CLASSIFICATION OF SEMI-NATURAL GRASSLANDS IN NORTH-EASTERN BULGARIA

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ABSTRACT - This study presents the syntaxonomic diversity of the semi-natural grasslands in North-Eastern Bulgaria following the principles of the Zürich-Montpellier School. A total number of 172 relevès, collected during 2002-2004, is used. TWINSPAN clustering is applied for determination vegetation types. The diagnostic species groups for the associations and subassociations are created by Cocktail method using the phi-coefficient with values above 0.3 within the JUICE software. As a result class *Festuco-Brometea* is established with the alliances *Festucion valesiacae*, *Pimpinello-Thymion* and *Chrysopogoni-Danthonion*. The originally described *Botriochloetum ischaemi* Pop 1977 association is considered as typical on the subassociation level and a part of our relevès are referred to it. Following the nomenclature rules we determined the subassotiation typicum. One new subassociation named *Thymetosum pannonici* of more xerophytic character, as compared to typical one, and well represented by differential species is established. The geographical distribution of *Agropyro-Thymetum zygoidi* and *Agrostideto-Chrysopogonetum grylli* associations is extended to the territory of Bulgaria. Class *Molinio-Arrhenatheretea* is represented by *Cynosurion* alliance and *Festuco-Agrostidetum* association is established by its probably most eastern area of distribution.

KEY WORDS - grasslands, syntaxonomy, Bulgaria.

INTRODUCTION

The potential natural vegetation in the largest part of North-Eastern Bulgaria belongs to the mixed deciduous broad-leaved forests and only narrow belt at the Romanian border belongs to the forest-steppes and grass-steppes (Bohn *et al.*, 2004). The historical relations with the Romanian and Moldavian steppes and forest-steppes have exerted a strong influence on the contemporary vegetation (Dihoru & Donita, 1970; Paşcovischi & Donita, 1967). Having been inhabited for millennia, nowadays this territory is occupied mostly by arable fields, forests, semi-natural grasslands and synanthropic vegetation mainly on abandoned arable lands.

The vegetation in this part of the country has so far not been studied according to the Braun-Blanquet approach. A thorough overview on the steppe-like vegetation

in Bulgaria was made by Jordanoff (1936). Some information on the plant communities, following dominance principles, is represented by Stoyanov *et al.* (1955) and Ganchev *et al.* (1964).

Palinological data is available on the historical changes concerning the characteristics of steppe vegetation and its distribution in the north-eastern part of the region under review: From the beginning of the Holocene, grass communities were represented in "open steppes" with a poorer floristic composition and a more limited presence of the *Poaceae*. Their development in time led to the formation of typical steppes with a rich composition of species and a higher presence of grasses. The development of forest-steppe began about 8000 BP. Further on, the proportion of typical steppes and the forest-steppe zone fluctuated in direct relation to the intensity of anthropogenic influence: lumbering, ploughing up, etc. (Atanassova, 2005).

In the zone around the Danube, from the beginning of the Holocene, oak forests dominated and grasses developed further, while the presence of steppe elements was regarded as secondary (Lazarova, 1998; Lazarova & Bozilova, 2001).

We can conclude that the majority of grass communities in North-Eastern Bulgaria are of secondary origin, the presence of steppe elements in them is secondary, and only in the north-easternmost part primary steppe communities can be found, and these are marked by a strong anthropogenic influence.

This study aims to present the syntaxonomic diversity of the semi-natural grasslands in North-Eastern Bulgaria following the principles of the Zürich-Montpellier School.

Our work was conducted within the frame of the National Grassland Inventory Project. Due to limited space we present here the results related to the classes *Festuco-Brometea* and *Molinio-Arrhenatheretea*. The vegetation within the class *Artemisietea vulgaris* (*Dauco-Melilotion*, *Convolvulo-Agropyrion* and *Onopordion*) will be the subject of another article.

Materials and Methods

The studied area is outlined on the Figure 1. The relief is predominantly plain or hilly with mean altitude 250 - 350 m (Stefanov, 2002). The study area includes also some parts of the northern Balkan Range foothills where the maximum altitude is about 1000 m. According to the national climate data (Nikolova, 2002) the mean annual temperatures are 10 - 13°C, which is equal to the values for the country. The mean annual precipitation is 537 mm (Mateeva, 2002) which is less than the average for the plain and hilly regions of the country.

The zonal soil types are related to 3 main groups: Chernozems and Faeozems to the north, and Luvisols at the Balkan Range foothills (Ninov, 2002). These soil types are developed on different basic rocks, such as limestone, loess, mergels and clays.

The relevès were collected during 2002-2004 following the floristic criteria (Braun-Blanquet, 1964, Westhoff & van der Maarel, 1973). For the purposes of the project, a simplified old Braun-Blanquet scale for abundance was used ("1"-up to 1%; "2"- 2-50%; "3" - above 50% of the total). The sample plot area for all relevès is 100 m^2.

FIGURE 1 - Map of the studied area.

The relevès were stored in Turboveg database (Hennekens & Schaminee, 2001). They were exported into JUICE software (Tichý, 2002) for analysis. A polythetic divisive clustering using TWINSPAN (Hill, 1979) was applied for determining the major groups. Some outlier relevès were deleted from subsequent analyses. For the present study a total number of 172 relevès was used. The diagnostic species were defined using the available literature sources (Horvat *et al.*, 1974; Oberdorfer, 1993; Mucina, 1997; Sanda *et al.*, 1998; Kojić *et al.*, 1998; Chytrý & Tichý, 2003 and others mentioned below). The diagnostic species groups were created by the Cocktail method (Bruelheide, 1995) using the phi-coefficient (Chytrý *et al.*, 2002). The diagnostic role was recognized by fidelity above 30 (phi-coefficient 0.3). The nomenclature of the syntaxa is in accordance with the Code of phytosociological nomenclature (Weber *et al.*, 2000). The vascular plant taxonomy follows Andreev *et al.* (1992), Delipavlov *et al.* (2003) and Petrov (1975) for the mosses. The phytogeographic affiliation of the species follows Dimitrov (2002).

RESULTS AND DISCUSSION

Festuco-Brometea has the most widespread distribution. This class comprises communities that are closest to natural ones; their composition is dominated by natural species for the area, although, in a number of cases, human activity has led to the presence of synanthropic species. It is represented in the region by 3 alliances:

Festucion valesiacae is covered by the largest number of relevès and should be considered as the most broadly distributed alliance in the region. During the data processing we tried to distinguish both *Festucion valesiacae* and *Festucion rupicolae*. However, the diagnostic species groups given by most mentioned literary sources show a high extent of coincidence. We also obtained coinciding groups of relevès, corresponding to the diagnostic species groups for each alliance. Royer (1991) points out *F. valesiacae* as synonym to *F. rupicolae*. We accepted the presence of *F. valesiacae* in the studied area following also Sanda *et al.* (1999) and Rodwell *et al.* (2002).

The described communities in Table 1 refer to the association *Botriochloetum ischaemi* (Krist 1937) I. Pop 1977. According to Pop (1977), this association is widespread in Romania and the communities of *Botriochloa ischaemum* occupy the forest-steppe and steppe zones as secondary vegetation type, mostly as pastures. In the adjacent territories in Bulgaria it preserves the same characteristics as described by Pop. The pasture regime, which has been intense in the past, is nowadays diminished or missing. The association is developed mostly on base-rich terrains and only on few occasions can be found on silicate bedrock. The communities contain many nitrophilous species as a result of human influence. Everywhere it is managed as pasture, but in varying degrees of intensity. We support the comments by Pop that the variety of described syntaxa of *Botriochloa ischaemum* in the zones of forest-steppes actually belong to one association with different subassociations, formed locally within the area of occupancy. So far, the same association has been mentioned for Bulgaria by Tzonev (2002), who reports a new subassociation *Cichorietosum inthybi* from the central part of North Bulgaria with differential species *Cichorium inthybus*, *Taraxacum serotinum*, and *Crepis setosa*. However, this subassociation seems strange when comparing the categorial constancy columns (Tab. 1). *Cichorium inthybus* is with high constancy in the represented by Pop (1977) synthetic table and in ours relevès as well.

The association described by Pop is dominated by European and Euro-Asiatic phytogeographical elements (75.6%). In North-Eastern Bulgaria, the representatives of this group decline to 50.4%, while Ponto-Mediterranean elements' presence has increased (43.7%).

Using the data from many literary sources, and comparing with other published syntaxa of similar character, Pop (1977) describes this association as typical vegetation for large area. But neither he nor any other author has appointed the typical subassociation. Part of Bulgarian communities show considerable degree of similarity with the Romanian ones. In the North-Eastern Bulgaria they could be characterised as xeromesophytic pasturelands which environmental conditions provide sufficient forage resources. Being grazed for many years, they are much invaded by nitrophylous plants and species persisting the trampling. This is why species like *Trifolium repens*, *Cynodon dactylon*, *Lolium perenne* play a differential role for the subassociation. The described communities in Bulgaria are characterised by mesophytic ecological conditions which is in accordance with the reported from Romania. They most often develop on moderately moist soils, upon different rock types. The communities are distributed all over the studied zone, between 40 and 450 m altitude. Most of them are used as pastures at present with relatively high intensity.

Following the nomenclature rules, we suggest subassociation *typicum* which includes published by Pop (1977) groups and our releves (rel. 73 - 99, Tab. 1). As lectotype for the association and for the subassociation *typicum* we selected rel. 4, Tab. 35 (Pop, 1968).

As a result of the analyses, one new subassociation appears. It is characterised by well distinguished differential species group (Tab. 1) and also by the more pronounced xerophytic character of the environment.

Botriochloetum ischaemi (Krist 1937) I. Pop 1977 *thymetosum pannonici* subass. nova (Typus: r.35 Tab.1)

The differential for this subassociation are *Teucrium polium* L., *Chrysopogon gryllus* (L.) Trin, *Thymus pannonicus* All., *Thymus callieri* Borbas ex Velen. ssp. *urumovii* Velen., and *Centaurea rhenana* Boreau. This subassociation is widely distributed within the whole studied area. The communities are developed mostly on limestone and few of them occupy loess or silicate rocks. The soils are Chernosems and Faeozems of medium depth but considerably dry. The communities are spread between 30 and 430 m altitude. The pasture is on very low intensity as compared to the typical subassociation. Depending on the former grazing intensity *B. ischaemum* and *C. gryllus* share the dominance in the communities. *B. ischaemum* bears much more trampling and indicates heavy exploitation in the past. The mean species number is 39 per relevè.

The alliance *Pimpinello-Thymion* was described by Dichoru (Dichoru & Donita, 1970) and is known so far from Ukraine, Crimea and Romania. In classical localities in northern Dobrudscha it occupies limestone areas with shallow soils in dry, rocky habitats. Bulgarian localities retain the ecological characteristics and floristic composition as described by the author. Our analyses reveal the presence of the association *Agropyro-Thymetum zygoidi* Dichoru 1970 (Tab. 2). The studied communities are localised in the Dobrich district and only two are in the Razgrad district (Fig. 1). Everywhere the association develops on limestone with very shallow soils, where rock outcrops occupy up to 25% of the sample plot. The territories are plain or slightly declined (1-5°), with diverse exposure. The biodiversity is considerably high - an average of 58 species per relevè. Comparing the floristic-geographical peculiarities of the species composition within the original described association (Dichoru & Donita, 1970) and our relevès, it is evident that the communities are formed by similar historical development and the more southern territories bear more Mediterranean elements (Tab. 3). The communities traditionally have been used as pastures, but nowadays they are abandoned or grazed at very low intensity. These communities are among the most representative for the semi-natural grasslands on the northern boundary of the forest-steppe zone in Bulgaria. The rich species diversity differentiates them from other, much broadly distributed grasslands within the *Festuco-Brometea*. In this respect, *Agropyro-Thymetum zygoidi* association could be related to the syntaxa of high conservation value. The common floristic composition among the communities described in Northern Dobrudscha (Romania) and those in Bulgaria is a good reason to make a suggestion for the probable primary origin of the Bulgarian communities. But having in mind some differences, being a result of anthropogenic impact, such point of view we can not take a firm stand.

Chrysopogoni-Danthonion is described by Kojić (1957, 1959) for Western Serbia and it is characterized as a specific for the Balkans, being a transition between mesophytic and xerophytic vegetation types. Its communities occupy silicate terrains. The species composition includes high number of Balkan floristic elements and, at the same time, hosts many steppe plants. For Bulgaria, the alliance has so far been reported by Meshinev *et al.* (2005) for the North-Western parts of the country. During our study we found localities on the northern Balkan Range foothills. The environmental peculiarities are similar to those pointed out by Kojić (1959). Being on the eastern boundary of its distribution, here the alliance is represented less typically in terms of diagnostic species group.

The association *Agrostideto-Chrysopogonetum grylli* Kojić 1959 occupies altitude between 220 and 600 m on the northern Balkan Range foothills. Its pronounced mesophytic character is related with the Luvisols of medium depth and moderate moisture, which are developed almost on silicate. The communities are abandoned pastures or at some places under moderate grazing. In individual cases mowing can be observed. The association takes the place of clear-cut *Quercus frainetto* and *Q. cerris* forests. Ecologically the described communities manifest a high degree of identity with those described by Kojić (1959). The floristic similarity is also impressive and this is the reason to refer our relevès to the same association. Considering the subassociations described by Kojić (l.c.) our descriptions are much related to subass. *brizetosum medii* (Tab. 6).

Cynosurion cristati Tx 1947 is represented in Bulgaria, like in Central Europe, with a small number of character species, and bears signs of other alliances within *Molinio-Arrhenatheretea*. In the studied region *Cynosurion* is localized on the northern Balkan Range foothills. Following the statement of Zuidhoff *et al.* (1995) for the high constancy of *Cynosurus cristatus*, *Lolium perenne* and *Trifolium repens* as a mark for the affiliation to *Cynosurion*, we refer our relevès convectively to the same alliance (Tab. 7). Horvat *et al.* (1974) point out that on the Balkans *Cynosurion* communities are not managed in a similar way as in Central Europe. This results in some difference in their species composition, for example with less presence of *Lolium perenne*. In the studied region the communities are not fertilized and are under much reduced grazing. The major type of maintenance is mowing.

Festuco-Agrostidetum Horv. 1951 association is represented in Targovishte and Veliko Tarnovo districts (Fig.1; Tab.8). It occupies different exposures but a low declination (5-10°), always on silicate. Soils are deep and moderately moist. Like in other parts of the country, these communities are predominantly mowed and at some places grazing takes part usually after the haymaking period. Five of the localities have been arable lands in the past, but were abandoned about a decade ago. Some authors (Horvat et al., 1974; Kojiç et al., 1998) refer the association to Arrhenatherion, while others (Boşcau, 1970; Zuidhoff *et al.*, 1995; Sanda et al., 1998) include this syntaxon into *Cynosurion*. We accept the latter decision as more appropriate for the studied communities in Bulgaria.

Syntaxonomical synopsis

Festuco - Brometea Br.-Bl. et R. Tx. in Br.-Bl. 1949

Festucetalia valesiacae Br.-Bl. et R. Tx. 1943

Festucion valesiacae Klika 1931

Botriochloetum ischaemi (Krist 1937) I. Pop 1977

typicum subass. nova

thymetosum pannonici subass. nova

Pimpinello - Thymion zygoidi Dichoru 1970

Agropyro - Thymetum zygoidi Dichoru 1970

Chrysopogono - Danthonion calycinae Kojić 1957

Agrostideto - Chrysopogonetum grylli Kojić 1959

brizetosum medii Kojić 1959

Molinio - Arrhenatheretea R. Tx. 1937

Arrhenatheretalia R. Tx. 1931

Cynosurion cristati R. Tx. 1947

Festuco - Agrostidetum Horvat 1951

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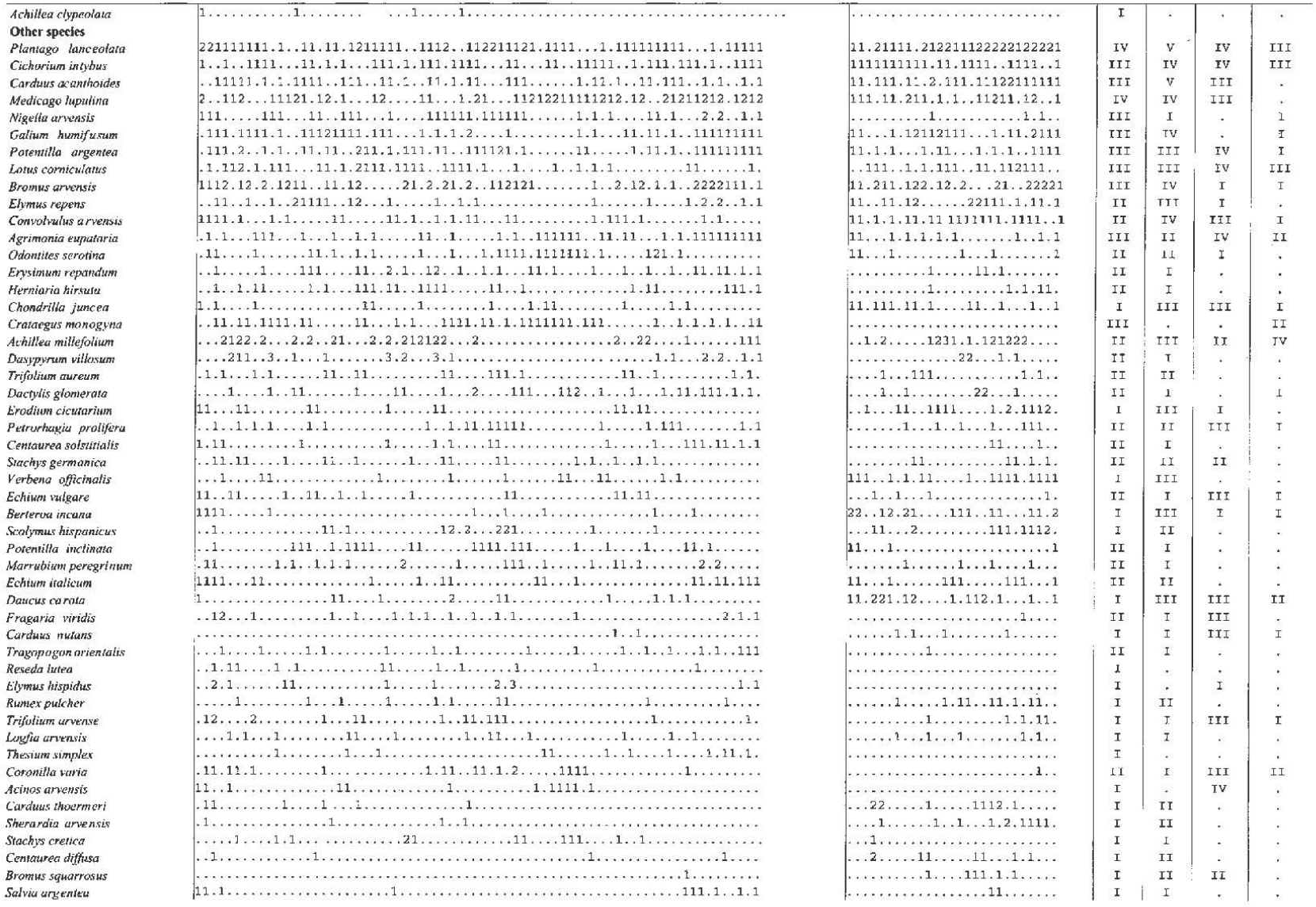
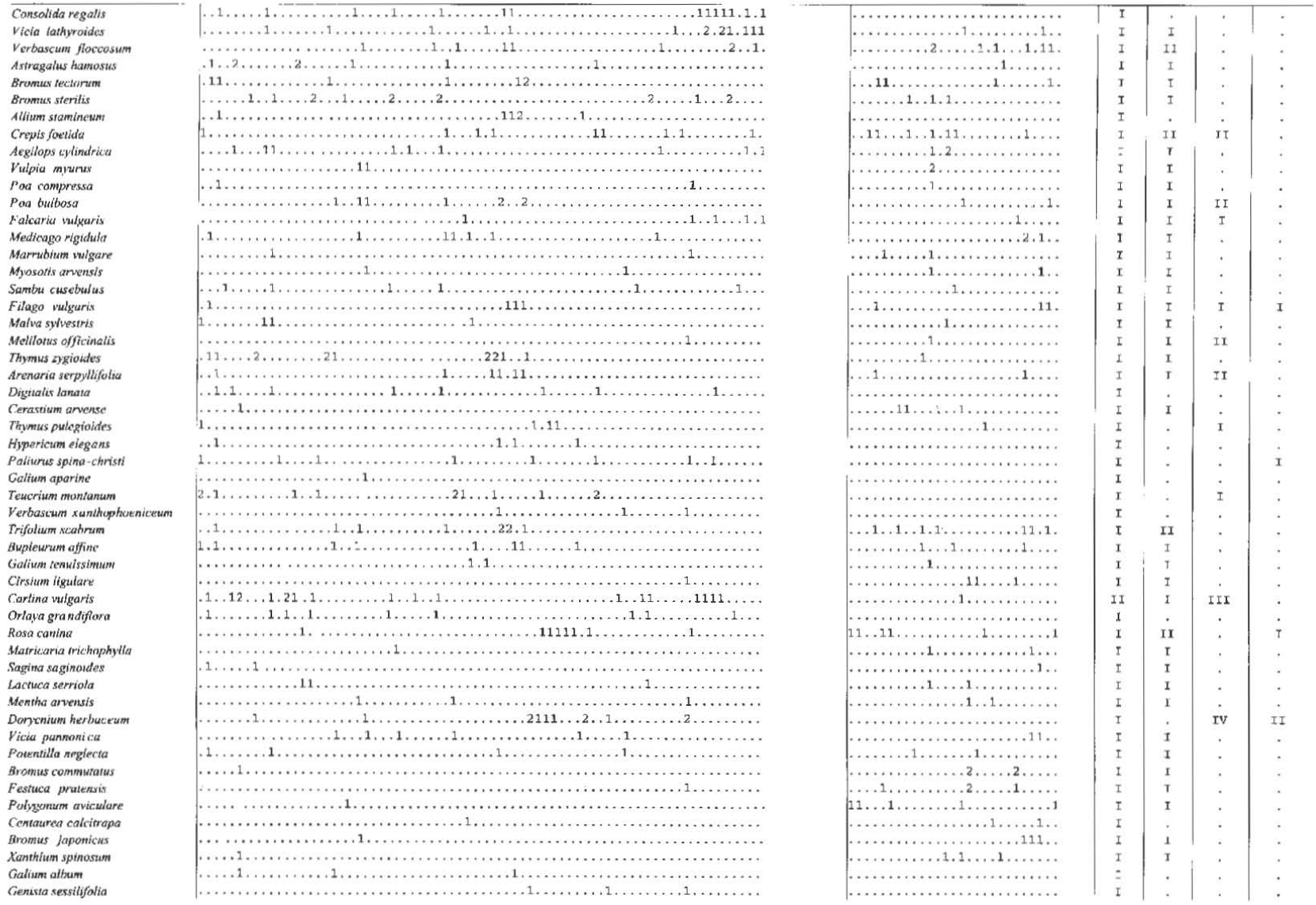
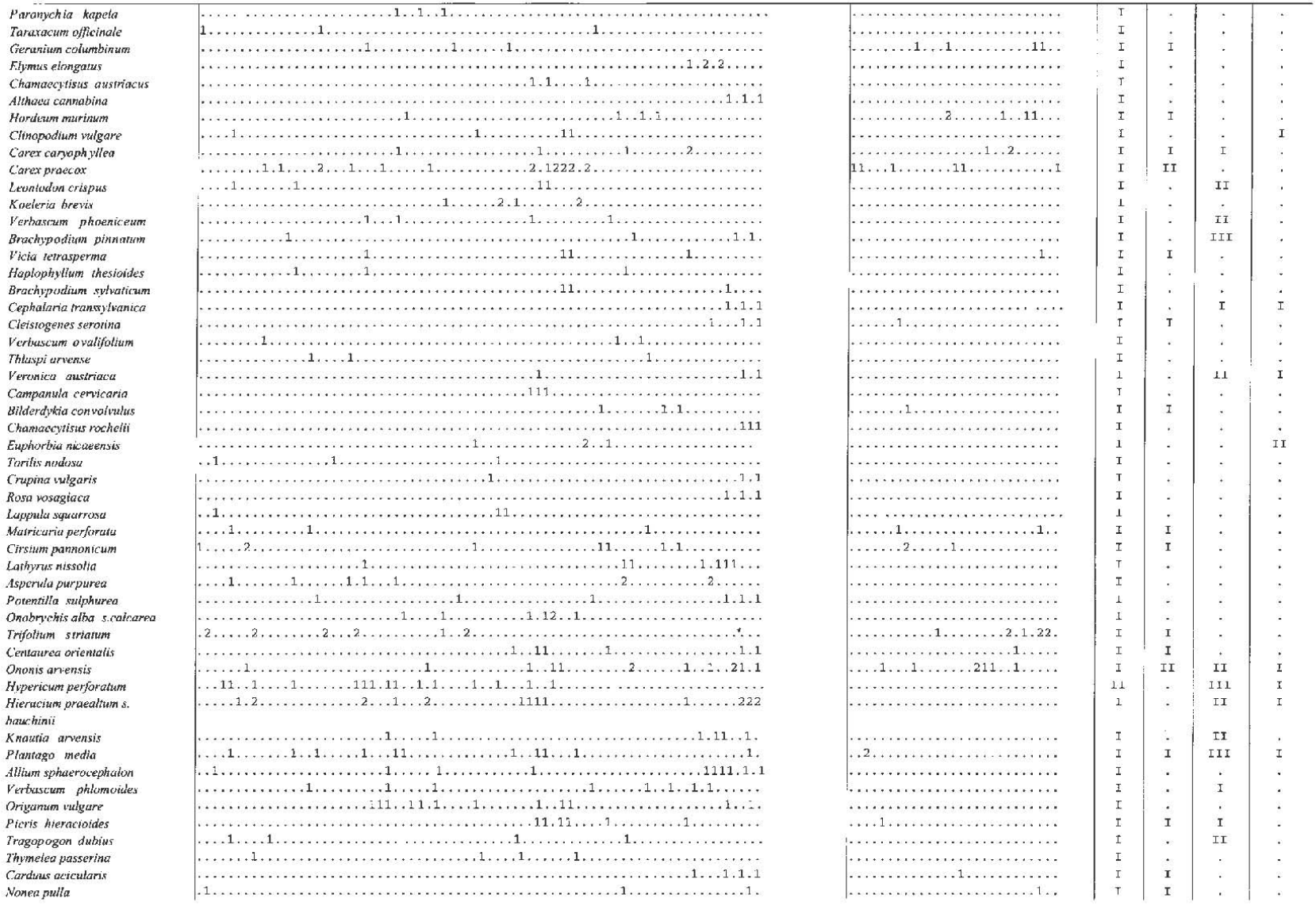
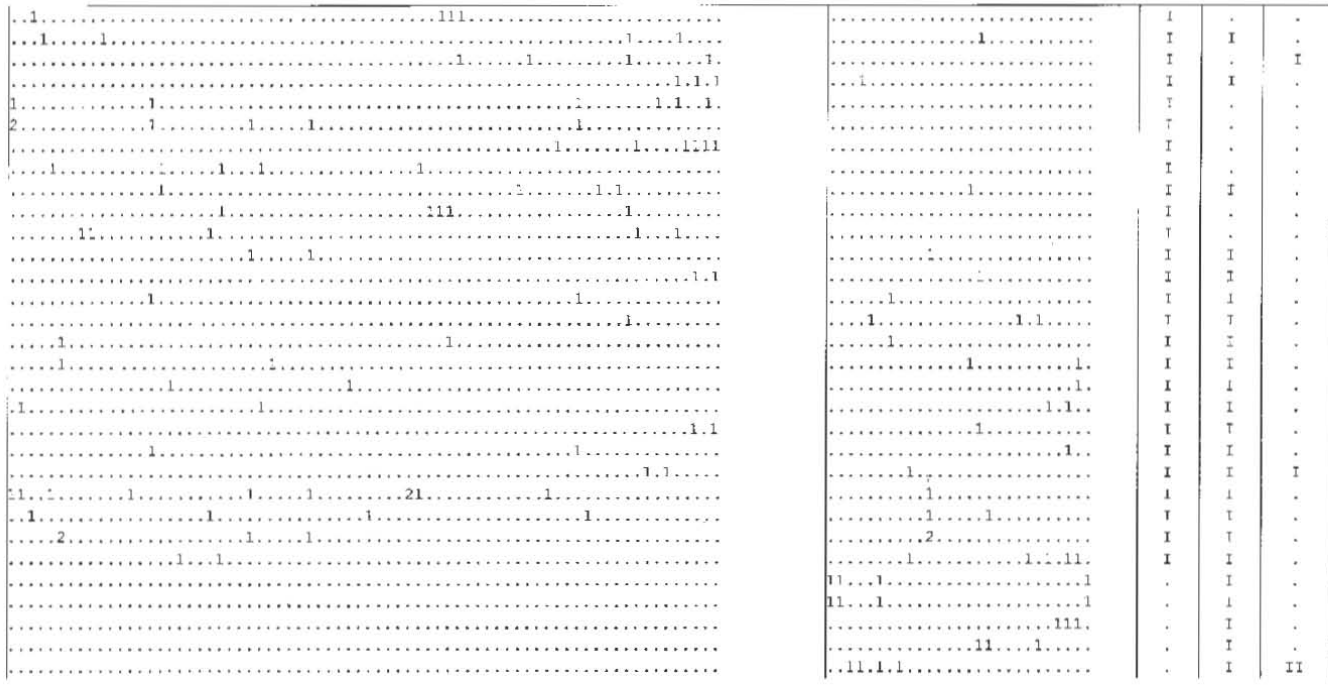
TABLE 1 - Botriochloetum ischaemi (Krist 1934) I. Pop 1977.

	thymetosum pannonici subass. nova (A)	*typicum* subass. nova (B)	Constancy			
			A	B	Pop (1977)	Tzonev (2002)
Relevé No	1111111111222222222233333333334444444445555555556666666666777 12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012	77777778888888889999999999 34567890123456789012345678				
Ass. diagnostic species						
Botriochloa ischaemum	31.21.23213..11222121333...13..2322322222222223323223.22.122323322232323	223222.32212221..2.11222.22	V	V	V	V
Diff. for the subassociations						
Teucrium polium	1.2.1111.12.22121..11.112111122..1..222.2211211212121111.11.111111111.2.2	.....1.....1...	IV	I	.	II
Chrysopogon gryllus	..2212..21.21.1..1....1..21.13...1.21.221.32112211.3121.21.3.31.1211.212	....1.2.....	IV	I	II	II
Centaurea rhenana	1...1.111.1111..11211.12.1..21..211.11111.1.....1.....1...1....1.12...2.	..1.....1.....1.1....	III	I	.	.
Thymus pannonicus	...2221.2.11.21...1...1...2.12.....11.21..2.121..1....1..11.1	.....1.....	II	I	.	.
Thymus callieri s. urumovii	.....2....2...2...11..1..1..122.2.....1..2.....1.22.2..1.1.....	.....1....2.	II	I	.	II
Cynodon dactylon	...1.1...11..1....221..1..1....2..2.....1.1.....11.....	11222111.1111221.2222211221	II	V	II	I
Trifolium repens	.....1..11.....1....1.....1.....	112..11111121.1...2111121.1	I	IV	III	.
Lolium perenne	.2.1.1.....21.1.2...2.....2....1..1.....1.1111.....1...	..121.2.1212211.2.23222221.	II	IV	I	.
Crepis setosa	.1...1.....2....2...2..1.....1..2....1.....1.....	...11.1.1.11..112.11221211.	I	IV	.	II
Bromus mollis	.....2.....2.....1.....1.....1...1.....1...1.1	...11.11.1.2.111211.1.2.1.	I	III	.	.
Festucion valesiacae						
Festuca valesiaca	12223311112322312.2211123231222.3.2211222222322222.113213221.11.232111.1	1112213212.1.2..1211122..11	V	IV	IV	IV
Xeranthemum annuum	2121..2.111..1112111.1221..1.2122.21221111111111.2112..212121.11211.1.1	22.222..2....3..11.2.11.1.2	IV	III	I	II
Teucrium chamaedrys	.11122.11221222211.11211211212211112111112122122211211..1.211.11212121212	....1.....1.....11..	V	I	IV	II
Medicago minima	12..1.1...1.....2..111.1.112.1.21.1.121..1.....1..1..2...11.1.....1.1	..11..11..11.....1..2.21.	II	II	II	.
Thymus glabrescens	.2.1..2..1.21122...2...121....2..1.1.....2.2..1.1221212111	111.1111.....1.....121	II	III	IV	.
Euphorbia seguerana	....1.....122..2...2.1.2..21.....1111111..11.11.1..1.1..1.1.....	...1.....	II	I	.	.
Sideritis montana	21..1.....11.....1.....2..1..211....11.12.....11.1...1..1.....1.1	.....	II	.	.	.
Salvia verticillata	11.....111.2....1.1..1..1.11....1.....11.....1...1.1.....1.....1.1	....1.....2....1.....	II	I	.	.
Alyssum minutum	.....1.....1.1..11...1.....2..11..1.....1...1...1.1.1....11.1	11.1.1.....1	II	I	.	.
Medicago falcata	.11..1.2.....2.....21.1.1.1211.....1.....	.....1..1.....1.211..	I	II	IV	V
Dianthus pallens	.....1...2..111.1.1.1.....1..1...2.2	.....	I	.	.	.
Stipa capillata	2.1.....1..1.2.....	.....	I	.	I	.
Linaria genistifolia	.....1.....1.....1.....1.....1.1...111	.....	I	.	I	.
Taraxacum serotinum	1.....11....1.....1.....1.....1.....1.....1.....	.....	I	.	.	III
Scabiosa ochroleuca	.....1.....1111.....	.....	I	.	III	III
Festuco -Brometea						
Eryngium campestre	11122211111111121.2111211211211212.12.1111111111.12111211111112122212 1.1	2212221112211121.221211...12	V	V	V	V
Achillea crithmifolia	.22....1.111.2.12..221.1.1.....122.1112.1..112211111.12..2121.222222.1.	33.2.31222.2..2.1.....12223	IV	III	.	.
Asperula cynanchica	211....11.2111121111.1.112..21.21.1.12111111112111211..1.1.111.....1111	.....1..1.....1....	IV	I	IV	II
Artemisia austriaca	..221.2..1...2.11121..1.....1...111..2.1.2.....1.....1.1.1....1.1.1	22...2..22221.1...2....2..2	II	III	.	.
Galium verum	.1211....11.1.111.211...1.....11.1....1111.....111.1111.111.1.1.1.1.11.1	..111.11.....1.21..1111112.	III	III	IV	II
Xeranthemum cylindraceum	.1.312123.....12.121.11..1..111..1..11....1.11.....1221.....121222...	11...1..1212.11...1...11211	III	III	.	I
Poa angustifolia	.1...1.....1.2...1....1.....1...12...1.....1....12.111...1.1.1...1.	11..11.2112111.21211...12.1	II	IV	.	II
Sanguisorba minor	.1.1...1111111.1....1111111.111..1.1..1.2.1111..2.1...21.....11...111.1	..1.....1..	III	I	III	II
Scabiosa argentea	.....1..1.....1...11....12...1111...1.111111211.1..1..1.1.1..1..1121	...1.....1.....	III	I	.	I
Koeleria nitidula	1.1.....121.12..1..11..12.1..1....1....12.....1..1.1.11211.1...1...1...	.....1.....2.....	II	I	.	.
Convolvulus cantabrica	21.....1.....1.1....11.1.11.....1.1.....1.1	.....	I	.	.	.
Allium flavum	.....1....21.....1..111.....	.....	I	.	.	.
Adonis vernalis	.....1.....11.....1.....1.....	.....	I	.	I	.


Achillea clypeolata
Other species
Plantago lanceolata
Cichorium intybus
Carduus acanthoides
Medicago lupulina
Nigella arvensis
Galium humifusum
Potentilla argentea
Lotus corniculatus
Bromus arvensis
Elymus repens
Convolvulus arvensis
Agrimonia eupatoria
Odontites serotina
Erysimum repandum
Herniaria hirsuta
Chondrilla juncea
Crataegus monogyna
Achillea millefolium
Dasypyrum villosum
Trifolium aureum
Dactylis glomerata
Erodium cicutarium
Petrorhagia prolifera
Centaurea solstitialis
Stachys germanica
Verbena officinalis
Echium vulgare
Berteroa incana
Scolymus hispanicus
Potentilla inclinata
Marrubium peregrinum
Echium italicum
Daucus carota
Fragaria viridis
Carduus nutans
Tragopogon orientalis
Reseda lutea
Elymus hispidus
Rumex pulcher
Trifolium arvense
Logfia arvensis
Thesium simplex
Coronilla varia
Acinos arvensis
Carduus thoermeri
Sherardia arvensis
Stachys cretica
Centaurea diffusa
Bromus squarrosus
Salvia argentea


Consolida regalis
Vicia lathyroides
Verbascum floccosum
Astragalus hamosus
Bromus tectorum
Bromus sterilis
Allium stamineum
Crepis foetida
Aegilops cylindrica
Vulpia myurus
Poa compressa
Poa bulbosa
Falcaria vulgaris
Medicago rigidula
Marrubium vulgare
Myosotis arvensis
Sambu cusebulus
Filago vulgaris
Malva sylvestris
Melilotus officinalis
Thymus zygioides
Arenaria serpyllifolia
Digitalis lanata
Cerastium arvense
Thymus pulegioides
Hypericum elegans
Paliurus spina-christi
Galium aparine
Teucrium montanum
Verbascum xanthophoeniceum
Trifolium scabrum
Bupleurum affine
Galium tenuissimum
Cirsium ligulare
Carlina vulgaris
Orlaya grandiflora
Rosa canina
Matricaria trichophylla
Sagina saginoides
Lactuca serriola
Mentha arvensis
Doryenium herbaceum
Vicia pannonica
Potentilla neglecta
Bromus commutatus
Festuca pratensis
Polygonum aviculare
Centaurea calcitrapa
Bromus japonicus
Xanthium spinosum
Galium album
Genista sessilifolia


Paronychia kapela
Taraxacum officinale
Geranium columbinum
Elymus elongatus
Chamaecytisus austriacus
Althaea cannabina
Hordeum murinum
Clinopodium vulgare
Carex caryophyllea
Carex praecox
Leontodon crispus
Koeleria brevis
Verbascum phoeniceum
Brachypodium pinnatum
Vicia tetrasperma
Haplophyllum thesioides
Brachypodium sylvaticum
Cephalaria transylvanica
Cleistogenes serotina
Verbascum ovalifolium
Thlaspi arvense
Veronica austriaca
Campanula cervicaria
Bilderdykia convolvulus
Chamaecytisus rochelii
Euphorbia nicaeensis
Torilis nodosa
Crupina vulgaris
Rosa vosagiaca
Lappula squarrosa
Matricaria perforata
Cirsium pannonicum
Lathyrus nissolia
Asperula purpurea
Potentilla sulphurea
Onobrychis alba s.calcarea
Trifolium striatum
Centaurea orientalis
Ononis arvensis
Hypericum perforatum
Hieracium praealtum s. hauchinii
Knautia arvensis
Plantago media
Allium sphaerocephalon
Verbascum phlomoides
Origanum vulgare
Picris hieracioides
Tragopogon dubius
Thymelea passerina
Carduus acicularis
Nonea pulla



Species in less than 3 relevès:

Portulaca oleracea 1: 2, *Cirsium arvense* 83: 1; *Saturejacoerulea* 1: 1, 51: 1; *Linum tenuifolium* 44: 1, 45: 1; *Aegilops triuncialis* 5: 2, 13: 1; *Poa annua* 66: 1, 87: 1; *Tordylium maximum* 83: 1, 88: 2; *Veronica prostrata* 13: 1; *Lactuca viminea* 1: 1; *Artemisia alba* 64: 1; *Tragopogon pratensis* 58: 1; *Calamintha nepeta* 41: 1, *Ornithogalum narbonense* 63: 1; *Caucalis platicarpos* 1: 1; *Medicago sativa* 10: 1; *Tragus racemosus* 1: 2; *Scleranthus perennis* 22: 1, 79: 1; *Logfia minima* 12: 1; *Veronica longifolia* 14: 1, 71: 1; *Consolida hispanica* 83: 2; *Inula germani ca* 13: 1; *Herniaria glabra* 14: 1; *Plantago argentea* , 64: 1; *Salvia aethiopis* 95: 1; *Carthamus lanatus* 83: 1; *Papaver rhoeas* , 83: 1; *Astragalus ponticus* 63: 1; *Onos mataurica* 3: 1; *Asperula aristata* 68: 1; *Melampyrum cristatum* 71: 1; *Linaria vulgaris* 63: 1; *Bromus erectus* 13: 1; *Onobrychis alba* 26: 1; *Rorippa pyrenaica* 6: 1; *Prunella vulgaris* 28: 1; *Polygala major* 45: 1; *Vincetoxicum hirundinaria* 66: 1; *Centaurium pulchellum* 41: 1; *Astragalus asper* 13: 1; *Chenopodium murale* 1: 1; *Androsace maxima* 1: 2; *Setaria viridis* 1: 2; *Senecio vernalis* 22: 1, *Herniaria incana* 6: 1; *Verbascum lichnitis* 33: 1; *Senecio squalidus* 66: 1; *Ornithogalum fimbriatum* 27: 1; *Bellis perennis* 6: 1; *Linum trigynum* 27: 1; *Astragalus austriacus* 21: 1; *Seseli rigidum* 66: 1; *Homalotheclum lutescens* 11: 1; *Hypericum rumeliacum* 44: 1; *Moenchia mantica* 1: 1, *Vicia grandiflora* 71: 1; *Erophila verna* 27: 2; *Festuca pseudovina* 6: 1; *Diplotaxis tenuifolia* 13: 1; *Trifolium incarnatum* 35: 1; *Stipa tirsa* 34: 1; *Trifolium alpestre* 66: 1; *Salvia nemorosa* 27: 2; *Veronica persica* 5: 1; *Polygonum patulum* 63: 2; *Viola canina* 28: 1; *Stachys atherocalyx* 2: 1; *Alcea pallida* 71: 1; *Bupleurum apiculatum* 5: 1; *Trifolium hirtum* 6: 1; *Ventenata dubia* 51: 2; *Thlaspi perfoliatum* 28: 1; *Crataegus pentagyna* 26: 1; *Phleum phleoides* 21: 1; *Legousia speculum-veneris* 12: 1; *Astragalus dasyanthus* 55: 1; *Lathyrus hirsutus* 6: 1; *Lavatera thuringiaca* 13: 1; *Trifolium pratense* 6: 1; *Urtica dioica* 59: 1, 85: 1; *Cruciata laevipes* 17: 1; *Ajuga genevensis* 6: 1; *Melissa officinalis* 5: 1; *Kochia prostrata* 36: 1; *Inula aschersoniana* 13: 1; *Carex divisa* 22: 2, 26: 1; *Galium lovcense* 22: 1, 55: 1; *Thalictrum minus* 63: 1, 66: 1; *Senecio nemorensis* 70: 1, 72: 1, *Vinca herbacea* 70: 1, 72: 1; *Silene otites* 34: 1; *Coronilla scorpioides* 5: 1; *Anthemis tinctoria* 44: 1, 83: 1; *Muscari botryoides* 25: 1, 31: 1; *Salvia nutans* 70: 1, 72: 1; *Lotus angustissimus* 43: 1, 45: 1; *Astragalus cicer* 47: 1, 48: 1; *Melampyrum arvense* 25: 1, 31: 1; *Scleranthus annuus* 5: 1, 13: 1; *Alcea rosea* 70: 1, 72: 1; *Chamaecytisus supinus* 44: 1, 46: 1; *Althaea hirsuta* 3: 1; *Digitalis viridiflora* 63: 1; *Crataegus curvisepala* 63: 1; *Chamaecytisus glaber* 8: 1; *Vicia dumetorum* 6: 1; *Glaucium corniculatum* 55: 1; *Gypsophila glomerata* 43: 1, *Coronilla elegans* 10: 1; *Galium paschale* 13: 1; *Veronica polita* 87: 1; *Veronica serpyllifolia* 27: 1, *Veronica teucrium ssp crinita* 71: 1; *Achillea nobilis* 22: 2; *Hieracium pilosella* 24: 1; *Galium divaricatum* 63: 1; *Carduus crispus* 68: 1; *Centaurea biebersteinii* 70: 1, 72: 1; *Linum tauricum s. bulgaricum* 44: 1, 46: 1; *Alyssum tortuosum* 22: 1, 55: 1; *Carex spicata* 15: 1, 58: 1, *Potentilla pedata* 3: 1, 32: 1; *Asparagus officinalis* 66: 1, 71: 1; *Vicia tenuifolia* 66: 1, 71: 1; *Thesium dollineri* 70: 2, 72: 2; *Asparagus tenuifolius* 70: 1, 72: 1; *Carex otrubae* 15: 1, 58: 1; *Alyssum montanum* 1: 2, 3: 1; *Alyssum desertorum* 15: 1, 58: 1; *Koeleria macrantha* 2: 1, 71: 2, *Sedum hispanicum* 25: 1, 31: 1; *Astragalus glycyphylloides* 26: 1, 55: 1; *Koeleria obscura* 5: 1, 13: 3; *Sisymbrium orientale* 30: 1, 68: 1; *Filipendula vulgaris* 26: 1, 39: 1; *Alyssum alyssoides* 10: 1, 27: 1; *Linum bienne* 13: 1, 44: 1; *Sedum sartorianum* 5: 1, 13: 1; *Erysimum diffusum* 5: 1, 13: 1; *Adonis flammea* 65: 1, 67: 1; *Anagalis arvensis* 27: 1, 35: 1; *Muscari comosum* 15: 1, 58: 1; *Erigeron annuus* 83: 1; *Melilotus alba* 83: 1; *Rumex crispus* 88: 1; *Phleum pratense* 77: 1; *Agrostis capillaris* 76: 1; *Anchusa barrelieri* 83: 1; *Avenula compressa* 77: 1; *Buglossoides arvensis* 91 : 1, 98: 1; *Bupleurum commutatum* 77: 1, 90: 1;

Euphorbi acyparissias 89: 2; *Helleborus adorus* 86: 1; *Inula britannica* 88: 1; *Lamium maculatum* 84: 1: *Leonurus cardiaca* 83: 1; *Sanguisorba officinalis* 93: 1; *Sisymbrium officinale* 93: 1, 95: 1; *Trifolium achroleucon* 79: 2, 83: 1; *Verbascum austriacum* 82: 1; *Achillea coarctata* 63: 1; *Agropyron cristatum* 63: 1;

Relev è loc ality and date:

1. Veliko Tarnovo District, N43 °08'37" E25°30'53", 19.08.2002; **2.** Silistra Distr., N43 °44'19" E26 °59'12", 1.07.2004; **3.** Dobrich Distr., N43 °42'22" E27 °20'10", 16.07.20 04; **4.** Dobrich Distr., N43 °39'39" E28 °17'43", 7.07.20 03; **5.** Shoumen Distr., Kameniak village, 5.06.20 02; **6.** Shoumen Distr., N43 °04'07" E26 °40'42", 12.06.2 002; **7.** Silistra Distr., Kolarovo village, 28.06.2 002; **8.** Silistra Distr., N44 °03'08" E26 °48'29", 13.07.2004; **9.** Silistra Distr., Staro selo village, 27.07.20 02; **10.** Rousse Distr., Novo selo village, 28.06.200 4; **11.** Shoumen Distr., N43 °27'20" E27 °07'58", 23.07.2002; **12.** Targovishte Distr., N43 °06'54" E26 °20'42", 19.06.2 003; **13.** Shoumen Distr., Kameniak village, 15.06. 2002; **14.** Silistra Distr., Golesh village, 24.07.2 002; **15.** Razgrad Distr., Kamenov village, 17.06.20 02; **16.** Shoumen Distr., N43 °26'25" E27 °09'54", 23. 07.20 02; **17.** Silistra Distr., N43 °56'47" E26 °36'43", 26.06 .2004 ; **18.** Silistra Distr., N43 °56'16" E27°23'25", 14.07.20 04; **19.** Silistra Distr., Kainardja village, 24.07.20 02; **20.** Shoumen Distr., N43 °24'20" E27 °05'27", 23.07.2002; **21.** Silistra Distr., N43 °43'26" E27 °17'43", 16.07.2004; **22.** Silistra Distr., Srebarna village, 19.05.2004; **23.** Silistra Distr., Svetoslav village, 25.07.20 02; **24.** Veliko Tarnovo Distr., N43 °36'21" E25 °27'55", 14.08.2002 ; **25.** Razgrad Distr., Topchii village, 17.06.2002; **26.** Silistra Distr., Yastrebina village, 18.05.2 004; **27.** Shoumen Distr., Kabiuk locality, 15.06. 2002; **28.** Razgrad Distr., Manastirsko village, 18.06.2002; **29.** Silistra Distr., N43°57'24" E27°29'28", 25.07.2002; **30.** Silistra Distr., N44 °04'00" E27 °02'43", 30.06.2 002; **31.** Razgrad Distr., N43 °40'34" E26 °30'27", 17.06. 2002; **32.** Razgrad Distr., N43 °44'12" E26 °58'17", 12.07.20 04; **33.** Silistra Distr., Dounavetz village, 13. 07.20 04; **34.** Silistra Distr., Golesh village, 24.07.200 2; **35.** Silistra Distr., N43 °48'16" E26 °56'12", 12.07.2 004; **36.** Veliko Tarnovo Distr., N43 °35'28" E25 °15'03", 13.08.2002 ; **37.** Silistra Di str., N43 °58'11" E27°22'59", 14.07. 2004 ; **38.** Silistra Di str., N43 °58'35" E27 °25'11", 14.07. 2004; **39.** Silistra Distr., N43 °44'50" E27 °17'24", 15.07.2 004; **40.** Silistra Distr., N43°53'22" E27 °22'37", 15.07.2004; **41.** Silistra Distr., N43 °46'38" E27 °19'53", 15.07.2004; **42.** Dobrich Distr., Tervel town, 16.07.20 04; **43.** Rousse Distr., N43 °29'07" E25 °43'58", 28.07.2 002; **44.** Rousse Distr., N43 °27'18" E25 °47'05", 27. 07.20 02; **45.** Rousse Distr., N43 °30'23" E25 °44'16", 28.07. 2002; **46.** Rousse Distr., Botrov village, 28.07.2 002; **47.** Veliko Tarnovo Distr., N43 °34'44" E25 °21'57", 13. 08.20 02; **48.** Veliko Tarnovo Distr., Tzarevetz village, 13.08.2 002; **49.** Silistra Distr., N43 °46'50" E27 °19'53", 15.07. 2004; **50.** Veliko Tarnovo Distr., N43 °36'31" E25 °18'24", 13.08.2 002; **51.** Shoumen Distr., N43 °26'24" E27 °03'47", 23.07.2002; **52.** Rousse Distr., G. Ablanovo village, 29.07. 2002; **53.** Veliko Tarnovo Distr., N43 °32'24" E25 °28'31", 14.08.2 002; **54.** Razgrad Distr., Kamenar village, 16.06.2 002; **55.** Silistra Distr., Smiletz village, 18.05.20 04; **56.** Silistra Distr., Popina village. 1.07.20 02; **57.** Razgrad Di str., G orofzvet village, 16. 06.20 02; **58.** Razgrad Di str., Kamenovo village, 17. 06.20 02; **59.** Silistra Di str., N44 °00'49" E27°22'26", 15.07. 2004 ; **60.** Rousse Distr., G. Ablanovo village, 29.07.20 02; **61.** Silistra Distr., N43 °59'56" E27 °29'31", 24.07.2002; **62.** Rousse Distr., N43 °38'03" E25 °42'54", 29.07.2 002; **63.** Veliko Tarnovo Distr., N43 °21'40" E25 °15'25", 22.08.2 003; **64.** Silistra Distr., Tutraka n town, 2.07.2 002; **65.** Silistra Distr., Angelovo village, 27.06 .2002; **66.** Silistra Distr., Vetren village, 1.07.2002; **67.** Silistra Distr., N43 °57'14" E26°32'26", 27.06.2002; **68.** Silistra Distr., Pojarevo village, 29.06.2 002; **69.** Silistra Distr., Popina village, 1.07.2002; **70.** Silistra Distr., S of Popina village, 1.07.2002; **71.** Silistra Distr., E of Popina village, 1.07.2002; **72.** Silistra Distr., N44 °05'59" E26 °57'38", 1.07.2002; **73.** Silistra Distr., P. Cholakovo village, 25.07.20 02; **74.** Silistra Distr., P. Cholakovo, 25.07.2002; **75.** Veliko Tarnovo Distr., Morava village, 25.08.2002; **76.** Veliko Tarnovo Distr., N43 °28'21" E25 °11'27", 28.07. 2004; **77.** Veliko Tarnovo Distr., N43 °17'10" E25 °12'38", 21.08 .2003; **78.** Silistra Distr., P. Cholakovo, 25 07.2002; **79.** Targovishte Distr., N43 °05'52" E26 °32'59", 18. 06.20 03; **80.** Rousse Distr., N43 °37'31" E25 °46'51", 29.07. 2002; **81.** Silistra Distr., N44 °00'07" E27 °44'38", 14. 07.20 04; **82.** Silistra Distr., N43 °51'06" E27 °19'54", 15.07.2004; **83.** Dobrich Distr., N43 °32'04" E28 °28'10", 9.07.2 003; **84.** Silistra Distr., N43 °56'53" E27°18'32", 14.07.20 04; **85.** Silistra Distr., N43 °57'27" E26 °51'24", 28.06.2 002; **86.** Rousse Distr., Koprivetz village. 29.07.2002; **87.** Silistra Distr., Sitovo village, 30.06.2002; **88.** Veliko Tarnovo Distr., N43 °18'42" E25 °20'43", 21.08.2 003; **89.** Veliko Tarnovo Distr., Resen village, 20.08.2 003; **90.** Veliko Tarnovo Distr., N43 °12'51" E25°24'59", 20.08.2003; **91.** Silistra Distr., N43 °50'49" E27 °22'23", 16.07.2 004; **92.** Veliko Tarnovo Distr., N43 °18'26" E25°16'47", 21.08.2003; **93.** Silistra Distr., N43 °50'19" E26 °51'56", 12. 07.20 04; **94.** Veliko Tarnovo Distr., Ivancha village, 22.08.2003; **95.** Razgrad Distr., N43 °43'48" E26 °54'58", 12.07. 2004; **96.** Silistra Distr., N43 °47'22" E27 °21'03", 15.07.2 004; **97.** Silistra Distr., N43 °45'29" E27 °00'24", 1.07.20 04; **98.** Razgrad Distr., N43 °48'44" E26 °45'07", 12.07.2004; **99.** Silistra Distr., P. Cholakovo village, 25.07.2002;

TABLE 2 - Agropyro-Thymetum zygoidi Dichoru 1970.

Relevé No	1111111111222222222 12345678901234567890123456789	Constancy	Dichoru (1970)
Ass. diagnostic species			
Thymus zygoides	1112122.2221..12222111.112.1	V	V
Agropyron brandzae	22.2212..1221.112222..22...1	IV	IV
Koeleria brevis	.1.2.1.....1..11.....	II	III
Satureja jacoerulea	..3.1..1.1...1..1...1.....	II	II
Pimpinello -Thymion			
Ajuga chamaepytis	.1.12.21.12111121221.111211.	IV	.
Sideritis montana	..1.21221.1..212.121.1211121	IV	.
Scolymus hispanicus	11..1.11..1..1112112.112.222	IV	.
Petrorhagia velutina	1.....11...1111111121111.111	IV	.
Seseli tortuosum	....11.2.1..1221..12.1.1..11	III	.
Tragopogon orientalis	1..1.1111.1.11...1.11.....	III	.
Salvia argentea	1..1..11.1..111....211..1111	III	.
Silene densiflora	1.....11..1.1111.1121.....1	III	.
Achillea leptophylla	...1.11..2.2...1...1.....	II	.
Paeonia tenuifolia	...21211.2...111.....	II	.
Bupleurum apiculatum	1.....1.1.11.1.1.....1	II	.
Iris pumila	.....1..112....2.....2....	II	.
Haplophyllum thesioides	..1.1.1.1.....	I	.
Echinops banaticus	...1.1.....1.....	I	.
Jurinea ledebourii	...1.1.....	I	.
Koeleria penzesii	.....11.....1....21.....	I	.
Festuco -Brometea			
Artemisia austriaca	2.1.1221.11111122222.21232.1	V	II
Eryngium campestre	21111222.111221232221222.211	V	II
Asperula cynanchica	12.11.21.21111121111111.1.111	V	I
Teucrium chamaedrys	1112212211211211122.2212..222	V	I
Bromus squarrosus	1...1.11..1..1122.11.212.111	IV	III
Festuca valesiaca	.212122.2212..111..2..21..12	IV	II
Convolvulus cantabrica	..1122221212.21..11211.11..1	IV	I
Achillea crithmifolia	21..1112.11..21.1222111.2212	IV	.
Galium verum	11..11111.11.11122.1.12...12	IV	.
Poa angustifolia	2..2.211.2..21211..211..1111	IV	.
Adonis vernalis	..12121.2111..11.....1	III	I
Scabiosa argentea	11..1..1.21.1111..1121....12	III	.
Chondrilla juncea	11....1....11.11.11111.1...1	III	.
Botriochloa ischaemum	1...1.1.12.....2....1...1...	II	II
Stipa capillata	...21....212....1..12.....1.	II	II
Linum tenuifolium	...2.1.1....121..1.....	II	I
Medicago falcata	.1.1.....1.1..1....1.....1	II	1
Sanguisorba minor	..1.1...1..11.1.....11.1...	II	.
Stipa lessingiana	1...1211...2111.....	II	.
Achillea clypeolata	..1.....1.1...2.....1.....	I	I
Allium sphaerocephalon	..11.1..1.....1:1.....	I	.
Filipendula vulgaris	...1.21..1.1.....	I	.
Campanula sibirica	..1.....1.....	I	.
Chrysopogon gryllus	..11.3.....1.....	I	.
Other species			
Teucrium polium	.2.2212212221212.22221211122	V	IV
Marrubium peregrinum	121111121121122122.2.1221212	V	II
Erysimum repandum	2111..2111211112211211211212	V	.
Euphorbia seguerana	211222212211112212221221222	V	.
Centaurea diffusa	11.12.21..11.2121111121.1121	IV	III
Xeranthemum annuum	11.11121.1211112.12221...112	IV	II
Nigella arvensis	11..11...12.1.1.1111.111.111	IV	II
Cynodon dactylon	21..2..2.12.2212.1222222.22.	IV	I
Plantago lanceolata	1..11..1112..111.12211111111	IV	I
Carduus acanthoides	11.111.1111.21.2.22.121..112	IV	.
Elymus repens	12..11.2.11.2221212.1222.122	IV	.
Cichorium intybus	.1..11111.1.11...1.12111.111	IV	.
Potentilla inclinata	1.11111.11.....11112..1.1.11	IV	.
Achillea coarctata	...1111..111..1122.1..21....	III	I
Medicago minima	12..1.....12..112..12.1111..	III	I
Melica transsilvanica	...1.112.1.112111.11...1...1	III	.
Linaria genistifolia	....11.1.2.11111..112.....11	III	.

Scandix pecten -veneris	.2..1....111..112.1..12111.2	III	.
Dianthus patiens	1...11....11.1.1..1.111..11	III	.
Verbascum floccosum	1...1....11.1.1..1.1121..111	III	.
Poa bulbosa	.2.1.....1...22....1.....	II	III
Reseda lutea	..111..11...11....1.....	II	II
Carduus thoermeri	...1.....1.....2.2.2.....2..	II	II
Acinos arvensis	1.....1...1..1.....1..1	II	I
Elymus hispidus	.2.2.....1.2.....1.....2	II	I
Petrorhagia prolifera	11..1.....1.1.....1.1.	II	I
Carduus nutans	.....2...1...2.2112..22..2.	II	I
Koeleria nitidula	...112...111...2..21.1.....1	II	.
Nonea pulla	1..1.1..11.1..1.....	II	.
Dactylis glomerata	1...1211111..1.....1.....1.	II	.
Hypericum elegans	....1..111..111....11.....11	II	.
Achillea millefolium	..1..1...1...2..2...2.....	II	.
Allium stamineum	1....11...1....11111.....1	II	.
Anthemis tinctoria	....1....21...1....11.1....1	II	.
Astragalus hamosus	.2..1.....1..1221.1...1.1..	II	.
Bromus tectorum	...111....1....1..1.212.....	II	.
Consolida hispanica	1...11....1...1.1111...1..1.	II	.
Convolvulus arvensis	1....1...11.1.....21...1...	II	.
Crataegus monogyna	..1..2..1.1.1.1....1...1....	II	.
Cuscuta planiflora	...1.2....1...11..12.1.....1	II	.
Digitalis lanata	..1...1.1...1..1.1.....	II	.
Echium vulgare	..1...1.1.1.1....1.....1.1.	II	.
Falcaria vulgaris	1.....1..1..1.1..1...1..1.	II	.
Fumana procumbens	....1121.....11.1....111....	II	.
Lolium perenne	1...1.....1...1..1.....1....	II	.
Medicago lupulina	1.1.11..1.....211..1.1....	II	.
Muscari botryoides	..11..1.....11.....1.1.1.	II	.
Salvia verticillata	.....1..111...2..111.....1	II	.
Taeniatherum caput -medusae	....1.1..1....2....1.1.11211	II	.
Verbascum banaticum	.....11.....211...2.....1	II	.
Veronica longifolia	...11....1.....1...1.....1	II	.
Vinca minor	...11.1..1.1..1.....1..1.	II	.
Bromus sterilis	1.....1.....1.12.1..12.1	II	.
Centaurea solstitialis	1.....1..1.1..21..11...	II	.
Crepis setosa	1.....1...1111..21..	II	.
Dasypyrum villosum	....1....11.....11...111.	II	.
Echium italicum	1.....1..1.1..211..11.1	II	.
Erodium cicutarium	.....1...11.1.1....11..	II	.
Herniaria hirsuta	.....1...1.1111.1111...	II	.
Inula germanica	....111.....1.1..1.....	II	.
Poa compressa	.....11.....1...1....11..2.	II	.
Trifolium echinatum	1.....1.2.1211.1....	II	.
Galium humifusum	.....1.1.1....1.1.....	I	I
Orlaya grandiflora	.....1.....1.....1...	I	I
Salvia nutans	..1.1.....	I	I
Goniolimon besseranum	.....1.....1.....	I	.
Allium flavum	...11....1.2.....1.....	I	.
Campanula glomerata	.....1.1.....1.1.....	I	.
Leontodon crispus	..21.2..2.....	I	.
Aegilops cylindrica	.....1.....1....1..1	I	.
Aegilops triuncialis	.....1...1.....1.	I	.
Agrimonia eupatoria	1.....11.....1.....	I	.
Alyssum minutum	.....1.....1...12.2...	I	.
Anchusa barrelieri	....1.....1.....	I	.
Artemisia santonicum	...2.....1..11.....1.	I	.
Asperula purpurea	..1.....1..1.....	I	.
Aster oleifolius	.....1.1.....	I	.
Astragalus monspessulanus	..1.....1...	I	.
Astragalus onobrychis	...11.....11.....1	I	.
Astragalus vesicarius	..1.....1.....	I	.
Berteroa incana	1.....1....1...	I	.
Bromus arvensis	.1.....2..2.....1.....1.	I	.
Bromus erectus	..1.....1.....	I	.
Bromus mollis	.....1.....11..	I	.
Carthamus lanatus	.....1.....1.....	I	.
Cerastium arvense	.....1.1.....1	I	.
Consolida regalis	.1.....1.....1..	I	.
Coronilla varia	.....1..11.....1...1...	I	.
Dianthus armeria	...1.1.....	I	.

Echinops ritro	.....1.1.....	I	.
Galium volhynicum	...111.....1.....	I	.
Hieracium praealtum s. bauchinii	...1.1.....1.....	I	.
Inula ensifolia	...1.1.....	I	.
Jurinea consanguinea	.....1.1.....1.....	I	.
Linum austriacum	.....2.....1.....	I	.
Lotus corniculatus	.....1.....1.....	I	.
Matricaria trichophylla	.....1.....1...	I	.
Medicago rigidula	.1.....1.....	I	.
Melilotus officinalis	.....1...2.....21.....1	I	.
Odontites serotina	1.....1.....1.....	I	.
Ornithogalum narbonense	.....1.....1.1....1.....	I	.
Phleum phleoides	.....1.1.....	I	.
Plantago argentea	.1.....1.....	I	.
Portulaca oleracea	.1.....1.1....1.....	I	.
Potentilla argentea	1.....1.....1....	I	.
Rosa canina	.....1.....1.....	I	.
Rumex pulcher	.....1.1..1.1.....	I	.
Salvia pratensis	.1.....1.....	I	.
Sambucus ebulus	.....1.....1.1.....1	I	.
Scabio sanchroleuca	.....1.1.....	I	.
Sherardia arvensis	.....1....2.....1...	I	.
Stachys angustifolia	.....1.....1.....	I	.
Stachys cretica	..1.....11.....1...	I	.
Stachys germanica	1.....1.1.....11..	I	.
Symphytum orientale	.....1.....1.....1.	I	.
Taraxacum serotinum	.1.....1.....	I	.
Teucrium montanum	.11.....1.....2....	I	.
Thalictrum lucidum	.....1.....1....1.....	I	.
Thesium simplex	..1.....1.1.	I	.
Tragus racemosus	.1.....1.....	I	.
Tribulus terrestris	.1.....1.....	I	.
Trifolium aureum	1.....1.1.....	I	.
Trinia glauca	.....1.....2.....	I	.
Verbascum lichnitis	.....1.1.....	I	.
Verbascum xanthophoeniceum	.....1.....1.	I	.
Verbena officinalis	.....1.....11..	I	.
Xeranthemum cylindraceum	.....1.....1.....	I	.
Crepis foetida	.....1.....1.	I	.
Vulpia myurus	.....1.....1	I	.
Marrubium vulgare	.....1.11.....	I	.
Myosotis arvensis	.....1..1...1....	I	.
Malva sylvestris	.....1.....1....	I	.
Linaria vulgaris	.....1...2...1...	I	.
Thymus longicaulis	.....11..1.	I	.
Euphorbia myrsinites	.....1.....1....	I	.
Astragalus haarbachii	.....1....1....	I	.
Phleum graecum	.....1.....1....	I	.
Cirsium arvense	.....21.....	I	.
Lepidium campestre	.....1..1.....	I	.
Galium aparine	.....11.....	I	.

Species in less than 2 relevès :

Cleistogenes serotina 4: 1; *Gypsophila glomerata* 10: 1; *Sedum caespitosum* 9: 1; *Achillea cluziana* 9: 2; *Alcea pallida* 13: 1; *Amygdalus nana* 10: 1; *Anacamptis pyramidalis* 3: 1; *Androsace maxima* 12: 1; *Artemisia campestris* 13: 1; *Asyneuma canescens* 4: 1; *Brachypodium pinnatum* 6: 1; *Carex caryophyllea* 4: 1; *Centaurea orientalis* 7: 1; *Centaurea stoebe* 9: 2; *Conium maculatum* 13: 1; *Echium plantagineum* 10: 1; *Eragrostis minor* 2: 1; *Erigeron annuus* 16: 1; *Erophila verna* 9: 1; *Euphorbia barrelieri* 9: 1; *Filago vulgaris* 2: 1; *Fragaria viridis* 9: 1; *Genista januensis* 3: 1; *Geum urbanum* 13: 1; *Haplophyllum suaveolens* 16: 1; *Hieracium hoppeanum* 3: 1; *Hordeum hystrix* 11: 1; *Hyacintella leucophaea* 6: 1; *Koeleria eriostachya* 3: 1; *Lactuca perennis* 10: 1; *Lathyrus pratensis* 13: 1; *Limonium vulgare* 15: 1; *Medicago polymorpha* 12: 1; *Melica ciliata* 3: 1; *Onosma visianii* 3: 1; *Plantago media* 9: 1; *Ranunculus velutinus* 3: 1; *Rumex crispus* 13: 1; *Salvia nemorosa* 2: 1; *Sanguisorba officinalis* 10: 1; *Sedum pallidum* 9: 1; *Stachys recta* 6: 1; *Stipa pennata* 4: 1; *Tanacetum vulgare* 3: 1; *Taraxacum species* 9: 1; *Thalictrum aquilegiifolium* 10: 1; *Thlaspi perfoliatum* 9: 1; *Thymelea passerina* 10: 1; *Trifolium arvense* 15: 1; *Verbascum ovalifolium* 9: 1; *Veronica orchidea* 3: 1; *Vinca herbacea* 3: 1; *Viola arvensis* 9: 1; *Viola odorata* 9: 1; *Onobrychis alba s. calcarea* 9: 1; *Logfia arvensis* 25: 1; *Vicia lathyroides* 20: 1; *Thymus pulegioides* 26: 1; *Paliurus spina-christi* 24: 1; *Trigonella monspeliaca* 21: 1; *Veronica barrelieri* 23: 1; *Bupleurum affine* 21: 1; *Trifolium strictum* 25: 1; *Veronica prostrata* 20: 1; *Lactuca viminea* 21: 1; *Artemisia alba* 25: 1; *Cirsium ligulare* 28: 2; *Carlina vulgaris* 25: 1; *Tragopogon pratensis* 25: 1; *Caucalis platicarpos* 21: 1; *Medicago sativa* 21: 2; *Logfia minima* 18: 1; *Sagina suginoides* 25: 1; *Poa annua* 25: 1; *Lactuca serriola* 20: 1; *Mentha arvensis* 21: 1; *Euphorbia niciciana* 23: 1; *Salvia aethiopis* 25: 1; *Tordylium maximum* 20: 2; *Silene conica* 18: 1; *Hordeum bulbosum* 20: 1; *Silene noctiflora* 25: 1; *Psilurus incurvus* 24: 1; *Erigeron acer* 20: 1; *Verbascum glanduligerum* 17: 1; *Echinops microcephallus* 23: 1; *Chenopodium album* 20: 1; *Lathyrus tuberosus* 20: 1; *Allium ampeloprasum* 28: 1; *Medicago orbicularis* 20: 1; *Cynosurus cristatus* 22: 2; *Curdaria draba* 20: 1; *Sedum acre* 20: 1; *Papaver rhoeas* 20: 1;

Releves' locality and date:
1. Dobrich District, N43 °41'44" E28 °21'03", 7.07.20 03; **2.** Dobrich Distr., N43 °35'20" E28 °32'37", 12.08.2 004; **3.** Razgrad Distr., N43 °28'13" E28 °39'05", 16.06.2 002; **4.** Dobrich Distr., N43 °36'00" E28°23'41", 5.07.20 03; **5.** Dobrich Distr., N43 °39'31" E28 °29'18", 8.07.20 03; **6.** Dobrich Distr., Bejanovo village, 7.07.2 003; **7.** Dobrich Distr., N43 °32'13" E28 °22'17", 6.07.2 003; **8.** Dobrich Distr., Vaklino village, 7.07.20 03; **9.** Razgrad Distr., Kamenar village, 16.06.2 002; **10.** Dubrich Distr., Bojanovo village, 16.08.2 004; **11.** Dobrich Distr., N43 °38'38" E28 °30'41", 8.07.20 03; **12.** Dobrich Distr., Tulenovo village, 14.08.20 04; **13.** Dobrich Distr., N43 °41'35" E28 °24'02", 7.07.20 03; **14.** Dobrich Distr., W of Durankoulak village, 7.07.20 04; **15.** Dobrich Distr., N43 °29'07" E28 °31'14", 9.07.20 03; **16.** Dobrich Distr., N43 °32'10" E28 °19'23", 6.07.20 03; **17.** Dobrich District, Tulenovo lillage, 22.07.2003; **18.** Dobrich Distr., N43 °39'39" E28 °17'43", 7.07.20 03; **19.** Dobrich Distr., Shabla town, 8.07.20 03; **20.** Dobrich Distr., N43 °36'59" E28 °29'07", 4.07.2 003; **21.** Dobrich Distr., Bojanovo village, 16..08.2 004; **22.** Dobrich Distr., Gorun village, 8..07. 2003; **23.** Dobrich Distr., N43 °25'26" E28 °18'28", 22.07.2 003; **24.** Dobrich Distr., Sveti Nikola - Russalka, 22.07.20 03; **25.** Dobrich Distr., N43 °35'02" E28 °06'55", 2.07.2 003; **26.** Dobrich Distr., N43 °32'49" E28 °18'18", 6.07.20 03; **27.** Dobrich Distr., N43 °25'03" E28 °13'58", 21.07. 2003; 28. Dobrich Distr., N43 °36'17" E28 °26'01", 5.07.20 03

TABLE 3 - Floristic elements in Agropyro-Thymetum zygoidi Dichoru 1970.

Floristic-geographical element	Bulgaria	Dichoru (1970)
Euro – Asiatic	26%	38%
Pontic, Mediterranean and sub-Mediterranean	47%	38%
Balkanic and Ponto-Balkanic	13%	19%

TABLE 4 - Agrostideto-Chrysopogonetum grylli Kojić 1959.

Releve No	1111111 1234567890123456	Constancy	
			Kojić (1959)
Ass. diagnostic species			
Chrysopogon gryllus	2.13.122.12.2.21	IV	V
Agrostis capillaris	.111...2.2222222	IV	V
Filipendula vulgaris	1..11111.1..112.	IV	V
Galium verum	1..11..1.2.1111.	III	IV
Centaurium erythraea	..11.....1.11..	II	I
Prunella laciniata	...1..1.1...1...	II	II
Briza media	....1..........	I	I
Chrysopogoni-Danthonion			
Trifolium ochroleucon	1.111..........	II	.
Leontodon hispidus	..1.......1.111.	II	II
Brachypodium pinnatum	........112.....	I	.
Moenchia mantica	..2.....1.....	I	IV
Euphrasia rostkoviana	1.1.....1....	I	.
Bestuco - Brometea			
Festuca valesiaca	2.21221212.21222	V	V
Eryngium campestre	121121112122212	V	IV
Bothriochloa ischaemum	....2..33.32323.	III	.
Asperula cynanchica	1.1.111.1.1.....	III	.
Hieracium hoppeanum	2121111.....	III	I
Sanguisorba minor	.......112111...	II	II
Euphorbia cyparissias	..1....2..2.2.1.	II	II
Koeleria nitidula	2..111...1.....	II	.
Carex caryophyllea	1.1.121....2.21.	III	III
Chondrilla juncea	.......11.11...1	II	.
Cleistogenes serotina	21..1.1.....	II	.
Fragaria viridis	.......11....1..	I	.
Teucrium chamaedrys	2.111112121.111.	V	I
Dorycnium herbaceum	1.11...2.2..212.	III	I
Other species			
Lotus corniculatus	121211111.12112.	V	V
Plantago lanceolata	1.111121.21121.1	V	V
Crataegus monogyna	22111121.112111.	V	.
Potentilla argentea	.2111112.2121111	V	II
Anthoxant. humodoratum	2232132..1.1.111	IV	V
Trifolium repens	1.111121..12.1..	IV	I
Thymus pulegioides	1..1.1111.1.2121	IV	II
Cynosurus cristatus	1212111....21.1.	IV	III
Ononis arvensis	1.1111.1.211.1..	IV	I
Hypericum perforatum	1.11.111.1..111.	IV	I
Rosa canina	..1..11111..1112	IV	.
Poa pratensis	11.111.....1.121	III	I
Achillea millefolium	..1....21212.211	III	V
Leontodon cichoraceus	1111111..2.....	III	.
Potentilla negiecta	2.11.111..1.11..	III	.
Cichorium intybus	1....1.11.1111.1	III	I
Trifolium arvense	1.1.1111..1.11..	III	.
Carlina vulgaris	1.1..11..1...112	III	.
Achillea crithmifolia	1211211.....2...	III	.
Cynosurus echinatus	1.....111211...2	III	.
Trifolium aureum	1..11111.....1..	III	.
Agrimonia eupatoria	.......112..1112	III	.
Bromus mollis	...21.11..12...2	III	I
Festuca rubra	....11.2....1...	II	.
Lolium perenne	.2..2..11..2...1	II	.
Sanguisorba officinalis	.1112.......1..	II	.
Trifolium pratense	....1..11...111.	II	I
Odontites serotina	.......11.1.12.1	II	.
Hieracium pilosella	.......11..1111.	II	.
Thymus glabrescens	1...1221..1.....	II	.
Thymus zygioides	1.2..1.....1....	II	.
Carduus acanthoides	1...1..11.1.1...	II	.
Poa compressa	.......111...1..	II	.
Scleranthus perennis	1.11..1.....	II	.
Digitalis lanata	..11...1.1.....	II	.
Sherardia arvensis	.....1.1...1...1	II	I
Centaurea rhenana	1...1..1..1.....	II	.

Cerastium arvense	1.1..11.....	II	.
Scabiosa triniifolia	1.....1.1.11	II	.
Daucus carota	.....11.1.112.	II	.
Stachys germanica	1.11...1.....1.1	II	.
Logfia arvensis	.....1..1211...	II	.
Xeranthemum annuum	.....1.1..112	II	.
Crepis setosa	1..1...1.2.1....	II	.
Hieracium praealtum s. bauchinii	1.....1...11.	II	I
Trifolium strictum	1..1.11.....	II	.
Echium vulgare	1.....1..11	II	.
Convolvulus arvensis	.....1...1.1.1	II	III
Vulpia myurus	11.2.....1....	II	II
Medicago lupulina	...1.1.11.....	II	.
Rumex acetosella	1..1..1..1.....	II	III
Leucanthemum vulgare	.....1.	I	V
Prunella vulgaris	1.....12.....	I	II
Cirsium ligulare	.....1....1..1	I	.
Bromus arvensis	.....11.1....	I	.
Vulpia bromoides	1.....2..1.....	I	.
Aira elegantissima	..1..11.....	I	IV
Luzula campestris	1.1..1.....	I	II
Acinos arvensis	.....111.....	I	.
Paliurus spina-christi	.....112.....	I	.
Nigella arvensis	.....1....1..1	I	.
Pteridium aquilinum	..2..1.....1.	I	.
Bellis sylvestris	.1.1..1.....	I	.
Rumex pulcher	.....1.2...1	I	.
Thesium simplex	1....1.....1..	I	.
Geranium columbinum	...1.....1..1...	I	I
Clinopodium vulgare	.....121.....	I	.
Dipsacus laciniatus	1	I	.
Verbena officinalis	.....1..11....	I	.
Medicago minima	.11.....1	I	.

Species in less than 3 relevès:

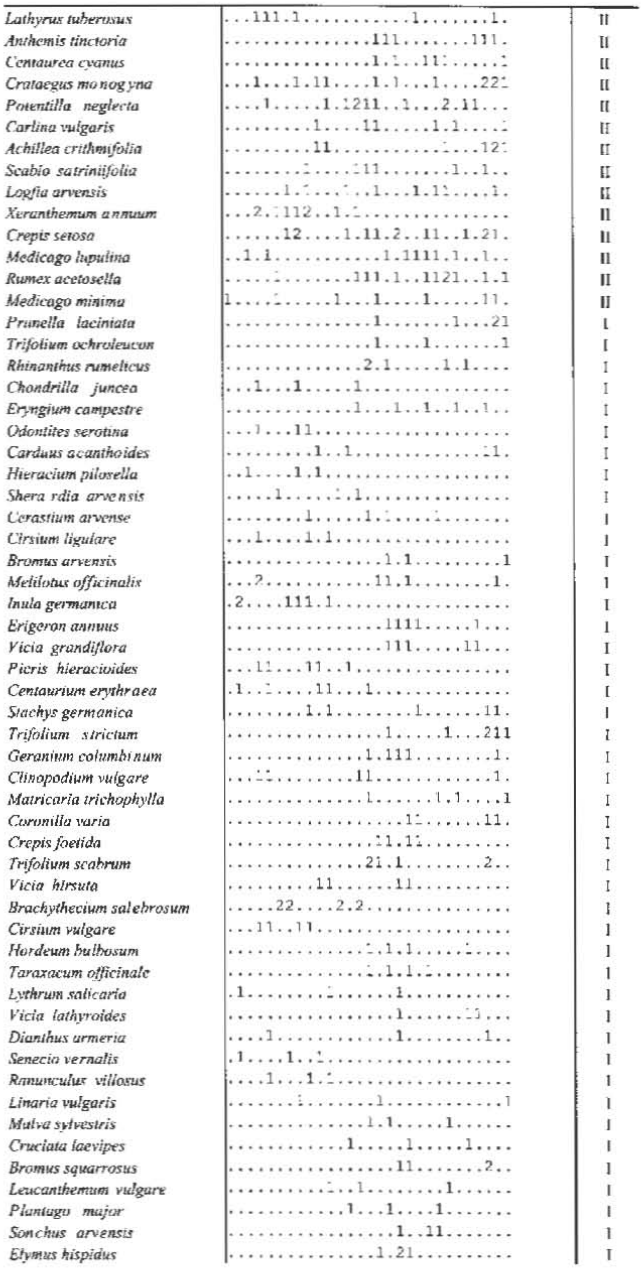
Campanula rapunculoides 10: 1; *Elymus repens* 14: 2, 16: 1; *Leontodon autumnalis* 8: 1, 14: 1; *Linum catharicum* 11: 1; *Dactylis glomerata* 8: 1, 16: 1; *Mentha arvensis* 16: 1; *Potentilla reptans* 13: 1, 16: 1; *Festuca pratensis* 15: 1; *Holcus lanatus* 8: 1, 13: 1; *Galium lovcense* 14: 1; *Trifolium nigrescens* 6: 1; *Matricaria perforata* 10: 1; *Rubus caesius* 15: 1; *Bromus commutatus* 16: 2; *Salvia verticillata* 16: 1; *Xeranthemum cylindraceum* 8: 1, 10: 2; *Lathyrus hirsutus* 4: 1; *Brachypodium sylvaticum* 8: 1, 15: 2; *Anthemis tinctoria* 10: 1; *Centaurea cyanus* 10: 1; *Inula germanica* 13: 1; *Picris hieracioides* 11: 1; *Matricaria trichophylla* 4: 1; *Coronilla varia* 8: 1; *Crepis foetida* 9: 1; *Trifolium scabrum* 1: 1; *Brachythecium salebrosum* 2: 2; *Cirsium vulgare* 14: 1, 16: 1; *Hordeum bulbosum* 16: 1; *Vicia lathyroides* 4: 1; *Senecio vernalis* 14: 1; *Cruciata laevipes* 6: 1; *Calamagrostis villosa* 10: 1; *Linaria genistifolia* 10: 1; *Setaria viridis* 9: 1; *Sambucus ebulus* 13: 1, 16: 1; *Origanum vulgare* 10: 1, 13: 1; *Trifolium hybridum* 8: 1; *Lathyrus nissolia* 10: 1; *Poa bulbosa* 1: 1, 4: 1; *Verbascum phoeniceum* 10: 1; *Plantago media* 8: 1, 9: 1; *Centaurea diffusa* 15: 1, 16: 1; *Carduus nutans* 12: 1, 14: 1; *Leontodon crispus* 4: 1, 8: 2; *Centaurea indurata* 13: 1; *Capsella bursa-pastoris* 5: 1; *Orlaya grandiflora* 10: 2; *Nonea pulla* 10: 1; *Vicia dumetorum* 10: 1; *Hordeum murinum* 12: 1; *Logfia minima* 7: 1; *Linum trigynum* 10: 1; *Viola tricolor* 8: 1; *Tragopogon pratensis* 1: 1; *Scleranthus neglectus* 1: 1; *Solidago canadensis* 11: 1; *Trifolium alpestre* 1: 1; *Muscari comosum* 4: 1; *Veronica orchidea* 9: 1; *Rosa vosagiaca* 10: 1; *Orlaya daucorlaya* 8: 1; *Helianthemum nummularium* 11: 1; *Petrorhagia velutina* 12: 2, 16: 1; *Scabiosa ochroleuca* 9: 1, 11: 1; *Cynodon dactylon* 6: 1, 12: 2; *Trifolium montanum* 1: 1, 5: 1; *Petrorhagia prolifera* 3: 1, 10: 1; *Helleborus odorus* 8: 1, 9: 1; *Taeniatherum caput-medusae* 2: 1, 12: 1; *Apera spica-venti* 1: 1, 4: 1; *Inula britannica* 10: 1; *Avenula compressa* 15: 1; *Rubus sanguineus* 10: 1; *Anagalis arvensis* 10: 1, 13: 1; *Thymus pannonicus* 10: 2, 11: 1; *Cirsium pannonicum* 9: 1, 11: 1; *Tragopogon dubius* 10: 1; *Centaurea biebersteinii* 15: 1; *Ceratodon purpureus* 3: 1; *Chamaecytisus supinus* 1: 2; *Convolvulus cantabrica* 10: 1; *Bromus tectorum* 10: 1; *Bellis perennis* 8: 1; *Salvia nemorosa* 10: 1; *Hypnum cupressiforme* 3: 1; *Anacamptis pyramidalis* 10: 1; *Hypericum linarioides* 6: 1; *Alyssum tortuosum* 10: 1; *Holosteum umbellatum* 10: 1; *Polygala vulgaris* 6: 1; *Potentilla sulphurea* 10: 1; *Ornithogalum umbellatum* 4: 1; *Rhodax canus* 1: 1; *Pimpinella tragium* 8: 1; *Racomitrium canescens* 3: 1; *Thymus longicaulis* 1: 1; *Bupleurum affine* 8: 1; *Erodium ciconium* 8: 1; *Galium tenuissimum* 7: 1; *Trifolium hirtum* 10: 1; *Trifolium affine* 12: 1;

Locality and date of relevès

1. Targovishte District, N43°05'30" E26°26'55", 17.06. 2003; **2.** Targovishte Distr., Verentzi village, 16.06.2003; **3.** Targovishte Distr., N43°01'44" E26°24'32", 16.06.2003; **4.** Targovishte Distr., N43°04'36" E26°20'50", 15.06.2003; **5.** Targovishte Distr., Dolno Kozarevo village, 17.06. 2003; **6.** Targovishte Distr., N43°03'37" E26°25'38", 16.06.2003; **7.** Targovishte Distr., Veseletz area, 16.06.2003; **8.** Veliko Tarnovo Distr., N42°58'22" E26°00'55", 18.08.2002; **9.** Veliko Tarnovo Distr., Rusalya village, 19.08.2002; **10.** Shoumen Distr., N43°03'59" E26°58'11", 13.06. 2002; **11.** Veliko Tarnovo Distr., N43°05'12" E25°30'34", 19.08.2002; **12.** Targovishte Distr., Velichka village, 09.08.2003; **13.** Veliko Tarnovo Distr., N42°57'43" E26°02'54", 18.08. 2002; **14.** Targovishte Distr., N43°07'41" E26°17'01", 11.08. 2003; **15.** Targovishte Distr., N43°00'13" E26°10'39", 8.08.2003; **16.** Targovishte Distr., Kapishte village, 08.08.2003.

TABLE 5 - Festuco-Agrostidetum Horv. 1951.

Relevé No	1111111111222222222 12345678901234567890123456789	Const.
Ass. diagnostic species		
Anthoxanthum odoratum	.1..2122221..121112...22211.2	IV
Agrostis capillaris	32321232223221..1.....	III
Festuca rubra	2.....1.1...1.....	I
Cynosurion		
Cynosurus cristatus	2....1222.1.1111112.11111.112	IV
Trifolium repens	2111..1111..11.1211122122.212	IV
Lolium perenne	.....1121.....22221.121.21222	III
Leontodon autumnalis	1.1..111.1.11.1.....2.....	II
Molinio-Arrhenatheretea		
Lotus corniculatus	2121112122.111.11.1.111111112	V
Plantago lanceolata	211.2.221112.211221.11.111122	V
Trifolium pratense	2111111211111.11.11112211111	V
Poa pratensis	1..2222.1.122221222.1..12.111	IV
Dactylis glomerata	.1..111221.11112.2...212.11.	IV
Achillea millefolium	2...12211..2.11.1.111..111.11	IV
Prunella vulgaris	11..1.1111....1..11111...1.11	III
Mentha arvensis	.1.1.1..2.11.111.111.1..1.111	III
Potentilla reptans	111..1111.1..1.1.11.....11.	III
Sanguisorba officinalis	.....11..1.1..1..11...11111..	III
Tragopogon orientalis	.....1.....111111....11.1.1	II
Stellaria graminea	1.....1.111....111...	II
Phleum pratense	....11....11....1.1...1....1.	II
Festuca pratensis	.....1...11.122.....23...	II
Holcus lanatus	.21.2.22222.....	II
Ranunculus acris	2.....1.111.11.....	II
Arrhenatherum elatius	.....1....11.12....12....	II
Veronica chamaedrys	.....1...1.11.....1.....1..	II
Lathyrus pratensis	.....111.....11..1	II
Other species		
Rumex crispus	.11121111112111111111.111111.1	V
Hypericum perforatum	.11111111.2111111111.11111..1	V
Potentilla argentea	...1112211.1.211.11.112...111	IV
Cichorium intybus	111111211.2111.1.111..111..11	IV
Agrimonia eupatoria	12112221112211..1.11....1.111	IV
Daucus carota	12112121222112...111...11....	IV
Convolvulus arvensis	111.2121.1.11.1111112111.1.1	IV
Elymus repens	1..21.1.2.....211211....1.1.1	III
Thymus pulegioides	..11211221121.21.....1.111	III
Galium verum	111.1...111.12.11.....11.1..	III
Galium lovcense	...112..11.2..111.1...11..111	III
Trifolium nigrescens	.2..1.1.111.11...111.1.1.1..1	III
Matricaria perforata	...1.....2111111111111	III
Vicia varia	...21..22....21111111...111..	III
Rubus caesius	.1.21..11.....11112....1111.	III
Bromus commutatus	...3....2...3..2111332....223	III
Rosa canina	.1.11..1111..2...11..1.....11	III
Trifolium arvense	...1....1...12.1.111..11...11	III
Cynosurus echinatus	...2...2221..2.2.11122....222	III
Trifolium aureum	....1.....1..11111...1111.1	III
Bromus mollis	....23221..3.12...1.1111112.2	III
Hieracium praealtum s. bauchinii	.1.11..11.1.....1..21121.1.1	III
Echium vulgare	.1.1...1..1....1.1.11..1.1111	III
Vulpia myuros	....1..21...21.2....1122..1.2	III
Dipsacus laciniatus	.1.11.1111..21..1111....11..1	III
Verbena officinalis	1.1.11.11..1.1.1.1...11.....	III
Leontodon hispidus	.....11.1.....1.....11..111	II
Festuca valesiaca	...1.2.21..2.1....1...1.1.1.1	II
Teucrium chamaedrys	.....1..11.1.11.....1.1....	II
Filipendula vulgaris	.1.....1111.....1.1..	II
Dorycnium herbaceum	.....2.111121....1.....1.1	II
Cirsium arvense	...11.....11..1....1..1	II
Salvia verticillata	...2.1.....1.1...11.....1.111	II
Silene vulgaris	...1.....1111....11.1..	II
Aster amellus	...1211.1..11.....	II
Xeranthemum cylindraceum	.....1....11..11.....12.	II
Lathyrus hirsutus	.....11111.....1.1	II
Brachypodium sylvaticum	...1.1.11111.....	II



Lathyrus tuberosus	II
Anthemis tinctoria	II
Centaurea cyanus	II
Crataegus monogyna	II
Potentilla neglecta	II
Carlina vulgaris	II
Achillea crithmifolia	II
Scabio satriniifolia	II
Logfia arvensis	II
Xeranthemum annuum	II
Crepis setosa	II
Medicago lupulina	II
Rumex acetosella	II
Medicago minima	II
Prunella laciniata	I
Trifolium ochroleucon	I
Rhinanthus rumelicus	I
Chondrilla juncea	I
Eryngium campestre	I
Odontites serotina	I
Carduus acanthoides	I
Hieracium pilosella	I
Shera rdia arvensis	I
Cerastium arvense	I
Cirsium ligulare	I
Bromus arvensis	I
Melilotus officinalis	I
Inula germanica	I
Erigeron annuus	I
Vicia grandiflora	I
Picris hieracioides	I
Centaurium erythraea	I
Stachys germanica	I
Trifolium strictum	I
Geranium columbinum	I
Clinopodium vulgare	I
Matricaria trichophylla	I
Coronilla varia	I
Crepis foetida	I
Trifolium scabrum	I
Vicia hirsuta	I
Brachythecium salebrosum	I
Cirsium vulgare	I
Hordeum bulbosum	I
Taraxacum officinale	I
Lythrum salicaria	I
Vicia lathyroides	I
Dianthus armeria	I
Senecio vernalis	I
Ranunculus villosus	I
Linaria vulgaris	I
Malva sylvestris	I
Cruciata laevipes	I
Bromus squarrosus	I
Leucanthemum vulgare	I
Plantago major	I
Sonchus arvensis	I
Elymus hispidus	I

Species in less than 2 relevès:

Lysimachia nummularia 19: 1; *Chrysopogon gryllus* 1: 2; *Brachy podium pinnatum* 19: 1; *Moenchia mantica* 27: 1; *Botriochloa ischaemum* 8: 1, 14: 1; *Hieracium hoppeanum* 15: 1; *Sanguisorba minor* 1: 1; *Cleistogenes serotina* 16: 1; *Fragaria viridis* 14: 1; *Ranunculus bulbosus s. bulbifer* 18: 1; *Linum catharicum* 15: 1; *Leontodon cichoraceus* 16: 1, 29: 1; *Poa compressa* 16: 1. 28: 1; *Scleranthus perennis* 23: 1, 27: 1; *Vulpia bromoides* 16: 1; *Aira elegantissima* 20: 1, 28: 1; *Pteridium aquilinum* 27: 1; *Rumex pulcher* 9: 1, 23: 1; *Calamagrostis villosa* 10: 1, 17: 1; *Knautia macedonica* 16: 1, 27: 1; *Allium ampeloprasum* 16: 1, 28. 1; *Linaria genistifolia* 1: 1, 24: 1; *Consolida regalis* 4: 1, 28: 1; *Setaria viridis* 3: 1, 7: 1; *Gentiana cruciata* 10: 1, 14: 1; *Sambucus ebulus* 4: 1, 27: 1; *Hornungia petraea* 27: 1, 29: 1; *Allium vineale* 2: 1, 5 : 1; *Knautia arvensis* 16: 2, 27: 1; *Origanum vulgare* 4: 1, 28: 1; *Lysimachia punctata* 18: 1, 19: 1; *Vicia tetrasperma* 19: 1, 26: 1; *Myosotis arvensis* 18: 1, 19 : 1; *Anchusa procera* 27: 1, 28: 1; *Trifolium hybridum* 3: 1, 16: 1; *Homalothecium lutescens* 8: 2, 27: 2; *Lathyrus nissolia* 27: 1, 29: 1; *Juncus conglomeratus* 1: 1, 3: 1; *Poa bulbosa* 23: 2, 28: 1; *Verbascum phoenic eum* 1: 1, 14: 1; *Mentha pulegium* 1: 1, 7: 1; *Campanula glomerata* 28: 1; *Bromus sterilis* 11: 1; *Genista sexsilifolia* 24: 1; *Verbascum xanthophoeniceum* 20: 1; *Carex tomentosa* 19: 1;

Carex hordeistichos 1: **1**; *Urtica dioica* 17: 1; *Berteroa incana* 23: 1; *Vicia villosa* 29: 1; *Rhinanthus angustifolius* 14: 2; *Tanacetum vulgare* 5: 1; *Alopecurus myosuroides* 19: 1; *Deschampsia caespitosa* 3: 2; *Aegilops cylindrica* 16: 1; *Geranium sanguineum* 17: 1; *Verbascum floccosum* 14: 1; *Filipendula ulmaria* 1: 2; *Viola arvensis* 24: 1; *Genista ovata* 29: **1**; *Filago vulgaris* 20: **1**; *Plantago media* 19: 1; *Juncus effusus* 2: 1; *Plagiothecium laetum* 6: **2**; *Lathyrus aphaca* 19: 1; *Hieracium murorum gr.* 24: 2; *Papaver rhoeas* 28: 1; *Centaurea diffusa* 29: 1; *Lepidium campestre* 16: 1; *Hypericum elegans* 22: 1; *Carduus nutans* 22: 1; *Linum tenuifolium* 5: 2; *Leontodon crispus* 28: 1; *Linum corymbulosum* 27: 1; *Linum hirsutum* 27: 1; *Lysimachia vulgaris* 2: 1; *Arctium lappa* 19: 1; *Carex ovalis* 8: 1; *Bellis annua* 15: 1; *Briza media* 25: 1; *Rorippa pyrenaica* 29: 1; *Crataegus pentagyna* 5: 1: *Carex rostrata* 19: 1; *Rumex acetosa* 1: 1; *Centaurea indurata* 1: 1; *Capsella bursa-pastoris* 23: 1; *Malus sylvestris* 14: 1; *Ornithogalum narbonense* 2: 1; *Polygala major* 27: 1; *Orlaya grandiflora* 28: 1; *Artemisia alba* 19: 1; *Allium stamineum* 25: 1; *Melampyrum cristatum* 29: 1; *Nonea pulla* 29: 1.

Locality and date of relevès

1. Veliko Turnovo District, N42 °55'49" E25 °58'21", 18.08.2002; **2.** Veliko Tarnovo Distr., N42 °55'18" E25°46'54", 6.08. 2003; **3.** Veliko Tarnovo Distr., N42 °55'49" E25 °58'22", 18.08. 2002; **4.** Targovishte Distr., N40 °04'09" E26 °11'30", 18.08. 2002; **5.** Veliko Tarnovo Distr., N42 °55'37" E25 °45'15", 6.08.2003; **6.** Veliko Tarnovo Distr., Blaskovtzi village", 7.08. 2003; **7.** Veliko Tarnovo Distr., N42 °56'18" E25 °48'36", 7.08.2003; **8.** Targovishte Distr., N43 °01'28" E26°11'16", 8.08. 2003; **9.** Targovishte Distr., N43 °01'36" E26 °13'10", 9.08.2003; **10.** Veliko Tarnovo Distr., Shilkovtzi village, 6.08.2003; **11.** Veliko Tarnovo Distr., N42 °55'07" E25°43'47", 6.08. 2003; **12.** Veliko Tarnovo Distr., N42 °57'13" E25°50'43", 7.08. 2003; **13.** Veliko Tarnovo Distr., Blaskovtzi village, 7.08.2003; **14.** Veliko Tarnovo Distr., N42 °57'06" E25 °51'13", 7.08.2003; **15.** Targovishte Distr., Gorsko selo Village, 15.06. 2003; **16.** Targovishte Distr., N43°06'05" E26°27'45", 17.06.2003; **17.** Targovishte Distr., N43 °08'25" E26 °10'26", 13.06.2003; **18.** Targovishte Distr., N43 °05'59" E26°19'39", 14. 06.2003; **19.** Targovishte Distr., N43 °08'14" E26°14'07", 13. 06.2003; **20.** Targovishte Distr., N43 °08'02" E26 °14'50", 13.06. 2003; **21.** Targovishte Distr., N43 °06'03" E26 °24'08", 15.06.2003; **22.** Targovishte Distr., N43 °04'16" E26 °21'54", 15.06.2003; **23.** Targovishte Distr., N43 °03'07" E26 °28'36", 16.06.2003; **24.** Targovishte Distr., N43 °04'27" E26°21'36", 14. 06.2003; **25.** Targovishte Distr., N43 °06'34" E26 °15'00", 14.06.2003; **26.** Targovishte Distr., N43 °07'50" E26 °10'41", 13.06.2003; **27.** Targovishte Distr., N43 °06'19" E26°26'38", 17.06.2003; **28.** Targovishte Distr., W of Omurtag, 18.06.2003; **29.** Targovishte Distr., N43 °04'46" E26°21'12", 15.06.2003;