

DRY GRASSLAND COMMUNITIES OF *ERYSIMO-TRIFOLIETUM* IN THE NORTH- EASTERN PART OF THE REPUBLIC OF MACEDONIA

Renata ČUŠTEREVSKA^{1*}, Vlado MATEVSKI^{1,2}, Mitko KOSTADINOVSKI¹
& Andraž ČARNI^{3,4}

Abstract

The study deals with the distribution and classification of the association *Erysimo-Trifolietum* Micevski 1977 (alliance *Trifolion cherleri* Micevski 1971, order *Astragalo-Potentilletalia* Micevski 1971, class *Festuco-Brometea* Br. Bl. et Tx. 1943). The association develops on siliceous bedrock of the northern and northeastern parts of the Republic of Macedonia. After the research of dry grasslands in the region of Kratovo, enough information was available to prepare a synthetic overview of the association *Erysimo-Trifolietum*. Within the frame of this association, two new subassociations are described – subass. *scleranthetosum* subass. nova and subass. *brachypodietosum* subass. nova. Analysis of geoelements showed that sub-Mediterranean species are the most numerous and analysis of life forms provided evidence of their therophyto-hemicryptophytic physiognomy. The paper also presents the localities of occurrence, their floristic composition, synecological characteristics, life forms incidence and areal types.

Key words: *Erysimo-Trifolietum*, geoelements, life forms, syntaxonomy, vegetation, Republic of Macedonia.

Izvešček

Raziskava se ukvarja z razširjenostjo in klasifikacijo asociacije *Erysimo-Trifolietum* Micevski 1977 (zveza *Trifolion cherleri* Micevski 1971, red *Astragalo-Potentilletalia* Micevski 1971, razred *Festuco-Brometea* Br. Bl. et Tx. 1943). Asociacija se pojavlja na silikatni podlagi v severnem in severovzhodnem delu Republike Makedonije. Po zaključenih raziskavah v okolici Kratova, smo razpolagali z zadostno količino podatkov, da smo lahko pripravili sintetični pregled asociacije *Erysimo-Trifolietum*. V okviru asociacije smo opisali dve novi subasociaciji – subasociacijo *scleranthetosum* subass. nova in *brachypodietosum* subass. nova. Analiza horološkega spektra je pokazala, da so v združbah najbolj pogoste submediteranske vrste, analiza življenjskih oblik pa kaže na terofitsko-hemikriptofitski značaj te asociacije. Delo prikazuje lokalitete, kjer se združbe pojavljajo, floristično zgradbo, sinekološke značilnosti, spekter življenjskih oblik in horološki spekter.

Ključne besede: *Erysimo-Trifolietum*, geoelementi, življenjske oblike, sintaksonomija vegetacija, Republika Makedonija.

1. INTRODUCTION

Dry grasslands have existed in the landscape of Europe since the Pleistocene and they are western outposts of the vast steppes of Russia and the Ukraine (Kuneš et al. 2008, Werger 2009), and can be primary and secondary. On the territory of

the Republic of Macedonia they are maintained by human activities. With the abandonment of traditional agriculture, they have become overgrown, mainly by thermophilous deciduous forest of *Quercetalia pubescentis*. During the 20th century, they therefore became fragmented and are among endangered habitats. Various activities

¹ Institute of Biology, Faculty of Natural Sciences and Mathematics, University of Ss. Cyril and Methodius, Gazi Baba b/b - P.O. Box 162, MK-1000 Skopje, Republic of Macedonia.

² Macedonian Academy of Sciences and Arts, Bul. Krste Misirkov, 2, P.O. Box 428, MK-1000 Skopje, Republic of Macedonia.

³ Institute of Biology, Scientific Research Center of the Slovenian Academy of Sciences and Arts, Novi trg 2, SI-1000 Ljubljana, Slovenia.

⁴ University of Nova Gorica, Vipavska cesta 13, SI-5000 Nova Gorica, Slovenia.

* corresponding author: renatapmf@yahoo.com

for the preservation of dry grasslands are taking place throughout Europe. (Dzwonko & Loster 2007, Kiehl & Pfadenauer 2007, Dostalek & Frantík 2008, Čarni & al. 2009, Kavgaci & al. 2010)

In continental parts of Europe, dry grasslands of lower altitudes are mainly classified within the class of *Festuco-Brometea*. In Atlantic and sub-Atlantic parts of Europe, appearing also in the western part of the Balkan Peninsula, there appear lowland dry grasslands over acidic substrate, dominated by *Nardus stricta*, but in the southern Balkans, such vegetation appears at higher altitudes and can be classified within *Caluno-Ulicetea* or *Juncetea trifidi*. (Micevski 1994, Redžić 2007, Velev & Apostolova 2009)

Dry grasslands in the southern part of the Balkan Peninsula are classified in the endemic order *Astragalo-Potentilletalia* within the class *Festuco-Brometea*. (Micevski 1971, Rodwell et al. 2002, Bergmeier & al. 2009).

The dry grasslands on siliceous geological bedrock on the territory of the Republic of Macedonia are assigned to the class *Festuco-Brometea*, order *Astragalo-Potentilletalia* and alliance *Trifolion cherleri*.

The order *Astragalo-Potentilletalia* (Micevski 1971) and alliance *Trifolion cherleri* (Micevski 1972) that comprises the vegetation of dry grassland on siliceous, have been described on the territory of Macedonia. Many elaboration of this vegetation exist over the wider area of the southern Balkans (Micevski 1970, 1972, 1973, 1977, 1978, 1994, Horvatić & Randjelović 1973, Randjelović 1975, Rexhepi 1979, Randjelović & Ružić 1982, 1986, Ružić 1983, Micevski & Matevski 1984, Konstantinou 1992, Matevski & Kostadinovski 1998, Matevski et al. 2007, Sopotlieva & Apostolova 2007, Bergmeier 2009, Čarni et al. 2010).

Five associations have been described in Macedonia so far, *Tunico-Trisetetum myrianthi* Micevski 1972 (in the region of Gevgelija and Bitola), *Helianthemo-Euphorbietum thessalae* Micevski 1973 (in the region of Kočani, Prilep, Veles and Makedonska Kamenica), *Erysimo-Trifolietum* Micevski 1977 (in the region of Skopje, Radoviš, Štip, Probištip, Kratovo and Veles), *Diantho-Cistetum incani* Micevski et Matevski 1984 (in the region of Gevgelija) and *Biserrulo-Scleranthetum dichotomae* Matevski et Kostadinovski 1998 (in the Mariovo region).

Here we deal with the dry grassland communities of *Erysimo-Trifolietum*, which develops on

siliceous bedrock up to 900 m. It is widespread in the central, northern and northeastern part of the Republic of Macedonia (Micevski 1977).

The aim of the article is to identify the position of newly acquired data of dry grassland vegetation in the eastern part of the Republic of Macedonia. After syntaxonomic classification of data within the association *Erysimo-Trifolietum*, we investigated its floristic, phytogeographical and structural diversity, as well as its detailed distribution pattern. Finally, we describe new syntaxa and discuss the classification of dry grasslands in the southern Balkans.

2. MATERIALS AND METHODS

During 2004 and 2005, field studies were conducted on many dry grassland localities in the region of Kratovo, on both sides of the River Kriva. We collected 81 vegetation samples (relevés) with plot size 100 m², inhomogeneous relevés are expelled, where mixture of silicate and carbonate plant appears, other are shown in Table 1. The average annual temperature for this region is 11.4 °C, and the average annual rainfall is 728.4 mm (Lazarevski 1993).

Vegetation research was carried out according to the Braun-Blanquet approach (Braun-Blanquet 1964; Westhoff & van der Maarel 1973). The nomenclature of plant species is according to *Flora Europaea* (Tutin et al. 1964–1993); *Prodromus florum peninsulae Balcanicae* (Hayek 1927–1933), *Flora of the Republic of Macedonia* (Micevski 1985, 1993, 1995, 1998, 2001, 2005), *Flora of Bulgaria* (Jordanov 1963–1979; Velchev 1982, Kozuharov 1992, 1995), *Flora of the SR Serbia* (Josifović 1970–1977), as well as many other monographs and floristic and taxonomic articles. The syntaxonomy and nomenclature of the new plant communities are in accordance with the International Code of Phytosociological Nomenclature (Weber al. 2000).

Vegetation relevés made in the field and from literature sources were entered in the Turboveg database (Hennekens et al. 2001). The combined values for the cover-abundance scale was transformed according to Van der Maarel (1979) for the purpose of numerical analysis. Classifications of relevés were made by the program PC-ORD 4 (McCune & Mefford 1999) where Ward's, Flexible beta methods and the relative Euclidean distance were applied. Vegetation relevés were also analyzed by the computer program JUICE 6.4

(Tichy 2006), whereby diagnostic species were determined using fidelity measure coefficients (Barkman 1979, Chytrý et al. 2002).

Life forms according to Raunkiaer (1934) were used for defining the biological spectrum. Geoelements were established according to Gajić (1980) and Pignatti (2005). The proportion of therophytes and hemicryptophytes was visualised by a Mean plot diagram in the computer program Statistica 7.0. (StatSoft, 2007).

The results of numerical analysis were used to elaborate an analytic table (Table 1). All plant taxa appearing in the relevés were classified into the corresponding syntaxa. The basis for this classification was a synthetic table (not shown in the article), including the calculation of fidelity measurements, and expert knowledge.

The basic soil properties (soil type, pH and CaCO_3 concentration) were analyzed and determined. The pH value of the soil solution was electrometrically determined with a glass electrode in water suspension and 1 M KCl, while the carbonate concentration in the soil was determined by Scheibler's volumetric method (Mitrićeski et al. 2001).

3. RESULTS

We first made a cluster analysis with the formed database, which consists of 257 vegetation relevés. The results are presented as a dendrogram (Figure 1). It can be seen that vegetation relevés made during of our investigations in the northern parts of the Republic of Macedonia (around in Kratovo region) are divided into two clusters (numbers 1 and 2) and they are mostly related to vegetation relevés of the ass. *Erysimo-Trifolietum* (cluster with ordinal number 3).

Our relevés show a floristic affinity to *Erysimo-Trifolietum* and all nine diagnostic taxa proposed by Micevski (1977) appear; it was decided to classify the relevés under consideration into *Erysimo-Trifolietum*.

The relevés classified within *Erysimo-Trifolietum* were elaborated separately. The results are presented as a dendrogram (Figure 2), in which it can be seen that the vegetation relevés are grouped in four clusters. It was decided that these four groups represent independent syntaxa, i.e., subassociations of the association *Erysimo-Trifolietum*, as *typicum*, *onobrychidetosum*, *scleranthetosum* and *brachypodietosum*.

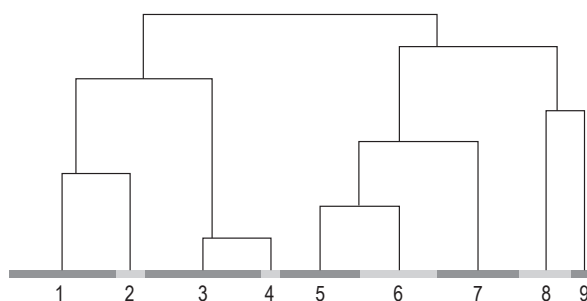


Figure 1: Dendrogram of hierarchical clustering of the vegetation relevés of the alliance *Trifolion cherleri* from the territory of the Republic of Macedonia in 9 clusters (flexible beta method, relative Euclidean distance). Legend: cluster 1 and cluster 2 – *Erysimo-Trifolietum* (Tab. I/1-25; II/26-53; III/1-32; Micevski, 1977); cluster 3 – Tab. 1/1-62 (own relevés) cluster 4 – Tab. 1/63-72 (own relevés); cluster 5 and cluster 7 – *Helianthemo-Euphorbietum thessalae* (literature data); cluster 6 – *Tunico-Trisetetum myrianthi* (literature data); cluster 8 – *Biserrulo-Scleranthetum dichotomae* (literature data); and cluster 9 – *Diantho-Cistetum incani* (literature data);

Slika 1: Dendrogram hierarhičnega kopičenja vegetacijskih popisov zveze *Trifolion cherleri* z ozemlja Republike Makedonije: 7 snopov (Wardova metoda, relativna evklidska razdalja). Legenda: snop 1 – Tabela 1/63-72 (lastni popisi); snop 2 – Tabela 1/1-62 (lastni popisi); snop 3 – *Erysimo-Trifolietum* (literaturni podatki); snop 4 – *Tunico-Trisetetum myrianthi* (literaturni podatki); snop 5 – *Helianthemo-Euphorbietum thessalae* (literaturni podatki); snop 6 – *Biserrulo-Scleranthetum dichotomae* (literaturni podatki); in snop 7 – *Diantho-Cistetum incani* (literaturni podatki).

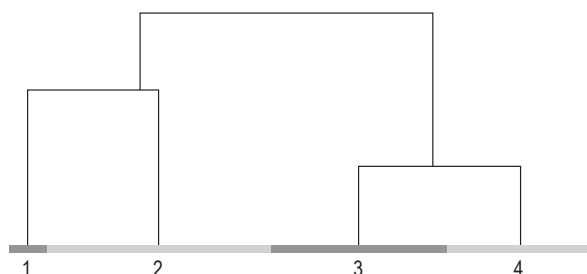


Figure 2: Dendrogram of hierarchical clustering of the vegetation relevés of the ass. *Erysimo-Trifolietum* Micevski 1977 on the territory of the Republic of Macedonia in four clusters (Ward's method, relative Euclidean distance); cluster 1 – Table 1/63-72 – *Erysimo-Trifolietum brachypodietosum*, cluster 2 – Table 1/1-62 – *Erysimo-Trifolietum scleranthetosum*, cluster 3 – *Erysimo-Trifolietum typicum*, cluster 4 – *Erysimo-Trifolietum onobrychidetosum*.

Slika 2: Dendrogram hierarhičnega kopičenja vegetacijskih popisov asociacije *Erysimo-Trifolietum* Micevski 1977 z ozemlja Republike Makedonije: 4 snopi (Wardova metoda, relative Evklidska razdalja); snop 1 – Tabela 1/63-72 – *Erysimo-Trifolietum brachypodietosum*, snop 2 – Tabela 1/1-62 – *Erysimo-Trifolietum scleranthetosum*, snop 3 – *Erysimo-Trifolietum typicum*, snop 4 – *Erysimo-Trifolietum onobrychidetosum*.

The individuality of the four groups was also confirmed by calculation of differences in the biological spectrum (life forms) and phytogeographical structure (geoelements) (Table 3, 4). The difference in the presence of therophytes and hemicryptophytes in the four groups of relevés (subassociations) is statistically significant (Figure 3, 4). The spread of the relevés from the first to the fourth group is generally from north to south, by which the impact of continental climate is reduced and the impact of the sub-Mediterranean climate is increased. Therophytes, as the plants most adapted to arid conditions, appear in a dry and hot climate in which the vegetation period is shorter. It seems that the main difference between the subassociations is the proportion of therophytes and hemicryptophytes, which correlates to the geographical position and this is shown in the map of the distribution of the four subassociations (Figure 5).

Their biological and chorological spectra are presented in Tables 2 and 3.

Table 2: Biological spectrum of the subassociations of the ass. *Erysimo diffusi-Trifolietum angustifolii* Micevski 1977.

Tabela 2: Biološki spekter subasociacij asociacije *Erysimo diffusi-Trifolietum angustifolii* Micevski 1977.

life form (%)	T	Ch	G	H	Ph
subass. <i>brachypodietosum</i>	53	40	2	4	1
subass. <i>scleranthetosum</i>	54	39	5	2	0
subass. <i>typicum</i>	56	38	3	3	0
subass. <i>onobrychietosum</i>	64	29	5	2	0

Table 3: Chorological spectrum of the subassociations of the ass. *Erysimo diffusi-Trifolietum angustifolii* Micevski 1977.

Tabela 3: Horološki spekter subasociacij asociacije *Erysimo diffusi-Trifolietum angustifolii* Micevski 1977.

Areal types (%)	subass. <i>brachypodietosum</i>	subass. <i>scleranthetosum</i>	subass. <i>typicum</i>	subass. <i>onobrychietosum</i>
Eurasian	37	34	30	32
Euromediterranean	36	32	36	36
Stenomediterranean	10	7	10	17
Mediterranean-mountain	2	3	5	3
Balkan and sub-Balkan	5	11	7	5
Boreal	2	3	3	0
Cosmopolitan	8	10	8	7

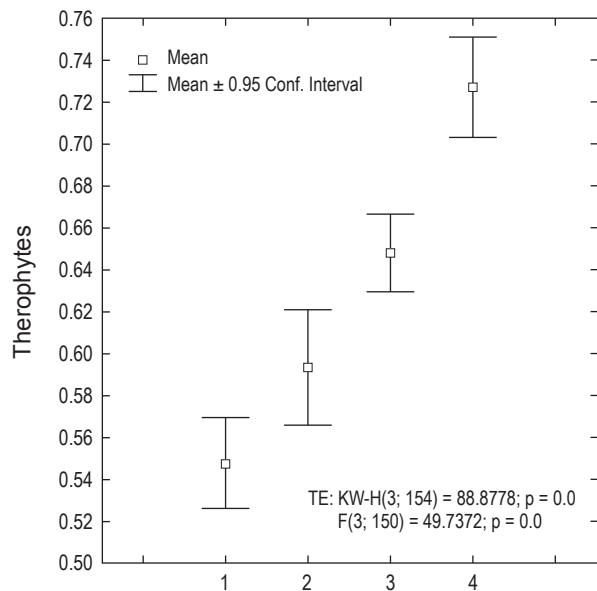


Figure 3: Mean plot diagram. Proportion of therophytes in groups of relevés (subassociations): 1 – subass. *brachypodietosum*, 2 – subass. *scleranthetosum*, 3 – subass. *typicum* and 4 – subass. *onobrychietosum*.

Slika 3: Diagram srednjih vrednosti. Delež terofitov v skupinah popisov (subasociacijah): 1 – subass. *brachypodietosum*, 2 – subass. *scleranthetosum*, 3 – subass. *typicum* in 4 – subass. *onobrychietosum*.

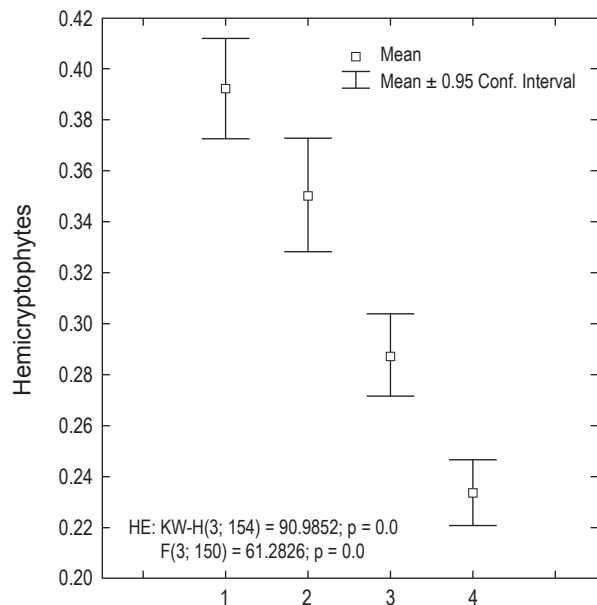


Figure 4: Mean plot diagram. Proportion of hemicryptophytes in groups of relevés (subassociations): 1 – subass. *brachypodietosum*, 2 – subass. *scleranthetosum*, 3 – subass. *typicum* and 4 – subass. *onobrychietosum*.

Slika 4: Diagram srednjih vrednosti. Delež hemikriptofitov v skupinah popisov (subasociacijah): 1 – subass. *brachypodietosum*, 2 – subass. *scleranthetosum*, 3 – subass. *typicum* in 4 – subass. *onobrychietosum*.

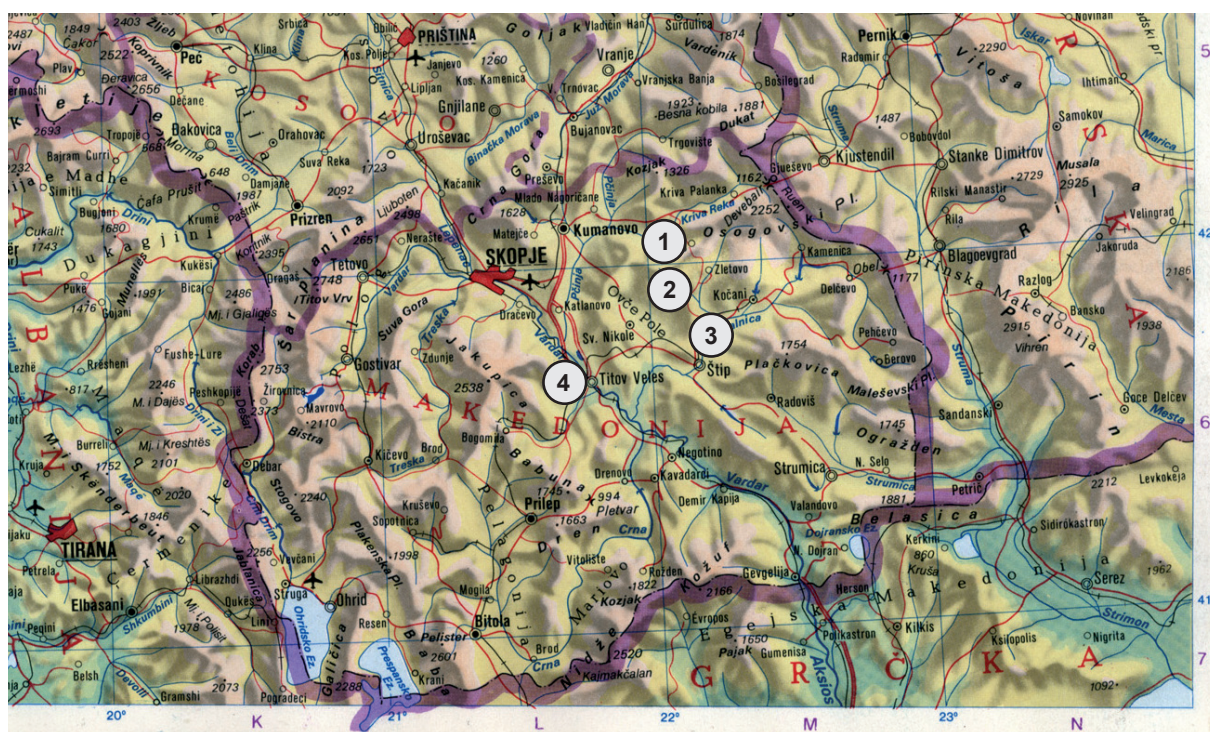


Figure 5: Distribution of the subassociations of the association *Erysimo-Trifolietum*, 1 – subass. *brachypodietosum*, 2 – subass. *scleranthetosum*, 3 – subass. *typicum* and 4 – subass. *Onobrychietosum*.

Slika 5: Razporeditev subasociacij asocijacije *Erysimo-Trifolietum*, 1 – subass. *brachypodietosum*, 2 – subass. *scleranthetosum*, 3 – subass. *typicum* in 4 – subass. *onobrychietosum*.

4. DISCUSSION

The results show that the vegetation of dry grasslands in the research area around Kratovo should be classified into the association *Erysimo-Trifolietum* Micevski 1977. Under the original syntaxonomic concept, it is part of the alliance *Trifolion cherleri*, which includes the community on rock and highland pastures on siliceous bedrock, in the order *Astragalo-Potentilletalia* and the class *Festuco-Brometea* (Micevski 1977).

The position of the alliance *Trifolion cherleri* in modern syntaxonomic systems is often defined differently from its original conception. Thus, according to Rodwell et al. (2002), which provides a review of phytocenological alliances and their correlation with EUNIS habitats, the alliance *Trifolion cherleri* is not part of the order *Astragalo-Potentilletalia* and the class *Festuco-Brometea* but within the order *Helianthemetalia guttati* Br.-Bl. in Br.-Bl. et al. 1940, from the class *Helianthemetea guttati* (Br.-Bl. in Br.-Bl. et al. 1952) Rivas Goday et Rivas-Mart. 1963.

This new syntaxonomic solution is accepted

by Sopotlieva & Apostolova (2007) and the first time they register the ass. *Erysimo-Trifolietum* on the territory of the Republic of Bulgaria, they place it in the class *Helianthemetea guttati*.

The problem of the syntaxonomic position of the alliance *Trifolion cherleri* described on the territory of the Republic of Macedonia (represented by five associations also described from its territory) is still an open question. A definitive solution requires extensive research into its broader areal, based on the most recent findings presented in the works of Royer (1991), Mucina (1997), Rodwell et al. (2002) and others. In this paper, we adhere to the syntaxonomy within the frame of the class *Festuco-Brometea*, in which have been subordinated community from the belt of mountain pastures in the territory of the Republic of Macedonia.

According to the results of analysis within the frame of the ass. *Erysimo-Trifolietum* from north-eastern parts of the Republic of Macedonia, two new well-separated subassociations can be distinguished, we propose the following syntaxonomic scheme of the association:

Class: *Festuco-Brometea* Br. Bl. et Tx. 1943

Order: *Astragalo – Potentilletalia* Micevski 1971

Alliance: *Trifolion cherleri* Micevski 1971

ass. *Erysimo diffusi-Trifolietum angustifolii* Micevski 1977

(Table 1 (Micevski 1977), lectotypus hoc loco: relevé no. 9)

– subass. *typicum* Micevski 1977

– subass. *onobrychietosum* Micevski 1977

(Table 3 (Micevski 1977), lectotypus hoc loco: relevé no. 14)

– subass. *scleranthetosum* subass. nova

– subass. *brachypodietosum* subass. nova

***Erysimo diffusi-Trifolietum angustifolii scleranthetosum* subass. nova**

(Table 1, relevés 1–62, holotypus hoc loco: relevé no. 11)

Registered at several locations around Kratovo, at 453–735 m height, inclination up to 10°, in fields with different aspects (mostly with a southern aspect) (Figure 6).

The differential species of the subassociation *scleranthetosum* are *Logfia arvensis*, *Scleranthus perennis* subsp. *dichotomus*, *Sedum hispanicum*, *Verbascum lesnovoensis*, *Trifolium retusum*, *Valerianella turgida* and *Elymus hispidus* subsp. *hispidus*.

The results of chemical analysis of soil samples taken from the soil profile on a representative vegetation relevé are shown in Table 4.

Table 4: Soil type results and pH.

Tabela 4: Tipi tal in pH.

Serial No.	Soil type	Horizon and depth (cm)	Locality	CaSO ₃ (%)	pH H ₂ O	pH nKCl
1	leptosol	(A) 0–5	v. Kuklica - Vidim	0	7.5	6.4
2	leptosol	(A) 0–10	v. Filipovci	0	6.9	5.4
3	leptosol	(A) 0–8	v. Konju	0	7.1	5.8

In the researched leptosols, because of the shallow solum, supplying the plants with water and nutrients is obstructed and the habitats must therefore be considered extremely xerothermic. The profile with serial number 1 is particularly xerothermic.

Stands of the subass. *scleranthetosum* were registered on very eroded habitats, so they contain many xerothermic species that are specific to that type of habitat (*Scleranthus perennis* subsp. *dichotomus*, *Sedum annuum*, *Sedum hispanicum*, *Sedum sartorianum*, *Sedum rubens*, *Valerianella turgida*, *Minuartia hirsuta* subsp. *falcata*, *Psilurus incurvus*,



Figure 6: Location of the investigated area (village Pendać).

Slika 6: Lokaliteta na raziskovanem območju (vas Pendać).

Poa bulbosa, *Eragrostis minor*, *Vulpia ciliata*, *Logfia arvensis* and others), which determine the physiognomy of the plant cover.

The communities representing the subass. *scleranthetosum* contain 250 plant species. Their biological and chorological spectra are presented in Table 2 and 3.

From the analysis of the floristic composition and percentage incidence of the life forms, it is obvious that this is a typical sub-Mediterranean community. The large percentage incidence of therophytes (54%) is in direct correlation with the influence of the modified sub-Mediterranean climate. The chorological spectrum in the studied areas shows great phytogeographic diversity.

***Erysimo diffusi-Trifolietum angustifolii brachypodietosum* subass. nova**

(Table 1, relevés. 63–72, Holotypus hoc loco: relevé no. 66)

The floristic composition of the community in the area is very rich and is shown in Table 1.

The subassociation is clearly differentiated and is characterized by the following species – *Minuartia hamata*, *Brachypodium distachyon*, *Echinaria capitata*, *Ziziphora capitata*, *Linum corymbulosum*, *Coronilla scorpioides*, *Buffonia tenuifolia* and *Dianthus pallens*.

According to the chemical analysis of soil samples taken from representative relevés of the researched areas, the soil reaction in H₂O is pH – 6.6, and in nKCl is 5.4.

Based on the American classification of soil reaction in water specified by Filipovski (1984), the soil of this locality has a neutral reaction.

The alliance *Trifolion cherleri* is poorly char-

acterized and is represented with several taxa – *Taeniatherum caput-medusae*, *Galium macedonicum* and *Aphanes arvensis*. This is probably the result of the large number of calcifilic species that have found favourable conditions for development within the subassociation and they have probably outcompeted most of the characteristic species of the alliance *Trifolion cherleri*.

The presence of many calcifilic species is specific for the researched stands of this subassociation around Kratovo, although there is a lack of limestone as a geological substrate. This could be explained by the influence of limestone from the deeper soil layers or the presence of limestone as a geology substrate in the surroundings.

The communities representing the subass. *brachypodietosum* contain 162 plant species. Their biological and chorological spectra are presented in Table 2 and 3.

From analysis of the floristic composition and percentage incidence of life forms, this is obviously a typical sub-Mediterranean community. The group of Mediterranean areal types (Steno-Mediterranean, Euromediterranean, and Mediterranean-mountain) is dominant and provides a strong sub-Mediterranean imprint to the vegetation of the researched area. This group is represented by 48 percent and usually inhabits therophyllous habitats.

5. ACKNOWLEDGEMENTS

We are grateful to the Macedonian Academy of Sciences and Arts for financial support of the research. The authors acknowledge also the financial support from the Slovenian Research Agency (projects N° L1-9737, P1-0236). R. Č. is grateful to the Institute of Biology, Scientific Research Centre of the Slovenian Academy of Sciences and Arts to get opportunity to work at the institute. Thanks to Marjan Andrejevski for help with pedological analysis.

6. REFERENCES

Bergmeier, E., Konstantinou M., Tsiripidis I. & Sýkora K. 2009: Plant communities on metaliferous soils in northern Greece. *Phytocoenologia* 39: 411–438.
Barkman, J.J. 1989: Fidelity and character-species, a critical evaluation. *Vegetatio* 85: 105–116.

Braun-Blanquet, J., Molinier, R. & Wagner, H. 1940: Prodrome des groupements végétaux. Prodromus der Pflanzengesellschaften. *Cisto-Lavanduletea* (landes siliceuses à cistes et lavandes). Montpellier. 53 pp.
Braun-Blanquet, J. & Tüxen, R. 1943: Übersicht der höheren Vegetationseinheiten Mitteleuropas. *Commun. Stat. Int. Géobot. Médit. et Alpin* 84: 1–11.
Braun-Blanquet, J., Roussine, N. & Nègre, R. 1952: *Les groupements végétaux de la France Méditerranéenne*. Centre National de la Recherche Scientifique. Montpellier.
Braun-Blanquet, J. 1964: Pflanzensociologie. Grundzüge der Vegetationskunde. 3. ed. Springer Verlag. Wien. 865 pp.
Chytrý, M., Tichý, L., Holt, J., & Botta-Dukát, Z. 2002: Determination of diagnostic species with statistical fidelity measures. *Journal of Vegetation Science* 13: 79–90.
Čarni, A., Košir, P., Karadžić, B., Matevski, V., Redžić, S. & Škvorc, Ž. 2009: Thermophilous deciduous forests in Southeastern Europe. *Plant Biosystems* 143: 1–13.
Čarni, A., Matevski, V. & Šilc, U. 2010: Morphological, chorological and ecological plasticity of *Cistus incanus* in the southern Balkans. *Plant Biosystems* 144: 602–617.
Dostalek, J. & Frantik, T. 2008: Dry grassland plant diversity conservation using low-intensity sheep and goat grazing management: case study in Prague (Czech Republic). *Biodiversity and Conservation* 17: 1439–1454.
Dzwonko, Z. & Loster, S. 2007: A functional analysis of vegetation dynamics in abandoned and restored limestone grasslands. *Journal of Vegetation Science* 18: 203–212.
Filipovski, Gj. 1984: *Pedologija*. Treto izdanje. Univerzitet Sv. Kiril i Metodij, Skopje
Gajić, M. 1980: Pregled vrsta flore SR Srbije sa biljno-geografskim oznakama. *Glasnik Šumarskog Fakulteta, "A" "Šumarstvo" (Beograd)*. 54: 111–140.
Hayek, A. 1924–1933: *Prodromus florae peninsulae Balcanicae*. I–III. Dachlem bei Berlin.
Hennekens, S.M. & Schaminée, J.H.J. 2001: TURBOVEG, a comprehensive database management system for vegetation data. *Journal of Vegetation Science* 12: 589–591.
Hill, M. O. 1979: TWINSpan. A Fortran program for arranging multivariate data in an ordered two-way table by classification of the individuals and attributes. Cornell University, Ithaca, 66 pp.

- Jordanov, D.(ed.). 1963–1979: Flora Republicae Popularis Bulgaricae, Vol. 1–7. In Aedibus Acad. Sci. Bulgaricae, Serdicae (in Bulgarian)
- Josifović, M. et al. 1970–1986: Flora SR Srbije, I – X, SANU, Beograd.
- Kavgaci, A., Čarni, A., Tecimen, B. & Ozlap, G. 2010: Diversity and ecological differentiation of oak forests in NW trace (Turkey). Archives of Biological Sciences 62: 707–720.
- Kiehl, K. & Pfenner, J. 2007: Establishment and persistence of target species in newly created calcareous grasslands on former arable fields. Plant Ecology 189: 31–48.
- Konstantinou, M. 1992: Phytosociological studies of the vegetation on metalliferous soils, in northern Greece, Institute of Systematic Botany and Phytogeography, Dept. Botany, Aristotle University, Thessaloniki.
- Kozhuharov, S. (ed.). 1995: Flora Republicae Popularis Bulgaricae. Vol. 10. In Aedibus Acad. Sci. Bulgaricae, Serdicae (in Bulgarian)
- Kuneš, P., Pelánková, B., Chytrý, M., Janovská, V., Pokorný, P. & Petr, L. 2008: Interpretation of the last-glacial vegetation of eastern-central Europe using modern analogues from southern Siberia. Journal of Biogeography 35: 2223–2236.
- Lazarevski, A. 1993: Klimata vo Makedonija. Kultura, Skopje, 282 pp.
- Matevski, V. & Kostadinovski, M. 1998: *Biserrulo-Scleranthetum dichotomae* Matevski et Kostadinovski ass. nova vo vegetacijata na brdskite pasišta vo Republika Makedonija. God. zb. biol. 51: 25–35.
- McCune, B. & Mefford, M. J. 1999: PC-ORD. Multivariate analysis of ecological data, Version 4.0. MjM Software Design, Gleneden Beach, 237 pp.
- Micevski, K. 1970: *Astragalo-Potentilletalia*, nov vegetacijski red na brdskite pasišta vo Makedonija. Prilozi MANU, Odd. za prir. mat. nauki 2(2): 15–23.
- Micevski, K. 1972: *Tunico-Trisetetum myrianthi* Micevski ass. nova vo vegetacijata na brdskite pasišta vo Makedonija. God. zb. PMF–biol. 24: 59–65.
- Micevski, K. 1973: *Helianthemo-Euphorbietum thesalae* Micevski ass. nova vo vegetacijata na brdskite pasišta vo Makedonija. God. zb. PMF – biol. 25: 149–155.
- Micevski, K. 1977: *Erysimo-Trifolietum* Micevski ass. nova vo vegetacijata na Makedonija. Prilozi MANU, Odd. za prir. mat. nauki 9(1): 75–82.
- Micevski, K. 1985: Flora na SR Makedonija I/1. MANU, Skopje.
- Micevski, K. 1993: Flora na Republika Makedonija I/2. MANU, Skopje.
- Micevski, K. 1994: Vegetation of Mt. Bistra. MANU, Skopje, pp. 1–91.
- Micevski, K. 1995: Flora na Republika Makedonija I/3. MANU, Skopje
- Micevski, K. 1996: *Verbascum lesnovoensis* Micevski spec. nov. vo florata na Republika Makedonija. Prilozi MANU, Odd. biol. med. nauki 17(1–2): 17–24.
- Micevski, K. 1998: Flora na Republika Makedonija I/4. MANU, Skopje.
- Micevski, K. 2001: Flora na Republika Makedonija I/5. MANU, Skopje.
- Micevski, K. 2005: Flora na Republika Makedonija I/6. MANU, Skopje.
- Micevski, K. & Matevski, V. 1984: *Diantho-Cistetum incani* Micevski et Matevski ass. nova vo vegetacijata na SR Makedonija. Prilozi MANU, Odd. biol. med. nauki 5(2): 11–16, Skopje.
- Mitrićski, J. & Mitkova, T. 2001: Praktikum po pedologija. Univerzitet Sv. Kiril i Metodij – Zemjodelski fakultet, Skopje, 1–165 pp.
- Mucina, L. 1997: Conspectus of classes of European vegetation. Folia Geobotanica et Phytotaxonomica 32: 117–172.
- Pignatti, S. 2005: Valori di bioindicazione delle piante vascolari della flora d'Italia. Braun-Blanquetia 39: 1–98.
- Raunkier, C. 1934: The life forms of plants and statistical plant geography. Clarendon, Oxford.
- Redžepi, F. 1979: Ekološke prilike i razvoj zajednice *Echinario-Convolutetum althaeoides* ass. nova na Kosovu. Drugi kongres ekologa Jugoslavije. Savez društava ekologa Jugoslavije 2, Zadar- Plitvice, pp. 1031–1036.
- Redžić, S. 2007: The syntaxonomy of the vegetation of the continental Dinaric Alps (W. Balkans). Collection of papers devoted to academician Kiril Micevski, MASA, Skopje, 249–280 pp.
- Rivas Goday, S. & Rivas-Martínez, S. 1963: Estudio y clasificación de los pastizales españoles. Publ. Ministerio de Agricultura. Madrid.
- Rivas-Martínez, S. 1978: Sur la syntaxonomie des pelouses thérophytiques d'Europe occidentale. Colloques Phytosociologiques 6: 55–69.
- Rodwell, J., Schaminée, J., Mucina, L., Pignatti, S., Dring, J. & Moos, D. 2002: The Diversity of European Vegetation. An overview of phytosociological alliances and their relationships

- to EUNIS habitats. Wageningen, NL. Report EC-LNV nr. 2002/054.
- Royer, J. M. 1991: Synthèse eurosibérienne, phytosociologique et phytogéographique de la classe des *Festuco-Brometea*. *Dissertationes Botanicae* 178: 1–296.
- Ružić, M. 1983: Asocijacija *Festuco-Chrysopogonum grylli* Randj. 74 na planini Vidojevići kod Prokuplja. *Glasnik Prirodnjačkog Muzeja* (Beograd), Ser. B 38: 47–54.
- Sopotlieva, D. & Apostolova, I. 2007: The association *Erysimo-Trifolietum* Micevski 1977 in Bulgaria and some remarks on its Mediterranean character. *Hacquetia* 6(2): 131–141.
- StatSoft, Inc. 2005: STATISTICA (data analysis software system). Version 7. – URL [http://www.statsoft.com].
- Ter Braak, C. J. F. & Šmilauer, P. 2002: CANOCO Reference Manual and CanoDraw for Windows User's Guide: Software for Canonical Community Ordination (version 4.5). Microcomputer Power (Ithaca NY, USA).
- Tichý, L. 2002: JUICE, software for vegetation classification. *Journal of Vegetation Science* 13: 451–453.
- Tutin, T.G. et al. [ed.] 1964–1993: *Flora Europaea*, 1–5, Cambridge University Press.
- Van der Maarel, E. 1979: Transformation of cover-abundance values in phytosociology and its effects of community similarity. *Vegetatio* 39 (2): 97–114.
- Velchev, V. (ed.). 1982: *Flora Republicae Popularis Bulgaricae*. Vol. 8. In *Aedibus Acad. Sci. Bulgaricae. Serdicae* (in Bulgarian)
- Velchev, V. (ed.). 1989: *Flora Republicae Popularis Bulgaricae*. Vol. 9. In *Aedibus Acad. Sci. Bulgaricae. Serdicae* (in Bulgarian)
- Velev N.I. & Apostolova I.I. 2009: A review of *Potentillo ternatae-Nardion strictae* alliance. *Hacquetia* 8: 49–66.
- Wagner V. 2009: Eurosiberian meadows at their southern edge: patterns and phytogeography in the NW Tien Shan. *Journal of Vegetation Science* 20: 199–208.
- Walter H. & Straka H. 1970: *Arealkunde. Floristisch-historische Geobotanik. Einführung die Phytologie*, V. Eugen Ulmer, Stuttgart, Germany. III/2, 478 p.
- Weber, H, E., Moravec, J. & Theurillat, J.-P. 2000: International Code of Phytosociological Nomenclature. 3 ed. *Journal of Vegetation Science* 11 (5): 739–768.
- Westhoff, V. & van der Maarel, E. 1973: The Braun-Blanquet approach. In: Whittaker R. H. (ed.): *Ordination and classification of communities*, Dr. W. Junk Publ., The Hague. p. 619–737.

Received 17. 8. 2011

Revision received 22. 2. 2012

Accepted 5. 3. 2012

7. APPENDIX

Localities of the relèves and cover of the layers in Table 1. Running number, locality aspect, altitude (m), cover, inclination (%), latitude, longitude, and sampling date are presented, respectively."

1: Ketenovo, E, 431, 79, 24, 42° 6' 32.31" N, 22° 5' 4.05" E, 28. 05. 2004; **2:** Ketenovo, E, 459, 82, 30, 42° 6' 36.65" N, 22° 5' 4.07" E, 28. 05. 2004; **3:** Ketenovo, NE, 478, 83, 17, 42° 6' 36.51" N, 22° 5' 2.79" E, 28. 05. 2004; **4:** Pendać, SW, 590, 87, 6, 42° 6' 50.42" N, 22° 0' 58.86" E, 05. 06. 2004; **5:** Pendać, SE, 593, 78, 8, 42° 6' 55.98" N, 22° 0' 50.57" E, 05. 06. 2004; **6:** Pendać, SW, 665, 91, 4, 42° 7' 11.30" N, 22° 0' 57.03" E, 06. 06. 2004; **7:** Pendać, SW, 652, 97, 3, 42° 7' 6.95" N; 22° 0' 47.04" E, 06. 06. 2004; **8:** Pendać, SW, 635, 83, 3, 42° 7' 7.99" N, 22° 0' 29.22" E, 06. 06. 2004; **9:** Filipovci, E, 544, 98, 6, 42° 3' 16.00" N, 22° 4' 45.01" E, 09. 06. 2004; **10:** Filipovci, S, 548, 89, 3, 42° 3' 16.49" N, 22° 4' 46.14" E, 09. 06. 2004; **11:** Filipovci, SW, 569, 78, 4, 42° 3' 16.05" N; 22° 4' 51.46" E, 10. 06. 2004; **12:** Filipovci, W, 575, 98, 42° 3' 15.18" N, 22° 4' 53.67" E, 09. 06. 2004; **13:** Filipovci, N, 578, 100, 2, 42° 3' 17.31" N, 22° 4' 55.65" E, 10. 06. 2004; **14:** Filipovci, W, 561, 100, 1, 42° 3' 21.08" N, 22° 4' 52.91" E, 10. 06. 2004; **15:** Š. Rudare, SW, 417, 100, 3, 42° 4' 47.56" N, 21° 59' 18.90" E, 07. 06. 2004; **16:** Š. Rudare, S, 423, 100, 10, 42° 4' 46.55" N, 21° 59' 20.93" E, 10. 06. 2004; **17:** Š. Rudare, SE, 445, 100, 9, 42° 4' 41.93" N, 21° 59' 30.47" E, 10. 06. 2004; **18:** Š. Rudare, SE, 440, 100, 3, 42° 4' 39.92" N, 21° 59' 32.24" E, 13. 06. 2004; **19:** Š. Rudare, SE, 433, 98, 8, 42° 4' 38.46" N; 21° 59' 34.17" E, 13. 06. 2004; **20:** Š. Rudare, W, 421, 92, 12, 42° 4' 53.82" N, 21° 59' 18.77" E, 13. 06. 2004; **21:** Š. Rudare, SW, 441, 100, 10, 42° 4' 52.62" N, 21° 59' 22.94" E, 13. 06. 2004; **22:** Ketenovo, N, 454, 84, 13, 42° 6' 51.75" N; 22° 5' 1.21" E, 29. 05. 2004; **23:** Ketenovo, NW, 427, 96, 17, 42° 6' 50.34" N, 22° 5' 7.30" E, 29. 05. 2004; **24:** Kuklica, W, 678, 100, 11, 42° 6' 2.97" N, 22° 1' 5.12" E, 31. 05. 2005; **25:** Kuklica, N, 413, 100, 15, 42° 5' 3.75" N, 22° 1' 6.56" E, 31. 05. 2005; **26:** Kuklica, N, 427, 100, 3, 42° 5' 4.58" N, 22° 1' 18.57" E, 31. 05. 2005; **27:** Kuklica, S, 395, 100, 1, 42° 4' 59.40" N, 22° 1' 24.93" EE, 03. 06. 2005; **28:** Kuklica, NE, 401, 100, 1, 42° 5' 2.27" N, 22° 1' 24.85" E, 03. 06. 2005; **29:** Kuklica, E, 404, 100, 5, 42° 5' 1.31" N, 22° 1' 23.20" E, 03. 06. 2005; **30:** Kuklica, S, 598, 97, 3, 42° 5' 40.08" N, 22° 1' 34.89" E, 28. 05. 2005; **31:** Kuklica, SE, 678, 98, 15, 42° 5'

43.80" N, 22° 1' 48.88" E, 28. 05. 2005; **32:** Kuklica, S, 765, 100, 17, 42° 6' 22.25" N, 22° 1' 32.11" E, 29. 05. 2005; **33:** Kuklica, SW, 705, 72, 5, 42° 5' 49.71" N, 22° 1' 39.49" E, 28. 05. 2005; **34:** Kuklica, NE, 698, 75, 8, 42° 6' 6.78" N, 22° 1' 39.76" E, 28. 05. 2005; **35:** Kuklica, S, 660, 68, 4, 42° 5' 57.40" N, 22° 1' 12.54" E, 29. 05. 2005; **36:** Kuklica, S, 650, 74, 3, 42° 5' 55.95" N, 22° 1' 12.29" E, 29. 05. 2005; **37:** Kuklica, S, 719, 78, 5, 42° 6' 5.52" N, 22° 1' 10.10" E, 29. 05. 2005; **38:** Kuklica, E, 727, 80, 8, 42° 6' 9.29" N, 22° 1' 13.23" E, 01. 06. 2005; **39:** Kuklica, SE, 745, 80, 4, 42° 6' 20.84" N, 22° 1' 17.13" E, 01. 06. 2005; **40:** Kuklica, E, 741, 100, 25, 42° 6' 35.53" N, 22° 1' 39.11" E, 29. 05. 2009; **41:** Kuklica, E, 535, 95, 12, 42° 5' 34.38" N, 22° 1' 31.14" E, 05. 06. 2005; **42:** Kuklica, N, 541, 98, 7, 42° 5' 37.42" N, 22° 1' 12.30" E, 05. 06. 2005; **43:** Kuklica, S, 390, 68, 5, 42° 4' 56.03" N, 22° 1' 17.31" E, 01. 06. 2005; **44:** Kuklica, SE, 387, 72, 10, 42° 4' 56.00" N, 22° 1' 23.00" E, 01. 06. 2005; **45:** Kuklica, E, 396, 96, 9, 42° 5' 0.46" N, 22° 1' 25.30" E, 01. 06. 2005; **46:** Kuklica, S, 387, 67, 5, 42° 4' 56.00" N, 22° 1' 5.00" E, 31. 05. 2005; **47:** Kuklica, S, 400, 69, 7, 42° 4' 59.00" N, 22° 1' 6.00" E, 31. 05. 2005; **48:** Kuklica, S, 406, 72, 9, 42° 5' 2.00" N, 22° 1' 5.00" E, 31. 05. 2005, 04. 06. 2005; **49:** Kuklica, S, 472, 62, 15, 42° 5' 26.00" N, 22° 1' 17.00" E, 01. 06. 2005; **50:** Kuklica, SW, 476, 78, 9, 42° 5' 28.23" N, 22° 1' 10.35" E, 04. 06. 2005; **51:** Kuklica, S, 480, 86, 9, 42° 5' 27.19" N, 22° 1' 15.26" E, 04. 06. 2005; **52:** Kuklica, SW, 487, 80, 5, 42° 5' 28.09" N, 22° 1' 20.79" E, 04. 06. 2005; **53:** Kuklica, S, 502, 90, 10, 42° 5' 30.00" N, 22° 1' 29.00" E, 04. 06. 2005; **54:** Kuklica, W, 403, 88, 14, 42° 5' 7.16" N, 22° 0' 34.46" E, 05. 06. 2005; **55:** Kuklica, S, 398, 86, 15, 42° 5' 7.02" N, 22° 0' 42.77" E, 05. 06. 2005; **56:** Kuklica, SW, 499, 89, 16, 42° 5' 10.00" N, 22° 0' 45.00" E, 05. 06. 2005; **57:** Ljoljak, S, 461, 94, 5, 42° 5' 5.89" N, 21° 57' 48.12" E, 04. 06. 2005; **58:** Ljoljak, S, 467, 99, 4, 42° 5' 7.26" N, 21° 57' 46.64" E, 04. 06. 2004; **59:** Konju, NE, 455, 98, 4, 42° 5' 5.90" N, 21° 57' 50.79" E, 04. 06. 2004; **60:** Konju, S, 470, 98, 6, 42° 5' 8.15" N, 21° 57' 44.43" E, 07. 06. 2004; **61:** Konju, S, 464, 88, 3, 42° 5' 10.22" N, 21° 57' 36.31" E, 07. 06. 2004; **62:** Pendać, SE, 592, 79, 4, 42° 6' 50.90" N, 22° 0' 58.88" E, 05. 06. 2004; **63:** Trnovac, SE, 550, 98, 4, 42° 7' 19.26" N, 22° 4' 43.17" E, 02. 06. 2004; **64:** Trnovac, S, 559, 99, 5, 42° 7' 17.91" N, 22° 4' 40.99" E, 02. 06. 2004; **65:** Trnovac, S, 550, 94, 8, 42° 7' 16.97" N, 22° 4' 41.36" E, 03. 06. 2004; **66:** Trnovac, E, 503, 90, 7, 42° 7' 17.35" N, 22° 4' 52.55" E, 03. 06. 2004; **67:** Trnovac, NE, 512, 97, 9, 42° 7' 18.35" N, 22° 4'

51.06" E, 03. 06. 2004; **68**: Trnovac, E, 495, 100, 5, 42° 7' 16.45" N, 22° 4' 53.52" E, 25. 05. 2004; **69**: Trnovac, NE, 513, 97, 14, 42° 7' 17.75" N, 22° 4' 50.33" E, 25. 05. 2004; **70**: Trnovac, S, 526, 93,

17, 42° 7' 15.36" N, 22° 4' 45.20" E, 26. 05. 2004; **71**: Trnovac, S, 521, 86, 12, 42° 7' 15.88" N, 22° 4' 46.62" E, 27. 05. 2004; **72**: Trnovac, S, 540, 98, 7, 42° 7' 16.30" N, 22° 4' 43.08" E, 26. 05. 2004;

Заедници од *Erysimo-Trifolietum* на брдските пасишта во северо-источниот дел на Република Македонија

Брдските пасишта на територијата на Република Македонија се секундарни вегетациски формации, формирани со сукцесивна и долготрајна деградација или со потполно уништување на шуми, пред се од редот *Quercetalia pubescentis*, класа *Quercio-Fagetea*, во низинскиот појас до 1200 (1400m). Денес тие завземаат околу 521.000 ha од територијата на Република Македонија. Припаѓаат кон сојузите *Trifolion cherleri* Мицевски 1971, *Saturejo-Thymion* Мицевски 1970 и *Armerio-Potentillion* Мицевски 1978 од редот *Astragalo-Potentilletalia* Мицевски 1971 и класата *Festuco-Brometea* Br. Bl. 1943.

Теренските истражувања во текот на 2004 и 2005 година, опфатија голем број на локалитети во околината на Кратово, каде во оптималниот вегетациски период (мај и јуни) направени се 72 вегетациски снимки, за да се регистрира вкупниот флористчки состав на истражуваната вегетација.

На истражуваното подрачје доминира умерено континентална, а во неколку делови и планинска клима, со топли и суви лета и ладни зими. Средна годишна температура е 11,4 °C

Вегетациските истражувања се направени со класичниот европски метод (Braun Blanquet 1964; Westhoff & Van der Maarel, 1973).

Вегетациските снимки (сопствени и од литература), внесени се во базата со податоци Turboveg (Hennekens, 2001). Комбинираната проценка за

бројност и покривност трансформирана е по Van der Maarel (1979). За таа цел користени се различни мултиваријантни анализи од компјутерските програми PC-ORD 4 (McCune & Mefford 1999), JUICE 6.4 (Tichý, 2006) и STATISTICA 7.0 (Stat Soft, Inc., www.statsoft.com).

По сеопфатните анализи и по споделувањето со претходно опишаните асоцијации на територијата на Република Македонија и соседните подрачја, дојдовме до заклучок дека на истражуваното подрачје се развиваат следните растителни заедници.

Ass. *Erysimo-Trifolietum* Мицевски 1977 (сојуз *Trifolion cherleri*, ред *Astragalo-Potentilletalia*, класа *Festuco-Brometea*).

Во асоцијацијата се издиференцирани две нови субасоцијации – *scleranthetosum* subass. nova и *brachypodietosum* subass. nova.

Subass. *brachypodietosum* subass. nova – е регистрирана во близина на селото Трновац. Диференцијални видови на оваа субасоцијација се следните: *Minuartia hamata*, *Brachypodium distachyon*, *Echinaria capitata*, *Ziziphora capitata*, *Linum corymbulosum*, *Coronilla scorpioides*, *Buffonia tenuifolia* и *Dianthus pallens*.

Subass. *scleranthetosum* subass. nova – е регистрирана на повеќе локалитети во околината на Кратово. Диференцијални видови на субасоцијацијата *scleranthetosum* по кои се одвојува од субасоцијацијата *brachypodietosum* се *Logfia arvensis*, *Scleranthus perennis* subsp. *dichotomus*, *Sedum hispanicum*, *Verbascum lesnovoensis*, *Trifolium retusum*, *Valerianella turgida* и *Elymus hispidus* subsp. *hispidus*.

Table 1: Analytical table of ass. *Erysimo diffusi*-*Trifolietum angustifolii* Micevski 1977.**Tabela 1:** Analitična tabela asociacije *Erysimo diffusi*-*Trifolietum angustifolii* Micevski 1977.

Number of relevé	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2		
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	
Erysimo-Trifolietum																													
<i>Erysimum diffusum</i>	+	+	+	+	.	.	+	+	+	.	+	+	+	+	+	+	+	+	+	.	+	+	1	1	+	+	+	+	
<i>Trifolium sylvaticum</i>	+	.	.	1	.	2	2	1	1	1	1	1	1	1	2	2	3	1	1	1	1	.	+	1	1	+	.	.	
<i>Trifolium angustifolium</i>	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	+	+	+	+	+	.	.	.	.	+	2	+	+	
<i>Trifolium leucanthum</i>	.	.	.	1	.	1	+	+	+	+	.	1	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	
<i>Vulpia myuros</i>	.	.	.	.	.	+	.	.	.	.	1	1	+	2	.	1	+	.	.	1	.	.	.	.	.	.	.	.	
<i>Trifolium echinatum</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	
<i>Trifolium striatum</i> subsp. <i>striatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	
<i>Trifolium physodes</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Ventenata dubia</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
scleranthetosum subass. nova																													
<i>Logfia arvensis</i>	2	3	2	3	3	1	1	1	2	2	2	2	+	1	3	1	1	3	2	2	2	.	.	.	.	.	+	+	
<i>Scleranthus perennis</i> subsp. <i>dichotomus</i>	.	.	.	3	1	.	1	.	1	1	3	2	+	.	+	1	.	+	.	+	.	+	.	.	.	.	.	.	
<i>Sedum hispanicum</i>	1	+	.	1	2	1	.	+	2	2	2	1	1	.	.	.	.	+	.	.	.	.	.	1	+	.	.	.	
<i>Verbascum lesnovoensis</i>	1	+	+	+	.	.	.	.	.	+	.	+	+	+	.	+	+	.	.	.	+	+	.	.	.	.	.	.	
<i>Trifolium retusum</i>	.	.	.	.	+	.	.	.	.	+	+	.	+	+	.	+	.	.	.	.	.	.	.	+	.	.	.	1	
<i>Valerianella turgida</i>	.	.	.	.	2	.	2	1	3	.	.	+	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	
<i>Elymus hispidus</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
brachypodietosum subass. nova																													
<i>Minuartia hamata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Brachypodium distachyon</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Echinaria capitata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Ziziphora capitata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Linum corymbulosum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Coronilla scorpioides</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Buffonia tenuifolia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
<i>Dianthus pallens</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Trifolion cherleri																													
<i>Taeniatherum caput-medusae</i>	1	1	2	.	1	1	1	2	+	1	1	1	1	1	2	3	2	2	1	1	2	1	.	+	+	1	1	1	
<i>Petrorhagia prolifera</i>	+	+	+	+	.	.	1	1	+	1	1	1	1	+	+	1	1	.	+	+	1	+	+	+	+	+	+	+	
<i>Galium macedonicum</i>	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	.	1	+	.	.	.	
<i>Vulpia ciliata</i>	.	.	.	.	.	1	.	2	+	+	1	2	2	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	
<i>Silene frivaldskyana</i>	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	
<i>Allium guttatum</i> subsp. <i>sardoum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	
<i>Aphanes arvensis</i>	.	.	.	.	.	+	.	.	.	+	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	
Astragalo-Potentilletalia																													
<i>Astragalus onobrychis</i> var. <i>chlorocarpus</i> f. <i>chlorocarpus</i>	+	2	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	1	+	1	1	+	1	+	1	
<i>Bromus squarrosus</i>	1	2	1	2	2	2	1	2	3	2	2	2	+	3	1	2	2	2	1	2	2	+	+	1	1	+	2	2	
<i>Centaurea grisebachii</i>	+	+	.	2	1	1	1	1	1	1	1	1	+	+	+	1	+	+	+	+	1	1	+	+	+	+	.	.	
<i>Potentilla laciniosa</i>	.	.	+	1	2	1	1	.	+	1	1	+	1	1	+	2	1	3	2	1	2	+	+	1	+	+	.	.	
<i>Thymus pseudo-atticus</i> var. <i>vardarensis</i>	2	2	2	3	3	2	1	2	1	2	2	2	3	3	+	2	2	1	1	1	1	.	.	2	2	+	+	+	
<i>Dasypyrum villosum</i>	1	2	1	1	2	1	+	1	1	1	+	+	+	1	+	+	.	.	.	.	.	.	+	.	+	1	1	1	
<i>Medicago rigidula</i>	3	2	3	+	+	1	1	2	1	1	+	1	1	1	1	+	+	1	+	+	1	+	+	+	1	+	+	+	
<i>Aegilops neglecta</i>	2	+	+	1	1	+	+	+	+	+	+	1	+	1	+	.	.	.	.	.	.	.	+	+	.	+	1	1	
<i>Xeranthemum annuum</i>	+	1	1	1	1	+	+	1	+	+	1	+	+	+	+	+	1	1	2	1	1	+	+	+	+	+	+	+	
<i>Ornithogalum comosum</i>	.	.	+	+	+	1	1	1	+	.	.	+	1	1	+	+	1	1	1	1	+	.	+	1	1	1	+	+	
<i>Sedum sartorianum</i>	.	.	1	1	1	.	1	1	+	+	+	+	+	+	1	.	1	.	.	.	.	.	+	+	1	+	+	.	.
<i>Hypericum rumeliacum</i> var. <i>rumeliacum</i>	+	+	+	1	.	1	1	+	.	+	+	+	.	1	.	+	+	.	.	.	.	.	1	+	+	+	+	.	
<i>Petrorhagia illyrica</i> subsp. <i>haynaldiana</i>	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+	
<i>Dianthus gracilis</i> subsp. <i>gracilis</i>	.	+	+	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	1	1	.	+	+
<i>Galium tenuissimum</i>	.	.	.	2	1	1	1	1	.	1	+	+	1	2	1	1	2	2	3	1	2	.	.	.	.	.	.	+	+

Number of relevé	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
<i>Crepis sancta</i>	2	1	.	1	1	1	+	+	+	+	1	1	1	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.
<i>Minuartia hirsuta</i> subsp. <i>falcata</i>	.	.	.	2	1	1	.	1	+	.	1	+	1	1	.	+	.	+	.	1	.	.	+	.	.	.	.	.
<i>Torilis leptophylla</i>	1	+	.	+	1	+	+	+	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	+	.	.	.
<i>Scabiosa triniifolia</i>	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	+	+	.	.	.	.
<i>Petrorhagia illyrica</i> subsp. <i>illyrica</i>	.	.	.	.	+	.	+	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	+	+	+	.	.
<i>Acinos hungaricus</i>	+	1	+	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.	1	1	.	.	.
<i>Anthemis ruthenica</i>	.	.	.	.	.	.	.	.	+	+	.	+	.	3	1	+	+	+	1	2	.	.	.	.	.	.	.	.
<i>Viola kitaibeliana</i>	+	1	+	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	1	+	.	.	.	.	.	.	.	.
<i>Onobrychis alba</i> subsp. <i>calcarea</i> var. <i>echinata</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.
<i>Crepis foetida</i> subsp. <i>rhoeadifolia</i>	+	.	.	.	+	+	.	.	+	+	.	.	.	.	.	+	.	.	1	+	+	.	.	.	.	+	+	.
<i>Crucianella graeca</i>	1	+	.	+	.	+	+	.	.	.	.	.	.	.	.	1	2	+	+	+	.	.	.	.	.	.	.	.
<i>Sideritis montana</i>	.	.	2	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
<i>Leontodon crispus</i> subsp. <i>crispus</i>	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.
<i>Rumex acetosella</i> var. <i>multifidus</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	+	+	.	.	.	.
<i>Festuca thracica</i> subsp. <i>violaceo-sordida</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Bupleurum apiculatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
<i>Thymus tosevii</i> subsp. <i>tosevii</i> var. <i>tosevii</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	2	1	.	.	.	.
<i>Allium meteoricum</i>	.	.	.	+	+	+	+	.	1	+	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Petrorhagia saxifraga</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Linaria simplex</i>	.	.	.	1	2	1	+	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
<i>Thymelaea passerina</i> f. <i>passerina</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Echinops microcephalus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Tragopogon balcanicus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
<i>Potentilla argentea</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.
<i>Plantago subulata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.
<i>Onobrychis alba</i> subsp. <i>calcarea</i>	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Scabiosa argentea</i> subsp. <i>ucranica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
<i>Allium stamineum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
<i>Medicago prostrata</i> subsp. <i>pseudorupestris</i> var. <i>pseudorupestris</i> f. <i>pseudorupestris</i>	.	.	.	.	.	1	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Euphorbia seguieriana</i> subsp. <i>niciciana</i>	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
<i>Onobrychis alba</i> subsp. <i>calcarea</i> var. <i>striatula</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Festuco-Brometea																												
<i>Eryngium campestre</i>	1	.	+	2	1	1	1	1	+	1	1	1	+	1	1	+	1	1	1	+	1	1	1	+	+	1	+	+
<i>Trifolium scabrum</i> f. <i>scabrum</i>	1	1	.	1	1	2	2	1	1	+	1	1	1	1	2	1	1	1	1	1	1	+	.	+	+	1	+	+
<i>Poa bulbosa</i>	.	.	.	2	2	2	1	2	2	2	2	1	2	2	2	2	.	+	1	1	.	1	2	+	+	+	.	+
<i>Herniaria incana</i> var. <i>incana</i>	+	+	.	+	+	+	+	+	+	1	+	1	+	+	.	+	1	+	+	+	.	+	.	.	.	+	+	+
<i>Dichanthium ischaemum</i>	2	2	1	+	2	1	.	.	.	1	.	1	.	1	1	+	.	.	.	+	+	1	2	+	+	+	+	+
<i>Holosteum umbellatum</i>	+	+	+	.	.	+	+	.	+	+	+	+	+	+	.	+	+	+	+	+	+	+	+	+	.	.	.	.
<i>Trifolium incarnatum</i> subsp. <i>molinerii</i>	.	.	.	+	+	.	.	.	.	.	.	+	+	+	+	+	.	.	.	.	.	.	.	+	1	1	+	+
<i>Convolvulus cantabrica</i>	+	+	1	2	1	1	1	1	1	+	.	.	+	+	+	1	1	+	1	+	1	.	.	.	+	.	.	.
<i>Trigonella monspeliaca</i>	+	+	+	+	+	1	1	+	1	1	+	+	+	+	+	+	+	1	+	.	+	+	+	+	.	.	.	.
<i>Asperula cynanchica</i>	.	+	.	+	.	+	+	.	+	+	+	+	+	.	.	+	+	+	+	.	+	2	+	.	.	.	+	+
<i>Melica ciliata</i>	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	+	1	+	+	1	+	1	1	.	.
<i>Teucrium polium</i>	1	1	2	.	.	.	.	.	.	.	1	+	.	.	.	+	+	+	+	+	+	.	+	.	.	.	.	+
<i>Bombycilaena erecta</i>	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
<i>Chondrilla juncea</i>	.	.	.	+	+	+	.	.	.	.	.	.	+	+	+	.	.	+	+	+	.	.	.	+	+	+	+	+
<i>Euphorbia cyparissias</i>	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.	+	+	.	.	.	1	+	.	.	+	+	+
<i>Koeleria splendens</i>	.	.	.	2	+	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	2	.	.
<i>Carthamus lanatus</i>	.	.	.	+	+	1	+	+	.	.	.	+	+	+	+	.	1	+	+	1	.	.	.	.	.	.	+	.
<i>Chrysopogon gryllus</i>	.	.	+	+	+	+	+	+	.	.	.	.	.	.	.	.	2	+	+	+	+	.	.	.	.	1	+	2
<i>Achillea setacea</i>	.	.	.	+	.	2	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	1	+
<i>Sanguisorba minor</i> subsp. <i>muricata</i>	.	.	.	.	+	.	.	.	.	1	+	+	1	1	.	.	.	.	.	.	.	1	1	.	.	.	.	.
<i>Phleum phleoides</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	1	1

[illegible]

Number of relevé	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
<i>Valerianella coronata</i>	2	1	1	1	1	.	.	.	.	.	.	1	.	.	.	1	+	+	+	+	.	+	+	+	1	1	+	+
<i>Nigella arvensis</i> f. <i>tuberculata</i>	+	+	+	.	.	1	1	1	+	+	+	+	.	+	+	+	1	1	1	1	1	.	.	+	+	+	.	.
<i>Trifolium hirtum</i>	1	2	1	1	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.
<i>Stipa capillata</i>	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	2	3	.	+	+
<i>Plantago lanceolata</i>	.	.	.	.	.	.	+	+	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	+	.	+	+
<i>Tribulus terrestris</i> var. <i>terrestris</i>	.	.	.	+	+	.	.	.	+	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.
<i>Crepis setosa</i>	+	.	.	+	+	+	+	1	+	.	.	.	1	.	+	+	.	.	+	+	+	.	.	+	.	2	2	.
<i>Taraxacum officinale</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Tragopogon dubius</i>	.	.	.	.	+	.	.	.	.	+	+	.	.	.	+	+	+	.	.	+	.	.	.	+	+	.	.	.
<i>Paliurus spina-christi</i>	+	+	1	.	+	+	+	+	.	.	.	.	+	.	.	.	.	.	+	.	.	+	.	+	+	.	.	.
<i>Cerastium brachypetalum</i> subsp. <i>roeseri</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	2	2	1	1	1	.	.
<i>Sherardia arvensis</i>	.	.	.	.	.	+	.	.	.	.	.	1	+	+	.	.	.	.	.	.	.	.	.	.	+	+	1	1
<i>Cynosurus echinatus</i>	.	.	.	.	.	+	+	.	.	+	.	.	.	+	.	+	+	+	.	1	.	.	.	.	+	+	+	+
<i>Polygonum aviculare</i>	.	.	.	+	+	+	+	+	.	.	.	+	.	.	.	.	+	+	+	+	+	.	.	+	+	+	.	.
<i>Conyza canadensis</i>	+	+	.	.	.	.	.	.	.	.	1	.	+	.	.	.	+	+	+	+	+	+	.	.	.	.	.	.
<i>Calepina irregularis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Centaurea solstitialis</i> subsp. <i>solstitialis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Eragrostis minor</i>	.	.	.	1	1	.	.	.	1	1	+	1	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Euphorbia helioscopia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Portulaca oleracea</i>	.	.	.	.	.	.	.	.	+	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Alyssum desertorum</i>	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Bromus tectorum</i>	.	+	.	+	.	.	.	.	+	+	.	2	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Setaria viridis</i>	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.
<i>Anthemis austriaca</i>	.	.	.	+	+	+	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Orlaya grandiflora</i>	.	+	.	+	+	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
<i>Scleranthus annuus</i> subsp. <i>polycarpus</i>	.	.	.	.	.	.	.	.	2	.	.	+	+	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Vicia hirsuta</i>	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.
<i>Carthamus dentatus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Tragus racemosus</i>	.	.	.	1	1	.	.	.	+	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Gagea arvensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Ranunculus ficaria</i> subsp. <i>calthifolius</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Digitalis lanata</i>	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
<i>Marrubium peregrinum</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.
<i>Heliotropium europeum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.
<i>Hieracium hoppeanum</i> subsp. <i>troicum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Papaver rhoeas</i> subsp. <i>rhoeas</i>	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+	1	1	+	.	.	.	.	.	.	.	.
<i>Convolvulus arvensis</i>	.	.	.	+	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.
<i>Alyssum strigosum</i>	1	1	.	.	.	.	.	.	.	+	1	+	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Carduus acanthoides</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lactuca serriola</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.
<i>Lathyrus cicera</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Arrhenatherum elatius</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	+	.	.	.
<i>Picnemon acarna</i>	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Stachys plumosa</i>	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Buglossoides arvensis</i>	.	.	+	.	+	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Herniaria hirsuta</i> f. <i>hirsuta</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.
<i>Anthemis arvensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Saxifraga tridactylites</i>	.	.	.	.	.	.	.	.	.	.	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lathyrus nissolia</i> var. <i>nissolia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Geranium columbinum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hypecoum pendulum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Myosotis arvensis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cichorium intybus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lotus corniculatus</i> var. <i>tenuis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.

110
Brought to you by | National & University Library
Authenticated | 10.248.254.158
Download Date | 8/26/14 4:56 AM

[illegible]