaris* (H, Eur-As, 29:+); *Tragopogon pratensis* (H, Eur-Med, 21:r, 28:+); *Geranium molle* (H, Eur-Med, 20:+, 31:+); *Bromus scoparius* (Th, subMed, 14:+, 17:+); *Carex spicata* (H, Eur-As, 12:+, 23:+); *Coronilla varia* (H, Eur-Med, 6:1); *Centaurea calcitrapa* (H, Med, 9:+); *Melilotus officinalis* (Th, Eur-As, 17:r); *Scorzonera hispanica* (H, Med, 9:+); *Trifolium aureum* (Th, Eur-Sib, 60:+, 65:+); *Koeleria simonkaii* (H, Bal, 44:1, 63:2a); *Leontodon crispus* (H, Pont-Med, 35:r); *Tragopogon orientalis* (H, Eur-Med, 53:r, 69:r); *Dianthus moesiacus* (H, Bal, 40:+); *Crucianella angustifolia* (Th, Med, 46:+, 69:+); *Trigonella monspeliaca* (Th, subMed, 56:r, 64:+); *Bupleurum apiculatum* (Th, Bal, 46:+, 80:+); *Ziziphora capitata* (Th, Med, 61:+); *Geranium pusillum* (Th, Eur-Med, 43:r); *Sedum hispanicum* (H, Eur-Med, 51:1); *Onobrychis caput-gali* (Th, subMed, 65:3); *Plantago lagopus* (Th, Med, 35:r); *Trifolium affine* (Th, Bal-Anat, 64:1); *Bryum elegans* (H, 45:+); *Scorzonera lanata* (H, Med, 47:+); *Dianthus roseoluteus* (H, Pont-Sib, 50:+); *Dianthus pinifolius* (H, Bal-dac, 59:+); *Phascum cuspidatum* (H, umeren, 45:+); *Cerastium dubium* (Th, Eur, 61:+); *Poa pratensis* (H, cosm, 68:+); (S) *Onobrychis alba* (H, subMed, 48:1); *Crupina vulgaris* (Th, subMed, 69:+); *Lathyrus aphaca* (Th, subBoreal, 72:1); *Caucalis platicarpos* (Th, Eur-CAs, 76:r); *Alopecurus pratensis* (H, Eur-As, 75:+); *Ornithogalum narbonense* (K, Med, 33:+); *Rosa canina* (Ch, subMed, 52:r); *Cardaria draba* (H, Eur-Med, 71:1); *Valerianella* sp. (69:+); *Veronica polita* (Th, Eur-As, 78:+); *Stachys germanica* (H, Eur-subMed, 48:+, 50:+); *Galium album* (H, Eur-As, 73:+); *Ajuga genevensis* (H, Pont, 76:+); *Odontites serotina* (Th, Eur, 57:+); *Myosotis sp.* (69:+); *Dorycnium herbaceum* (H, Eur-Med, 52:2a); *Geranium dissectum* (Th, Eur-As, 76:r); *Eurhynchium hians* (H, 33:+); *Orlaya grandiflora* (Th, Ap-Bal, 46:+); *Paliurus spina-christi* (Ch, Eur-As, 46:r); *Ranunculus sardous* (Th, Eur-Med, 68:+); *Vicia cracca* (H, Eur-As, 52:+); *Agrostis canina* (H, Eur-Sib, 68:+); *Medicago orbicularis* (Th, Eur-Med, 34:+); *Echinops ritro* (H, Eur-Sib, 67:+); *Alyssum tortuosum* (H, Pont-Med, 13:+); *Stipa capillata* (H, Pont-Med, 50:1, 59:r); *Allium flavum* (K, Med, 47:r); *Phleum phleoides* (H, Eur-As, 36:+); (S) *Hieracium praealtum* (H, 48:+, 60:1); *Fragaria viridis* (H, Eur-Sib, 41:+,46:+); *Alyssum alyssoides* (Th, Eur-Med, 51:+); *Ventenata dubia* (Th, Pont-Med, 60:r); *Hordeum bulbosum* (H, Eur-As, 24:+, 53:2a); *Trifolium cherleri* (H, Med, 1:+); *Vicia grandiflora* (H, subMed, 72: +, 75:+); *Scleranthus annuus* (Th, Eur-Sib, 39:+, 64:r).

Localities: 1. Dalak Chalabair loc., NE from Kermen, 42.51339° N, 26.28025° E, 18.07.2004; 2. Chukarka village, Burgas distr., 42.64371° N, 27.11221° E, 13.07.2005; 3. S from Zlati vojvoda village, Sliven distr., 42.57842° N, 26.18539° E, 18.07.2004; 4. S from Tenevo village, Yambol distr., 42.33451° N, 26.54058° E, 11.06.2004; 5. S from Vodenichane village, Yambol distr., 42.53231° N, 26.69298° E, 02.07.2005; 6. By the road Yambol-Elhovo, S from cross-road to Tenevo village, Yambol distr., 42.35561° N, 26.57036° E, 15.07.2004; 7. NE from Ovchi kladenets village, Yambol distr., 42.23864° N, 26.20544° E, 21.07.2004; 8. E from Rechitsa, Sliven, 42.62945° N, 26.28969° E, 03.06.2004; 9. NW from Rosa village, Yambol distr., 42.42406° N, 26.40272° E, 16.07.2004; 10. between Kozarevo and Kalchevo villages, Yambol dist., 42.44173° N, 26.59862° E, 30.06.2004; 11. NE from Krushovo village, Burgas distr., 42.55444° N, 27.07307° E, 11.07.2005; 12. E from Izvorishte village, Burgas distr., 42.66028° N, 27.43617° E, 21.07.2005; 13. E from Kozarevo, Tvarditsa, Sliven distr., 42.46031° N, 26.62372° E, 30.06.2004; 14. S from Troyanovo village, Burgas distr., 42.54496° N, 27.14339° E, 11.07.2005; 15. between Kozarevo and Kalchevo villages, Yambol dist., 30.06.2004; 16. hill between Chokoba and Bezmer villages, Yambol distr., 09.06.2004; 17. E from Zheleznik village, Burgas distr., 42.56714° N, 26.91149° E, 02.07.2005; 18. S from Karnobat, Burgas distr., 42.62547° N, 26. 98660° E, 29.06.2005; 19. S from Smolnik village, Burgas distr., 42.52488° N, 26.92806° E, 05.07.2005; 20. NW from Irechekovo village, Yambol distr., 42.49553° N, 26.72015° E, 17.06.2005; 21. between Ekzarh Antimovo and Zhitosvyat villages, Burgas distr., 42.48860° N, 26.97875° E, 05.07.2005; 22. Maglen village, Burgas distr., 42.73323° N, 27.36793° E, 22.07.2005; 23. Golemiya bair loc., NW from Irechekovo

village, Yambol distr., 42.49116° N, 26.74852° E, 17.06.2005; 24. NW from Voynika village, Yambol distr., 01.07.2004; 25. W from Detelina village, Burgas distr., 42.56347° N, 27.02275° E, 11.07.2005; 26. NW from Karnobat, Burgas distr., 42.63651° N, 26.94968° E, 29.06.2005; 27. S from Krumovo gradishte village, Burgas distr., 42.60185° N, 26.93290° E, 29.06.2005; 28. between Ekzarh Antimovo and Zhitosvyat villages, Burgas distr., 42.49419° N, 26.97703° E, 05.07.2005; 29. between Sadievo and Dryankovets villages, Burgas distr., 42.67682° N, 27.32084° E, 22.07.2005; 30. S from Parvenets village, Yambol distr., 42.41991° N, 26.85475° E, 02.07.2005; 31. Golemiya bair loc., NW from Irechekovo village, Yambol distr., 42.49173° N, 26.75367° E, 17.06.2005; 32. W from Detelina village, Burgas distr., 42.56438° N, 27.02272° E, 11.07.2005; 33. W from Detelina village, Burgas distr., 42.56438° N, 27.02272° E, 11.07.2005; 34. N from Mirolyubovo village, Burgas distr., 42.65397° N, 27.36315° E, 21.07.2005; 35. S from Palauzovo village, Yambol distr., 42.52381° N, 26.73799° E, 02.07.2005; 36. SW from Karnobat, Burgas distr., 29.06.2005; 37. E from Karnobat, Burgas distr., 42.64586° N, 27.02229° E, 13.07.2005; 38. E from Malka polyana village, Burgas distr., 42.64233° N, 27.24806° E, 25.07.2007; 39. N from Korten village, Sliven distr., 42.55508° N, 25.99200° E, 12.07.2005; 40. between Karnobat and Dragantsi village, Burgas distr., 42.61250° N, 26.98975° E, 05.07.2005; 41. Boztepe loc., E from Kamenovo village, Sliven distr., 42.54154° N, 26.13032° E, 19.07.2004; 42. Idemir hill, SW from Kermen, Sliven distr., 42.51616° N, 26.24355° E, 18.07.2004; 43. Azmashka mogila loc., Hadzhi Dimitrovo village, Sliven distr., 42.53870° N, 26.41424° E, 08.06.2004; 44. N from Sadievo village, Burgas distr., 42.66933° N, 27.32442° E, 23.07.2005; 45. NE from Bozadzhii village, Sliven distr., 42.48268° N, 26.33966° E, 16.07.2004; 46. S from Konyovo village, Sliven distr., 42.51088° N, 26.16263° E, 19.07.2004; 47. N from Korten village, Sliven distr., 42.55640° N, 25.98573° E, 12.07.2005; 48. N from Korten village, Sliven distr., 42.55554° N, 25.98958° E, 12.07.2005; 49. Mirolyubovo village, Burgas distr., 42.63849° N, 27.36152° E, 21.07.2005; 50. between Izvorishte and Bryastovets villages, Burgas distr., 42.66612° N, 27.45120° E, 21.07.2005; 51. N from Sadievo village, Burgas distr., 42.66961° N, 27.32397° E, 23.07.2005; 52. E from Polski Gradets village, Sliven distr., 42.18546° N, 26.12583° E, 21.07.2004; 53. between Izvorishte and Bryastovets villages, Burgas distr., 21.07.2005; 54. N from Kableshkovo village, Burgas distr., 42.67146° N, 27.55190° E, 23.07.2005; 55. Sarnena Sredna gora Mt., between Staro selo and Kamenovo villages, Sliven distr., 42.56093° N, 26.14154° E, 19.07.2004; 56. W from Karnobat, Burgas distr., 29.06.2005; 57. E from Karnobat, Burgas distr., 42.64609° N, 27.02644° E, 13.07.2005; 58. E from Karnobat, Burgas distr., 42.64801° N, 27.02742° E, 13.07.2005; 59. Hill between Kovachite and Mladovo villages, Sliven distr., 42.55644° N, 26.21116° E, 18.07.2004; 60. Hill between Chokoba and Bezmer villages, Yambol distr., 42.49382° N, 26.38229° E, 09.06.2004; 61. W from Kaloyanovo village, Sliven distr., 42.67240° N, 26.44070° E, 23.06.2005; 62. S from Parvenets village, Yambol distr., 42.41694° N, 26.85969° E, 02.07.2005; 63. Malak Topchii hill, between Karnobat and Detelina village, Burgas distr., 42.60602° N, 27.00560° E, 11.07.2005; 64. N from Korten village, Sliven distr., 42.55653° N, 25.98458° E, 12.07.2005; 65. W from Glufishevo village, Sliven distr., 42.54491° N, 26.31444° E, 09.06.2004; 66. Hill between Veselinovo and Mogila villages, Yambol distr., 42.51435° N, 26.57119° E, 15.06.2004; 67. By the road Yambol-Elhovo, S from cross-road to Tenevo village, Yambol distr., 15.07.2004; 68. S from Stamovo (Han Asparuh) village, 42.41620° N, 26.85365° E, 14.07.2004; 69. S from Peshtersko village, Burgas distr., 42.73288° N, 27.33456° E, 22.07.2005; 70. between Izvorishte and Bryastovets villages, Burgas distr., 42.66513° N, 27. 45106° E, 21.07.2005; 71. E from Karnobat, Burgas distr., 42.65403° N, 26.91887° E, 23.07.2005; 72. W from Medovo, Burgas distr., 42.70296° N, 27.55550° E, 23.07.2005; 73. E from Stratsin village, Burgas distr., 42.76537° N, 27.48149° E, 23.07.2005; 74. SE from Zhitosvyat village, Burgas distr., 42.45625° N, 26.98731° E, 02.07.2005; 75. N from Mirolyubovo village, Burgas distr., 42.65403° N, 27.36101° E, 21.07.2005; 76. between Sadievo and Dryqnkovets villages, Burgas distr., 42.67826° N, 27.32107° E, 22.07.2005; 77. SW from Dragantsi village, Burgas distr., 42.56339° N, 26.97769° E, 05.07.2005; 78. N from Karanovo village, Burgas distr., 42.65030° N, 27.18485° E, 11.07.2005; 79. N from Hadzhiite village, Burgas distr., 42.61142° N, 27.07072° E, 13.07.2005; 80. hills S from Kermen, Sliven distr., 42.49107° N, 26.27134° E, 16.07.2004; 81. E from microdam, Nauchen village, Sliven distr., 42.55370° N, 26.08693° E, 20.07.2004.

Table 3: Relevés of the association *Festuco valesiacae-Stipetum capillatae* Sillinger 1930.

Species occurring in 2 or fewer relevés: *Ornithogalum umbellatum* (K, Pont-subMed, 6;+); *Dasypyrum villosum* (H, subMed, 1:1, 4:1); *Cichorium intybus* (H, Eur-Sib, 1:r); *Potentilla inclinata* (H, Eur-As, 4:2a, 9:+); *Plantago lanceolata* (H, cosm, 6:+); *Galium tenuissimum* (Th, Pont-CAs; 6:+); *Achillea depressa* (H, Bal, 7:1, 11:+); *Trifolium retusum* (Th, Med, 7:+); *Centaurea caliacrae*

(Th, Bal, 7:+); *Trifolium pallidum* (Th, subMed, 6:+); *Trachynia distachya* (Th, Med-As, 9:+); *Stachys germanica* (H, Eur-subMed, 6:r); *Bromus japonicus* (Th, Med-CAs, 1:+, 4:+); *Nigella arvensis* (Th, subMed, 1:+, 4:+); *Phleum subulatum* (Th, Eur-As, 4:+); *Conyza canadensis* (Th, Nam(adv), 1:+); *Bilderdykia dumetorum* (Th, Eur-Med, 4:+); *Carduus acanthoides* (H, Eur, 6:+); *Tragus racemosus* (Th, subBoreal, 7:+); *Vicia sp.* (6:+); *Elymus repens* (H, Boreal, 6:+); *Verbascum densiflorum* (H, subMed, 6:r); *Erysimum repandum* (Th, Eur, As, 6:+, 7:+); *Myosotis stricta* (Th, Eur-As, 1:+); *Trifolium cherleri* (H, Med, 3:1, 8:+); *Logfia arvensis* (Th, Eur-Med, 6:r); *Tribulus terrestris* (Th, Eur-As, 1:1); *Trifolium angustifolium* (Th, Med, 1:+); *Achillea coarctata* (H, Pont-Med, 3:+, 10:+); *Sanguisorba minor* (H, subBoreal, 9:+, 10:+); *Portulaca oleracea* (Th, adv, 7:+); *Sideritis montana* (Th, subMed, 8:+, 9:+); *Viscaria vulgaris* subsp. *atropurpurea* (H, Eur-Sib, 8:+); *Viola arvensia* (Th, Eur, 8:+); *Onobrychis caput-gali* (Th, subMed, 9:2a); *Acinos arvensis* (Th, Eur-Med, 9:+); *Linum bienne* (Th, Med, 9:+); *Salvia pratensis* (H, Eur-Med, 9:r); *Sedum hispanicum* (H, Eur-Med, 10:1); *Daucus carota* (Th, Eur-As, 9:r); *Hypericum rumeliacum* (H, Bal, 10:+); *Koeleria simonkaii* (H, Bal, 11:+); *Stachys leucoglossa* (H, Bal, 10:+); *Velezia rigida* (Th, subMed, 10:+); *Alyssum strigosum* (Th, subMed, 10:+); *Trigonella monspeliaca* (Th, subMed, 10:+); *Orlaya grandiflora* (Th, Ap-Bal, 10:+); *Scrophularia canina* (H, Eur-Med, 10:r); *Bryum capillare* (H, Temp, 10:+).

Localities: 1. NE from Izvorishte village, Burgas distr., 42.66149° N, 27.44725° E, 23.07.2005; 2. E from Venets village, Burgas distr., 42.64422° N, 26.36200° E, 29.06.2005; 3. W from Nauchen village, Sliven distr., 42.56536° N, 26.08056° E, 20.07.2004; 4. NE from the town of Aytos, 42.72169° N, 27.24446° E, 25.07.2005; 5. E from Venets village, Burgas distr., 42.64373° N, 26.86331° E, 29.06.2005; 6. Izvorishte village, Burgas distr., 42.65629° N, 27.43556° E, 21.07.2005; 7. between the town of Aytos and Peshtersko village 42.73009° N, 27.32797° E, 22.07.2005; 8. W from Gorno Aleksandrovo village, Sliven distr., 42.65694° N, 26.61849° E, 16.06.2004; 9. Pamucite locality, NE from Polski Gradets village, Sliven distr., 42.19784° N, 26.12378° E, 21.07.2004; 10. slopes of Sredna gora Mt., N from the villages of Bratya Kunchevi and Rumanya, Stara Zagora distr., 42.50638° N, 25.86973° E, 22.07.2004; 11. N from Vratitsa village, Burgas distr., 42.59851° N, 27.17150° E, 11.07.2005.

Table 4: Relevés of the association *Medicagini-Festucetum valesiacae* Wagner 1941.

Species occurring in 2 or fewer relevés: *Trifolium angustifolium* (Th, Med, 2:+, 4:+); *Lotus corniculatus* (H, Eur-Med, 4:+, 8:+); *Aegilops geniculata* (Th, Med, 1:2m, 2:1); *Carthamus lanatus* (Th, subMed, 1:+, 2:+); *Astragalus hamosus* (H, Eur-as, 1:1, 6:+); *Dianthus moesiacus* (H, Bal, 3:+, 9:+); *Dianthus pallens* (H, Bal-dac, 3:1); *Marrubium peregrinum* (H, subMed, 1:+, 11:+); *Lolium perenne* (H, Eur-As, 2:+); *Trifolium pallidum* (Th, subMed, 4:+); *Bupleurum flavum* (Th, Med, 4:+); *Linum bienne* (Th, Med, 4:+); *Coronilla varia* (H, Eur-Med, 4:+); *Trachynia distachya* (Th, Eur-As, 4:1, 10: 2m); *Stachys germanica* (H, Eur-subMed, 3:+); *Hypochaeris radicata* (H, Eur-Med, 5:+); *Nigella arvensis* (Th, subMed, 5:+); *Trifolium setiferum* (Th, Med, 3:+); *Hypericum rumeliacum* (H, Bal, 4:+); *Phascum cuspidatum* (H, Temp, 3:1); *Ononis spinosa* (H, Eur-As, 4:1, 10:r); *Setaria viridis* (Th, Boreal, 5:+); *Bryum rubens* (H, 3:+); *Onobrychis gracilis s. Gracilis* (H, Pont-Med, 4:r); *Elymus repens* (H, Boreal, 3:+); *Phleum pratense* (H, Eur-subMed, 2:+); *Ornithogalum umbellatum* (K, Pont-subMed, 3:+, 12:+); *Centaurea stereophylla* (H, Pont, 3:+); *Cynodon dactylon* (H, cosm, 7:+); *Haplophyllum suaveolens* (H, Med, 6:+); *(S) Onobrychis alba* (H, subMed, 6:+, 10:+); *Velezia rigida* (Th, subMed, 6:+); *Potentilla pedata* (H, Med, 6:+); *Queria hispanica* (Th, subMed, 6:+); *Trifolium incarnatum* (Th, subMed, 7:+); *Trifolium suffocatum* (Th, subMed, 7:+); *Koeleria nitidula* (H, Pont, 8:+); *Medicago lupulina* (Th, Eur-As, 8:+); *Trigonella monspeliaca* (Th, subMed, 8:+); *Dactylis glomerata* (H, Eur-As, 8:r); *Polygonum aviculare* (Th, cosm, 9:+); *Galium tenuissimum* (Th, Pont-CAs, 9:+, 12:+); *Achillea coarctata* (H, Pont, Med, 10:+); *Leonthodon crispus* (H, Pont-Med, 11:+); *Minuartia caespitosa* (H, Eur-Med, 12:1); *Scleranthus polycarpos* (Th, subMed, 12:1); *Sedum caespitosum* (H, Med, 12:+); *Portulaca oleracea* (Th, adv, 12:+).

Localities:1. Hill between the villages of Veselinovo and Mogila, Yambol distr., 42.51435° N, 26.57119° E, 15.06.2004; 2. NE from Kamenets village, 42.34660° N, 26.75043° E, 01.07.2004; 3. E from Venets village, Burgas distr., 29.06.2005; 4. W from Polski Gradets village, Sliven distr., 21.07.2004; 5. E from Malka Polyana village, 42.62700° N, 27.24925° E, 25.07.2005; 6. Slopes of Stara planina Mt., N from Gorno Aleksandrovo village, Sliven distr., 42.65974° N, 26.63966° E, 16.06.2004; 7. Hill S from Zlati vojvoda village, Sliven distr., 42.57842° N, 26.18539° E, 18.07.2004; 8. Svetiiliiski hills, Polsko Padarevo village, Sliven distr., 42.45191° N, 26.08582° E, 11.06.2005; 9. S from town of Karnobat, 42.62766° N, 26.99434° E, 05.07.2005; 10. N from Korten village, Sliven distr., 42.55682° N, 25.98334° E, 12.07.2005; 11. Malak Topchii hill, between Karnobat and Detelina village, 42.60705° N, 27.00412° E, 11.07.2005; 12. E from Dragantsi village, Burgas distr., 42.56876° N, 26.98893° E, 05.07.2005.

Table 5: Relevés of the association *Trifolio arvensis-Festucetum valesiacae* Sopotlieva & Apostolova 2013.

Species occurring in 2 or fewer relevés: *Potentilla argentea* (H, Pont, 6:+, 7:2a); *Cichorium intybus* (H, Eur-Sib, 2:r, 7:+); *Medicago rigidula* (Th, Eur-Med, 4:+, 5:+); *Trifolium angustifolium* (Th, Med, 4:+, 11:+); *Polygonum aviculare* (Th, cosm, 4:+, 5:+); *Dasypyrum villosum* (H, subMed, 2:+, 6:r); *Vicia* sp. (4:+ 5:+); *Setaria viridis* (Th, Boreal, 7:+); *Carduus nutans* (H, Eur, Med, 2:r, 9:r); *Marrubium peregrinum* (H, subMed, 1:r, 2:r); *Centaurea caliacrae* (Th, Bal, 6:+); *Carthamus lanatus* (Th, subMed, 1:+); *Lolium perenne* (H, Eur-As, 1:+); *Bromus arvensis* (Th, Eur-As, 1:+); *Phleum subulatum* (Th, Eur-As, 5:+); *Berteroa incana* (H, Pont, 2:+); *Ajuga genevensis* (H, Pont, 9:2a); *Bupleurum rotundifolium* (Th, Eur-As, 2:r); *Aegilops triuncialis* (Th, Eur-As, 1:2a); *Bilderdykia dumetorum* (Th, Eur-Med, 5:+); *Carduus acanthoides* (H, Eur, 4:+); *Tragopogon dubius* (H, Eur-Med, 2:r, 9:r); *Tragus racemosus* (Th, subBoreal, 5:+); *Euphorbia agraria* (H, subMed, 9:1); *Hypericum thasium* (H, Bal, 3:r); *Astragalus hamosus* (H, Eur-As, 1:+); *Iris suaveolens* (K, Bal, 9:+); *Brachythecium rutabulum* (H, Temp, 9:+); *Hypnum cupressiforme* (H, Temp, 9:+); *Potentilla pedata* (H, Med, 9:1); *Portulaca oleracea* (Th, adv, 5:+); *Centaurea solstitialis* (Th, Eur-Med, 4:+); *Sanguisorba minor* (H, subBoreal, 4:+, 11:+); *Leontodon cichoraceus* (H, subMed, 4:r); *Bupleurum affine* (Th, subMed, 4:+); *Medicago orbicularis* (Th, Eur-Med, 5:+); *Allium vineale* (K, Eur-Nam, 6:+); *Dianthus moesiacus* (H, Bal, 6:+, 8:+); *Thesium simplex* (H, Bal-dac, 6:r); *(S) Anagallis arvensis* (Th, cosm, 7:+); *Tragopogon pratensis* (H, Eur-Med, 8:r); *Coronilla varia* (H, Eur-Med, 8:+); *Phascum cuspidatum* (H, Temp, 8:+); *Centaurea stereophylla* (H, Pont, 8:+); *Phlomis herba-ventis* (H, Eur-As, 8:+); *Euphorbia nicaeensis* (H, Eur-Med, 8:+); *Bryum rubens* (H, 8:+); *Inula hirta* (H, Eur-Sib, 10:+); *Carduus candicans* subsp. *globifer* (H, 10:+); *Dianthus armeria* (Th, Eur, 10:+); *Lotus corniculatus* (H, Eur-Med, 11:+).

Localities: 1. Drakata loc., NW from Slamino, Yambol distr., 11.06.2004; 2. E from the town of Karnobat, 42.64695° N, 27.02333° E, 13.07.2005; 3. Slivova mogila hill, town of Tvarditsa 42.68585° N, 25.91407° E, 09.06.2005; 4. SW from Izvorishte village, Burgas distr., 42.65685° N, 27.43546° E, 21.07.2005; 5. SE from Bryastovets village, Burgas distr., 42.66712° N, 27.47598° E, 21.07.2005; 6. Peshtersko village, Burgas distr., 42.73028° N, 27.32726° E, 22.07.2005; 7. SW from Bata village, Burgas distr., 42.73011° N, 27.48065° E, 23.07.2005; 8. E from Venets village, Burgas distr., 42.64110° N, 26.84054° E, 29.06.2005; 9. S from Malenovo village, Yambol distr., 42.55194° N, 26.76805° E, 22.06.2005; 10. between Sokolova and Dragovo villages, Burgas distr., 42.63995° N, 27.08967° E, 13.07.2005; 11. Ognen village, Burgas distr., 42.69614° N, 26.80961° E, 26.06.2005.

Table 6: Relevés of the community of *Chrysopogon gryllus*.

Species occurring in 2 or fewer relevés: *Cynosurus echinatus* (H, subMed, 9:3); *(S) Elymus hispidus* (H, Pont-CAs, 1:2m); *Tragopogon pratensis* (H, Eur-Med, 5:r); *Trifolium hybridum* (H, Eur-Med, 3:+, 8:+); *Dianthus armeria* (Th, Eur, 7:+, 8:r); *Cynodon dactylon* (H, Cosm, 5:+);*Torilis nodosa* (Th, Eur-As, 1:+); *Bromus tectorum* (Th, Boreal, 9:1); *Bromus mollis* (Th, Boreal, 8:1); *Echium vulgare* (H, Eur-As, 7:r); (H, Cosm, 9:+, 10:+); *Convolvulus arvensis* (H, Cosm, 9:+, 10:+);*(S) Trifolium repens* (H, Eur-Sib, 7:+); *Dasypyrum villosum* (H, subMed, 4:+, 10:2m); *Veronica arvensis* (Th, Eur-Sib, 1:+); *Geranium rotundifolium* (Th, Eur-As, 9:r); *Bromus arvensis*(Th, Eur-As, 4:2b); *Vulpia ciliata* (Th, Med-As, 7:+); *Hordeum bulbosum* (H, Eur-As, 4:+); *Apera spica-venti* (Th, subBoreal, 10:+); *Cichorium intybus* (H, Eur-Sib, 5:+, 10:r); *(S) Taraxacum* sp. (H, 8:+); *Rumex pulcher* (H, Eur-As, 1:r); *Tragopogon dubius* (H, Eur-Med, 9:r); *Berteroa incana* (H, Pont, 9:1); *Vulpia myurus* (Th, subBoreal, 9:1); *Lotus angustissimus* (Th, Med-As, 6:1); *Poa pratensis* (H, Cosm, 6:2m); *Rorippa thracica* (H, subMed, 9:+); *Nigella arvensis* (Th, subMed, 1:+); *Filago vulgaris* (Th, Eur-As, 6:1, 7:+); *Trifolium scabrum* (Th, Med-As, 10:+, 11:+); *Bromus squarrosus* (Th, subMed, 4:+); *Torilis arvensis* (Th, Eur-As, 6:+); *Hypochaeris radicata* (H, Eur-Med, 7:r, 8:+); *Trifolium pallidum* (Th, subMed, 5:+, 11:+); *Vicia grandiflora* (Th, subMed, 5:+); *Agrimonia eupatoria* (H, Eur-Med, 9:r); *Achillea collina* (H, Eur-subMed, 6:+); *(S) Elymus elongatus* (H, Pont-SMed, 6:3); *Agrostis capillaris* (H, Boreal, 4:+); *Filipendula vulgaris* (H, Eur-Med, 8:+); *Paliurus spina-christi* (Ch, Eur-As, 9:r); *Galium verticillatum* (Th, Med-As, 9:+); *Vicia hirsuta* (Th, Eur-Med, 1:+); *Goniolimon collinum* (H, Pont, 10:2a); *Trifolium aureum* (Th, Eur-Sib, 8:1); *Viola tricolor* (Th, Eur-As, 9:+); *Galium aparine* (Th, Eur-As, 9:+); *Poa sylvicola* (H, Eur-As, 4:+); *Nonea pulla* (Th, subMed, 2:r, 10:+); *Phleum subulatum* (Th, Eur-As, 10:3); *Poa angustifolia* (H, Cosm, 9:+); *Achillea crithmifolia* (H, Pann-Bal, 8:+); *Bupleurum flavum* (Th, Med, 4:+); *Galium tenuissimum* (Th, Pont-CAs, 1:+, 7:+); *Phleum pratense* (H, Eur-subMed, 6:+); *Bromus japonicus* (Th, Med-CAs, 10:2m); *Minuartia caespitosa* (H, Eur-Med, 8:+); *Potentilla pedata* (H, Med, 3:+); *Ajuga genevensis* (H, Pont, 10:+); *Medicago minima* (Th, Eur-As, 2:+);*Helianthemum nummularium* (Ch, Alp-Med, 2:2m); *Medicago falcata* (H, Eur-As, 2:+);

Carthamus lanatus (Th, subMed, 2:+); *Asyneuma anthericoides* (H, Bal, 2:+); *Trifolium arvense*(Th, Eur-Sib, 11:1); *Fumana procumbens* (Ch, Pont-Med, 11:+); *Potentilla pilosa* (H, Eur, 11:+); *Allium vineale* (K, Eur-Nam, 11:+); *Hypericum rumeliacum* (H, Bal, 11:+); *Phleum phleoides* (H, Eur-As, 11:+); *Scleranthus perennis* (H, Eur-Med, 11:+); *Herniaria hirsuta* (Th, Eur-As, 11:+); *Centaurea caliacrae*(Th, Bal, 11:+); *Haplophyllum suaveolens* (H, Med, 11:+); *Centaurea diffusa* (H, Pont-Med, 11:+); *Syntrichia ruralis* (H,Cosm; Temp, 11:+); *Erysimum repandum* (Th, Eur-As, 11:+); *Erodium cicutarium* (Th, subBoreal, 11:r); *Ceratodon purpureus* (H, Cosm; Temp, 11:+); *Portulaca oleracea* (Th, Adv, 11:+); *Trifolium retusum* (Th, Med, 11:+); *Carduus acanthoides* (H, Eur, 11:+);

Localities: 1. N from Venets village, Burgas distr., 42.64406° N, 26.80502° E, 26.06.2005; 2. between Veselinovo and Mogila villages, Yambol distr., 42.51435° N, 26.57119° E, 15.06.2004; 3. E from Devetintsi village, Burgas distr., 42.59531° N, 26.83205° E, 23.06.2005; 4. W from Savino village, Yambol distr., 42.33759° N, 26.27544° E, 29.06.2004; 5. NE from Elenovo village, Sliven distr., 42.38495° N, 26.15897° E, 14.06.2004; 6. S from Stamovo (Han Asparuh) village, Stara Zagora distr., 14.07.2004; 7. Svetiiliski hills, between Ezero and Radevo villages, Sliven distr., 42.44348° N, 26.06228° E, 11.06.2005; 8. Kayriaka hill, S from Hanovo, Yambol distr., 08.06.2004; 9. Svetiiliski hills, 42.42224° N, 26.13721° E, 11.06.2006; 10. SW from the town of Karnobat, 42.63281° N, 26.94546° E, 29.06.2005; 11. Dabnik village, Burgas distr., 42.63643° N, 27.51047° E, 21.07.2005.

Table 7: Relevés of the association *Euphorbio myrsinitae-Bothriochloetum ischaemi* R. Jovanović 1955 subass. *medicaginetosum rhodopaeae* Sopotlieva & Apostolova 2013.

Species occurring in 2 or fewer relevés: *Carduus nutans* (H, Eur-Med, 9:r, 19:r); *Hypericum thasium* (H, Bal, 8:+, 9:r); *Cerastium pumilum* (Th, Eur-Med, 6:+, 9:+); *Taeniatherum caput-medusae* (Th, Eur-As, 7:r, 9:+); *Muscari* sp. (K, 7:+, 19:+); *Reseda lutea* (H, subBoreal, 14:r); *Coronilla scorpioides* (Th, subMed, 16:+); *Echium vulgare* (H, Eur-As, 6:r); *Phleum subulatum* (Th, Eur-As, 7:r); *Veronica arvensis* (Th, Eur-Sib, 6:+); *Iris* sp. (K, 7:r); *Achnatherum bromoides* (H, subMed16:1); *Anthericum liliago* (H, subMed, 17:+); *Phascum cuspidatum* (H, Temp, 18:+); *Bryum argenteum* (H, Temp, 12:+); *Tortella flavovirens* (H, subMed, 5:1); *Weissia controversa* (H, Temp, 13:1); *Petrorhagia prolifera* (Th, Pont-Med, 18:+, 22:+); *Vulpia myurus* (Th, subBoreal, 7:+); *Tragopogon dubius* (H, Eur-Med, 3:+); *Trifolium cherleri* (H, Med, 6:r); *Ceratodon purpureus* (H, Temp, 14:+); *Galium tenuissimum* (Th, Pont-CAs, 9:+); *Velezia rigida* (Th, subMed, 14:+); *Onobrychis degenii* (H, Bal, 15:r); *Centaurea salonitana* (H, Pont-Med, 16:r); *Galium octonarium* (H, Med-CAs, 16:+); *Bupleurum apiculatum* (Th, Bal, 15:2a); *Anthemis tinctoria* (H, Eur-Sib, 10:r), *Genista sessilifolia* s. *Trifoliata* (Ch, subMed, 10:2a); *Potentilla sulphurea* (H, subMed, 13:r); *Asyneuma limonifolium* s. *limonifolium* (H, Ap-Bal, 17:r); *Pterocephalus papposus* (Th, Med, 20:+); *Crepis sancta* (Th, subMed, 20:r); *Koeleria simonkaii* (H, Bal, 20:r); *Verbascum banaticum* (H, Bal-Dac, 20:r); *Scrophularia canina* (H, Eur-Med, 20:r); *Alyssum alyssoides* (Th, Eur-Med, 20:+); *Achillea coarctata* (H, Pont-Med, 21:1); *Stachys leucoglossa* (H, Bal, 21:+); *Dianthus pinifolius* (H, Bal-Dac, 21:+); *Potentilla pilosa* (H, Eur, 21:+);*Centaurea caliacrae* (Th, Bal, 22:+); *Trigonella monspeliaca* (Th, subMed, 22:+).

Localities: 1. S from the town of Shivachevo, Karabair hill, 42.63708° N, 26.06470° E, 19.07.2005; 2. Tvarditsa town, Tepyata hill, 42.68141° N, 25.95564° E, 09.06.2005; 3. Karabair hill, Binkos village, 42.64122° N, 26.08435° E, 15.06.2005; 4. Karabair hill, Binkos village, 42.65040° N, 26.09269° E, 15.06.2005; 5. Tvarditsa town, Golina hill, 42.68245° N, 25.92630° E, 09.06.2005; 6. Tvarditsa town, Golina hill,, 42.68375° N, 25.92518° E, 09.06.2005; 7. Svetiiliyski hills, 42.43351° N, 26.15047° E, 11.06.2005; 8. Tvarditsa town, Tepyata hill, 09.06.2005; 9. Tvarditsa town, Tepyata hill, 42.68164° N, 25.95451° E, 09.06.2005; 10. Karabair hill, Binkos village, 42.64068° N, 26.08257° E, 15.06.2005; 11. S from Shivachevo town, Karabair hill, 42.63763° N, 26.06706° E, 19.07.2005; 12. Shivachevo town, close to old lime-kilns, 42.63709° N, 26.03591° E, 19.07.2005; 13. Svetiiliyski hills, Dyadovo village, 42.43958° N, 26.03478° E, 11.07.2005; 14. S from the town of Shivachevo, Karabair hill, 42.65076° N, 26.03798° E, 19.07.2005; 15. Shivachevo town, close to old lime-kilns, 42.63743° N, 26.03710° E, 19.07.2005; 16. Between the villages of Binkos and Seliminovo, 42.64787° N, 26.12901° E, 15.07.2005; 17. Between the villages of Binkos and Seliminovo, 42.64885° N, 26.12825° E, 15.07.2005; 18. S from the town of Shivachevo, Karabair hill, 42.65268° N, 26.03948° E, 19.07.2005; 19. Karabair hill, Binkos village, 42.65061° N, 26.09136° E, 15.06.2005; 20. South slopes of East Stara planina Mt., N from Glushnik village, Sliven distr., 42.66522° N, 26.50144° E, 05.06.2004; 21. N from Karanovo village, Sliven distr., 42.51823° N, 25.89938° E, 22.07.2004; 22. N from Asenovets village, Sliven distr., 42.54326° N, 25.94406° E, 12.07.2005.