

Flora of Ponor Special Protection Area (Natura 2000), Western Bulgaria

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Abstract: Ponor Special Protection Area is mainly covered by dry grasslands on carbonate terrains, which are known for their capacity to maintain high diversity of plant species. The main objective of this study is to identify the floristic composition of this special protection area, including mosses, and to present a systematic and phytogeographical analysis of the flora. As a result of the survey, 869 vascular plant species belonging to 84 families and 364 genera were identified. Additionally 60 bryophyte species of 2 classes, 25 families and 39 genera were recorded. Species with southern centre of distribution are abundant in xerothermic and xero-mesophytic grassland communities, which predominate in the region. Most of moss-species diversity is concentrated in wet meadows and in areas close to streams, which are rare in the study area because of the carbonate bedrock draining water very fast. Seventy five rare, threatened and protected species occur in the studied area that are of scientific and conservation interest.

Keywords: Bulgaria, Natura 2000, endemic plants

Introduction

The Ponor Special Protection Area (further referred to as Ponor SPA) falls into the Western Balkan Range floristic region. Open landscape and diverse topography determine the high species richness in the area. Despite its position in North Bulgaria, many southern species occur here in largely distributed dry grasslands on carbonate terrains. These particular types of habitats are known for their capacity to maintain high plant species diversity (AUSDEN 2008). On the other hand, close location of the area to the main ridge of the Balkan Mountains, exceeding 2000 m a.s.l. at places, determines the boreal influence on its flora.

Being recently declared as Special Protection Area (SPA), the selected territory has not been previously floristically studied in detail. However, there are some data about the flora of certain sites known from the past. One of the earliest sources of information about the flora of Ponor SPA is the work of JORDANOV (1924), which is on the phytogeography of Western Balkan Mountains. This study

deals with larger area but valuable information on our study area is available as well. Later, other authors (URUMOV 1935; STOYANOV 1941, STEFANOV 1943) put focus of their works on the flora of the region. The most complete and contemporary information is provided by the MSc thesis of YORDANOVA (1999), who conducted her study on the territory of Ponor Mt.

The main objective of this study is to identify the floristic composition of Ponor SPA, including mosses, which have not been studied so far and to present a systematic and phytogeographical analysis of the flora.

Methods

Floristic investigation of Ponor Mt. was performed in the period 2008–2009. Voucher specimens were deposited in the Herbarium of the Institute of Biodiversity and Ecosystem Research (SOM). The identification of the collected vascular plants was

made according to Guide to the Vascular Plants in Bulgaria (KOZHUHAROV 1992), Flora of RP Bulgaria (JORDANOV 1963, 1964, 1966, 1970, 1973, 1976, 1979; VELCHEV 1982, 1989), Flora of R Bulgaria (KOZHUHAROV 1995), and Flora Europaea (TUTIN *et al.* 1964, 1968, 1972, 1976, 1980). Determination and nomenclature of mosses follows PETROV (1975), GANEVA, NATCHEVA (2003) and NATCHEVA, GANEVA (2005), whereas nomenclature for all other plant species follows KOZHUHAROV (1992). Additional data about floristic diversity in the study area was provided by YORDANOVA (1999). The floristic analysis was carried out in accordance to the methods of TOLMACHEV (1974). The number of taxa was assessed by nomenclature categories (families, genera, species, life forms and floristic elements) as well as the relative participation of taxa of different ranks in the studied flora as compared to their general number in the flora of Bulgaria. Species with conservation concern (Balkan and Bulgarian endemics as well as species protected by conventions and laws) are determined according to WALTER, GILLET (1998), PETROVA (2006), PETROVA, VLADIMIROV (2009, 2010), PEEV (2011), Bulgarian Diversity Act (2007), CITES(2010), Directive 92/43/EEC (1992), IUCN Red list (2001) and Convention on the Conservation of European Wildlife and Natural Habitats (1979). The chorological spectrum was established by using the data for floristic elements according to ASSYOV, PETROVA (2006) for vascular plants and GANEVA, DUELL (1999) for bryophytes. Life strategies of mosses follow DIERSSEN (2001). The biological spectrum of the flora was determined by the life forms according to RAUNKIAER (1934) and MUELLER-DOMBOIS, ELLENBERG (1974). The floristic diversity of the region was compared with those for the country (3997 species, 889 genera and 147 families) according to ASSYOV, PETROVA (2006).

Results

As a result of this study, 869 vascular plants (bryophytes excluded) belonging to 84 families and 364 genera were identified (Table 1 and 2). Mosses were represented by 60 species, 39 genera, 25 families and 2 classes. All 5 main life-form types (Phanerophytes, Chamaephytes, Hemicryptophytes, Cryptophytes and Therophytes) for vascular plants were present as well as 9 groups of bryophytes according to their life strategy (Table 1). All vascular plants without mosses were classified into 60 floristic elements groups whereas bryophytes into 16 (Table 1 and 3). A total of 75 species with conservation concern were found in the study area (Table 1). Thirty-seven

species are included in Annexes 2, 3 and 4 of the Bulgarian Biological Diversity Act, 18 are endemics (2 Bulgarian and 16 Balkan). In addition, 27 species appear in the Red List of Bulgarian vascular plants, 7 are included in the Red Data Book of the Republic of Bulgaria, 8 are protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora, 2 by the Convention on the Conservation of European Wildlife and Natural Habitats, 2 by the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora and 1 by the Red List of IUCN.

Discussion

Floristic diversity

On the territory of Ponor SPA, 22% of the total number of species, 46% of the total number of genera and 74% of the total number of families of Bulgarian flora are presented. These data show a relatively rich flora of the study site despite its small area.

The families belonging to the Magnoliopsida predominate: 68 (86% of the total number of families registered), 288 genera (79%) and 686 species (80%). The Liliopsida is represented by 11 families (14%), 68 genera (19%) and 169 species (20%). The Pinopsida is represented by a single family (1%), three genera (0.7%) and five species (0.7%), the Polypodiopsida with three families (2.8%), four genera (1%) and six species (0.7%), and the Equisetopsida with one family (1%), one genus (0.2%) and three species (0.3%).

The list of the first ten families with highest number of species in the study area is similar to those of Bulgarian flora (Table 2). The richest families are: Asteraceae (98 species, 10.5% of the total number of species for the area), Poaceae (81, 8.7%), Fabaceae (79, 8.5%), Lamiaceae (54, 5.8%), Caryophyllaceae (44, 4.7%), Rosaceae (44, 4.7%), Apiaceae (40, 4.3%), Brassicaceae (34, 3.7%), Scrophulariaceae (34, 3.7%) and Cyperaceae (31, 3.3%).

The family Lamiaceae occupies the fourth position, whereas in the Bulgarian flora it takes ninth position according to its species diversity. The high number of Lamiaceae species is related to the abundance of calcareous terrains in the area and their flora. Species of this family have Mediterranean and sub-Mediterranean centre of distribution and often take part in the composition of dry grasslands (e.g. alliances *Festucion valesiacae*, *Saturejion montanae*). In the study area, the species of the genera *Thymus*, *Acinos* and *Salvia* are widely distributed. Similar tendency was found also by YORDANOVA

Table 1. List of plant species found in Ponor SPA. Life-forms: P – Phanerophytes, chamaephytes, H – Hemicryptophytes, C – Cryptophytes, T – Therophytes; life strategies: pc – competitive perennials, c – colonists, l – long-lived shuttle, d – dominant, p – perennials, ps – stress tolerant perennials, s – short-lived shuttle, cp – pioneer colonists; floristic elements: Adv – Adventive, Alp – Alpine, Anat – Anatolian, Ap – Apenninian, Am – American, Arct – Arctic, As – Asiatic, Bal – Balkan, Boreal – Boreal, Bul – Bulgarian, Carp – Carpathian, Cauc – Caucasus, Dac – Dacian, Eur – European, Cosmopolitan, Med – Mediterranean, OT – Oriental-Turanian, Pann – Pannonian, Pont – Pontic, Sib – Siberian, S – south, W – west, N – north, C – central, temp – temperate, mont – montane. Conservation status: ¹ – Bulgarian endemic, ² – Balkan endemic, ³ – Red List of Bulgarian vascular plants, ⁴ – Red Data Book of the Republic of Bulgaria, ⁵ – Bulgarian Biological Diversity Act, ⁶ – CITES, ⁷ – Bern convention, ⁹ – Directive 92/43/EEC, ¹⁰ – Red List of IUCN

	Life form / strategy	Floristic element
MARCHANTIOPHYTA		
Jungermanniopsida		
Aneuraceae		
<i>Aneura pinguis</i> (L.) Dumort.	s	n.temp
Lophocoleaceae		
<i>Chiloscyphus polyanthos</i> L.	pc	subbor
Scapaniaceae		
<i>Scapania irrigua</i> (Nees) Dum	c	bor-mont
<i>Scapania undulata</i> (L.) Dum.	pc	w.temp-mont
Marchantiopsida		
Marchantiaceae		
<i>Marchantia polymorpha</i> L.	c	temp
BRYOPHYTA		
Bryopsida		
Amblystegiaceae		
<i>Amblystegium serpens</i> (Hedw.) B.S.G.	p	temp
<i>Calliergonella cuspidata</i> (Hedw.) Lceske	pc	temp
<i>Calliergonella lindbergii</i> (Mitt.) Hedenaes	pc	bor-mont
<i>Campylium stellatum</i> (Hedw.) Lang et C. Jens.	pc	bor
<i>Cratoneuron decipiens</i> (De Not.) Loeske	pc	temp
<i>Warnstorfia exannulata</i> (Schimp.) Loeske.	l	bor
Aulacomniaceae		
<i>Aulacomnium palustre</i> (Hedw.) Schwaegr.	p	subarc-subalp
Bartramiaceae		
<i>Philonotis calcarea</i> (Bruch, Schimp. & W.Gümbel) Schimp.	l	subBoreal
<i>Philonotis fontana</i> (Hedw.) Brid.	pc	n.temp
Brachytheciaceae		
<i>Brachythecium glareosum</i> (Spruce) B. S. G.	pc	subbor(-mon)
<i>Brachythecium mildeanum</i> W. P. Schimper	p	bor-arc
<i>Brachythecium rivulare</i> B. S. G.	pc	subbor
<i>Brachythecium velutinum</i> (Hedw.) B. S. G.	p	temp
<i>Cirriphyllum piliferum</i> (Hedw.) Grout	pc	subbor
Bryaceae		
<i>Bryum caespeticium</i> Hedw.	c	temp
<i>Bryum pseudotriquetrum</i> (Hedw.) P.Gärt., E.Mey. & Scherb.	pc	temp
<i>Pohlia</i> sp.		
Climaciaceae		
<i>Climacium dendroides</i> Web. Et Mohr	pc	subbor
Dicranaceae		
<i>Dicranum bonjeanii</i> De Not.	pc	bor
Ditrichaceae		
<i>Ceratodon purpureus</i> (Hedw.) Brid.	c	temp
<i>Ditrichum flexicaule</i> (Schleich.) Hampe	c	subbor(-mon)
Fissidentaceae		

Table 1. Continued

	Life form / strategy	Floristic element
<i>Fissidens adianthoides</i> Hedw.	<i>c</i>	subbor
<i>Fissidens taxifolius</i> Hedw.	<i>c</i>	temp
Grimmiaceae		
<i>Grimmia pulvinata</i> (Hedw.) Sm.	<i>c</i>	temp
<i>Schistidium apocarpum</i> (Hedw.) B. S. G.	<i>cp</i>	bor-mont
Hedwigiaceae		
<i>Hedwigia ciliata</i> (Hedw.) P. Beauv.	<i>l</i>	subbor(-mon)
Hylocomiaceae		
<i>Pleurozium schreberi</i> (Brid.) Mitt.	<i>pc</i>	subbor
Hypnaceae		
<i>Hypnum cupressiforme</i> Hedw.	<i>ps</i>	bor-mont
Leskeaceae		
<i>Pseudoleskeella catenulata</i> (Schrad.) Kindb.	<i>ps</i>	bor-mon/dealp
Mniaceae		
<i>Plagiomnium affine</i> (Blanfow ex Funck) T. J. Kop.	<i>pc</i>	temp
<i>Plagiomnium elatum</i> (Bruch & Schimp) T. J. Kop.	<i>pc</i>	bor
<i>Rhizomnium punctatum</i> (Hedw.) T. J. Kop.	<i>l</i>	n.suboc
Orthotrichaceae		
<i>Orthotrichum anomalum</i> Hedw.	<i>c</i>	temp
Pottiaceae		
<i>Didymodon acutus</i> (Brid.) K. Saito	<i>c</i>	submed
<i>Syntrichia ruralis</i> Brid.	<i>c</i>	temp
<i>Tortella flavovirens</i> (Bruch) Broth.	<i>c</i>	suboc-submed
<i>Tortella tortuosa</i> (Hedw.) Limpr.	<i>ps</i>	bor-mont
<i>Weissia longifolia</i> Mitt.	<i>s</i>	s.temp
<i>Weissia</i> sp.		
Rhytidiaceae		
<i>Rhytidium rugosum</i> (Hedw.) Kindb.	<i>pc</i>	subbor(-mon)
Polytrichopsida		
Polytrichaceae		
<i>Atrichum undulatum</i> (Hedw.) P. Beauv.	<i>s</i>	temp
<i>Polytrichum commune</i> Hedw.	<i>pc</i>	subbor
<i>Polytrichum juniperinum</i> Willd.	<i>ps, pc</i>	temp
<i>Polytrichum piliferum</i> Hedw.	<i>ps</i>	temp
<i>Polytrichum strictum</i> Sm.	<i>pc</i>	bor
Sphagnopsida		
Sphagnaceae		
<i>Sphagnum centrale</i> C. Jens. ²	<i>l</i>	bor
<i>Sphagnum contortum</i> Schultz ²	<i>l</i>	bor(-mont)
<i>Sphagnum cuspidatum</i> Hoffm. ^{3,4,5}	<i>l, d</i>	bor
<i>Sphagnum falax</i> (Klinggr.) Klinggr. Emend. Warnst. ^{3,5}	<i>l, d</i>	subbor
<i>Sphagnum flexuosum</i> Dozy et Molk. ⁵	<i>l, d</i>	subbor
<i>Sphagnum girgensohnii</i> Russ. ⁵	<i>l</i>	bor-mont
<i>Sphagnum inundatum</i> Russ. ⁵	<i>l</i>	bor
<i>Sphagnum magellanicum</i> Brid. ⁵	<i>l, d</i>	bor
<i>Sphagnum russowii</i> Warnst. ⁵	<i>l</i>	bor-mont
<i>Sphagnum subsecundum</i> Nees ⁵	<i>l</i>	bor
PTERIDOPHYTA		
Equisetopsida		
Equisetaceae		
<i>Equisetum arvense</i> L.	<i>G</i>	Boreal
<i>Equisetum palustre</i> L.	<i>H</i>	Boreal

Table 1. Continued

	Life form / strategy	Floristic element
<i>Equisetum telmateia</i> Ehrh.	<i>G</i>	Boreal
Polypodiopsida		
Aspleniaceae		
<i>Asplenium ruta-muraria</i> L.	<i>H</i>	Boreal
<i>Asplenium viride</i> Huds.	<i>H</i>	Boreal
<i>Asplenium trichomanes</i> L.	<i>H</i>	Kos
<i>Ceterach officinarum</i> DC.	<i>H</i>	subMed
Athyriaceae		
<i>Cystopteris fragilis</i> (L.) Bernh.	<i>H</i>	Kos
Ophioglossaceae		
<i>Botrychium lunaria</i> (L.) Sw.	<i>H</i>	Boreal
PINOPHYTA		
Pinopsida		
Pinaceae		
<i>Pinus mugo</i> Turra	<i>P</i>	Alp-Carp-Bal
<i>Abies alba</i> Mill.	<i>P</i>	Boreal
<i>Picea abies</i> (L.) Karst.	<i>P</i>	Boreal
<i>Pinus sylvestris</i> L.	<i>P</i>	subBoreal
<i>Pinus nigra</i> Arnold	<i>P</i>	subMed
MAGNOLIOPHYTA		
Liliopsida		
Alliaceae		
<i>Allium ursinum</i> L.	<i>G</i>	Eur
<i>Allium scorodoprasum</i> L.	<i>G</i>	Eur-Med
<i>Allium rotundum</i> L.	<i>G</i>	Eur-OT
<i>Allium flavum</i> L.	<i>G</i>	Med
<i>Allium carinatum</i> L.	<i>G</i>	Pont-Med
Araceae		
<i>Arum maculatum</i> L.	<i>H</i>	Eur-subMed
Cyperaceae		
<i>Blysmus compressus</i> (L.) Panz. ex Link	<i>H</i>	Eur-As
<i>Carex nigra</i> (L.) Rchb.	<i>H</i>	Alp-Carp
<i>Carex caryophyllea</i> Latourr.	<i>H</i>	Boreal
<i>Carex flava</i> L.	<i>H</i>	Boreal
<i>Carex hirta</i> L.	<i>H</i>	Boreal
<i>Carex lepidocarpa</i> Tausch	<i>H</i>	Boreal
<i>Carex pallescens</i> L.	<i>H</i>	Boreal
<i>Carex panicea</i> L.	<i>H</i>	Boreal
<i>Carex rostrata</i> Stokes	<i>H</i>	Boreal
<i>Carex tricolor</i> Velen. ^{1,3}	<i>H</i>	Bul
<i>Carex buekii</i> Wimm.	<i>H</i>	Eur
<i>Carex michelii</i> Host	<i>H</i>	Eur
<i>Carex otrubae</i> Podp.	<i>H</i>	Eur
<i>Carex curta</i> Good.	<i>H</i>	Eur-As
<i>Carex hallerana</i> Asso	<i>H</i>	Eur-As
<i>Carex humilis</i> Leyss.	<i>H</i>	Eur-As
<i>Carex lasiocarpa</i> Ehrh.	<i>H</i>	Eur-As
<i>Carex serotina</i> Mérat	<i>H</i>	Eur-As
<i>Carex acuta</i> L.	<i>H</i>	Eur-Sib
<i>Carex montana</i> L.	<i>H</i>	Eur-Sib
<i>Carex tomentosa</i> L.	<i>H</i>	Eur-Sib
<i>Carex acutiformis</i> Ehrh.	<i>H</i>	Kos

Table 1. Continued

	Life form / strategy	Floristic element
<i>Carex echinata</i> Murr.	H	Kos
<i>Carex muricata</i> L.	H	Kos
<i>Carex ovalis</i> Good.	H	Kos
<i>Eleocharis quinqueflora</i> (Hartm.) O. Schwartz	H	Arct
<i>Eleocharis palustris</i> (L.) R. Br.	H	Kos
<i>Eriophorum gracile</i> Koch ex Roth	H	Boreal
<i>Eriophorum latifolium</i> Hoppe	H	Boreal
<i>Eriophorum vaginatum</i> L.	H	Eur-As
<i>Scirpus sylvaticus</i> L.	H	subBoreal
Dioscoreaceae		
<i>Tamus communis</i> L.	G	subMed
Iridaceae		
<i>Crocus veluchensis</i> Herbert ^{2,5}	G	Bal
<i>Iris reichenbachii</i> Heuff.	H	Bal-Dac
<i>Iris variegata</i> L.	H	subMed
Juncaceae		
<i>Juncus articulatus</i> L.	H	Boreal
<i>Juncus thomasi</i> Ten.	H	Carp-Bal
<i>Juncus conglomeratus</i> L.	H	Eur
<i>Juncus filiformis</i> L.	H	Kos
<i>Juncus tenuis</i> Willd.	H	NAm(Adv)
<i>Juncus effusus</i> L.	H	subBoreal
<i>Juncus inflexus</i> L.	H	subBoreal
<i>Juncus atratus</i> Krock.	H	subMed
<i>Luzula luzulina</i> (Vill.) Dalla Torre & Sarnth.	H	Alp-Med
<i>Luzula pilosa</i> (L.) Willd.	H	Boreal
<i>Luzula luzuloides</i> (Lam.) Dandy	H	Eur
<i>Luzula sylvatica</i> (Hudson) Gaudin	H	Eur
<i>Luzula multiflora</i> (Retz.) Lej.	H	Kos
<i>Luzula sudetica</i> (Willd.) DC.	H	Kos
<i>Luzula campestris</i> (L.) Lam. & DC.	H	subBoreal
Juncaginaceae		
<i>Triglochin palustre</i> L.	H	Boreal
Liliaceae		
<i>Anthericum liliago</i> L.	H	subMed
<i>Asparagus officinalis</i> L. ⁵	H	Eur
<i>Asphodelus albus</i> Mill. ⁵	H	subMed
<i>Colchicum autumnale</i> L.	G	Eur
<i>Convallaria majalis</i> L.	CH	Boreal
<i>Erythronium dens-canis</i> L. ⁵	G	Med
<i>Gagea pratensis</i> (Pers.) Dumort.	G	Eur
<i>Gagea lutea</i> (L.) Ker Gawl.	G	Eur-As
<i>Gagea arvensis</i> (Pers.) Dumort.	G	Pont-Med
<i>Hyacinthella leucophaea</i> (Steven ex Kunth) Schur	G	Pont-Med
<i>Lilium jankae</i> A. Kern. ^{2,3,5,7}	G	Bal
<i>Lilium martagon</i> L. ⁵	G	Eur-As
<i>Muscari botryoides</i> (L.) Mill.	G	Med
<i>Muscari comosum</i> (L.) Mill.	G	Med
<i>Muscari neglectum</i> Guss. ex Ten.	G	Med-OT
<i>Muscari racemosum</i> DC.	G	subMed
<i>Ornithogalum kochii</i> Parl.	G	Eur-subMed
<i>Ornithogalum comosum</i> L.	G	Med

Table 1. Continued

	Life form / strategy	Floristic element
<i>Ornithogalum umbellatum</i> L.	G	Pont-subMed
<i>Scilla bifolia</i> L. ⁵	G	Pont-subMed
<i>Veratrum lobelianum</i> Bernh.	H	Eur-As
<i>Veratrum nigrum</i> L.	H	Eur-As
Orchidaceae		
<i>Dactylorhiza cordigera</i> (Fries) Sóo ^{5,6}	G	Carp-Bal
<i>Dactylorhiza saccifera</i> (Brongn.) Soo ⁵	G	Eur-Sib
<i>Epipactis helleborine</i> (L.) Crantz ^{5,6}	G	subBoreal
<i>Epipactis palustris</i> (L.) Crantz ^{3,4,5}	G	subMed
<i>Gymnadenia frivaldii</i> Hampe ex Griseb. ^{3,5,6}	G	Carp-Bal
<i>Gymnadenia conopsea</i> (L.) R. Br. ^{5,6}	G	Eur-As
<i>Orchis coriophora</i> L. ^{5,6}	G	Eur-subMed
<i>Orchis morio</i> L. ^{5,6}	G	Eur-subMed
<i>Orchis tridentata</i> Scop. ^{5,6}	G	Eur-subMed
Poaceae		
<i>Aegilops cylindrica</i> Host	T	Med
<i>Agropyron cristatum</i> (L.) Gaertn.	H	Eur-Pont
<i>Agrostis castellana</i> Boiss. & Reut.	H	Bal-Anat
<i>Agrostis capillaris</i> L.	H	Boreal
<i>Agrostis gigantea</i> Roth	H	Boreal
<i>Agrostis stolonifera</i> L.	H	Boreal
<i>Agrostis canina</i> L.	H	Eur-Sib
<i>Alopecurus aequalis</i> Sobol.	H	Eur-As
<i>Alopecurus pratensis</i> L.	H	Eur-As
<i>Anthoxanthum odoratum</i> L.	H	Eur-As
<i>Arrhenatherum elatius</i> (L.) P. Beauv. ex J. & C. Presl	H	Eur-As
<i>Avenula planiculmis</i> (Schrad.) Sauer & Chmelitschek	H	Bal-Anat
<i>Avenula compressa</i> (Heuffel) Sauer & Chmelitschek	H	Bal-Dac
<i>Avenula pubescens</i> (Huds.) Dumort.	H	SSib
<i>Bellardiachloa violacea</i> (Bellardi) Chiov.	H	subMed-Anat
<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.	H	Eur-As
<i>Brachypodium pinnatum</i> (L.) P. Beauv.	H	SSib
<i>Briza media</i> L.	H	Eur
<i>Bromus mollis</i> L.	T	Boreal
<i>Bromus sterilis</i> L.	T	Boreal
<i>Bromus moesiacus</i> Velen. ^{1,3,7,8}	H	Bul
<i>Bromus arvensis</i> L.	T	Eur-As
<i>Bromus barcensis</i> Simonk.	H	Eur-As
<i>Bromus riparius</i> Rehmman	H	Pont
<i>Bromus squarrosus</i> L.	T	subMed
<i>Calamagrostis arundinaceae</i> (L.) Roth	H	subBoreal
<i>Chrysopogon gryllus</i> (L.) Trin.	H	Pont-Med
<i>Cynodon dactylon</i> (L.) Pers.	H	Kos
<i>Cynosurus cristatus</i> L.	H	Eur
<i>Dactylis glomerata</i> L.	H	Eur-As
<i>Danthonia alpina</i> Vest	H	Eur
<i>Dasyphyrum villosum</i> (L.) Cand.	T	subMed
<i>Deschampsia caespitosa</i> (L.) P. Beauv.	H	Boreal
<i>Deschampsia flexuosa</i> (L.) Trin.	H	Boreal
<i>Desmazeria rigida</i> (L.) Tutin	T	subMed
<i>Dichanthium ischaemum</i> (L.) Roberty	H	SMed-As
<i>Elymus repens</i> (L.) Gould.	H	Boreal

Table 1. Continued

	Life form / strategy	Floristic element
<i>Elymus hispidus</i> (Opiz) Melderis	<i>H</i>	Pont-CAs
<i>Festuca paniculata</i> (L.) Schinz & Thell.	<i>H</i>	Alp-Carp-Bal
<i>Festuca stojanovii</i> (Acht.) Kožuharov ²	<i>H</i>	Bal
<i>Festuca airoides</i> Lam.	<i>H</i>	Boreal
<i>Festuca heterophylla</i> Lam.	<i>H</i>	Boreal
<i>Festuca panciciana</i> (Hack.) K. Richt.	<i>H</i>	Boreal
<i>Festuca pratensis</i> L.	<i>H</i>	Boreal
<i>Festuca rubra</i> L.	<i>H</i>	Boreal
<i>Festuca nigrescens</i> Lam.	<i>H</i>	Eur
<i>Festuca pseudodalmatica</i> Krajina ex Domin	<i>H</i>	Eur-As
<i>Festuca rupicola</i> Heuff.	<i>H</i>	Pann-Bal
<i>Festuca valesiaca</i> Schleich. ex Gaudin	<i>H</i>	Pont
<i>Festuca arundinacea</i> Schreb.	<i>H</i>	Pont-SAs
<i>Festuca dalmatica</i> (Hack.) K. Richt.	<i>H</i>	subMed
<i>Holcus lanatus</i> L.	<i>H</i>	Eur
<i>Holcus mollis</i> L.	<i>H</i>	Eur
<i>Koeleria macrantha</i> (Ledeb.) Schult.	<i>H</i>	Eur
<i>Koeleria nitidula</i> Velen.	<i>H</i>	Pont
<i>Lerchenfeldia flexuosa</i> (L.) Schur	<i>H</i>	Boreal
<i>Lolium perenne</i> L.	<i>H</i>	Eur-As
<i>Melica ciliata</i> L.	<i>H</i>	Eur-subMed
<i>Molinia caerulea</i> (L.) Moench	<i>H</i>	Boreal
<i>Molinia arundinacea</i> Schrank	<i>H</i>	Pann-Bal
<i>Nardus stricta</i> L.	<i>H</i>	Arct-Alp
<i>Phleum phleoides</i> (L.) Karst.	<i>H</i>	Eur-As
<i>Phleum pratense</i> L.	<i>H</i>	Eur-subMed
<i>Phleum montanum</i> C. Koch	<i>H</i>	Med
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	<i>H</i>	Kos
<i>Poa trivialis</i> L.	<i>H</i>	Boreal
<i>Poa badensis</i> Haenke ex Willd.	<i>H</i>	Eur-As
<i>Poa bulbosa</i> L.	<i>H</i>	Eur-As
<i>Poa sylvicola</i> Guss.	<i>H</i>	Eur-As
<i>Poa compressa</i> L.	<i>H</i>	Eur-subMed
<i>Poa angustifolia</i> L.	<i>H</i>	Kos
<i>Poa annua</i> L.	<i>T</i>	Kos
<i>Poa pratensis</i> L.	<i>H</i>	Kos
<i>Sesleria latifolia</i> (Adamovič) Degen ²	<i>H</i>	Bal
<i>Sesleria coerulans</i> Friv.	<i>H</i>	Carp-Bal
<i>Sesleria caerulea</i> (L.) Ard.	<i>H</i>	Eur
<i>Sieglingia decumbens</i> (L.) Bernh.	<i>H</i>	Eur-Med
<i>Stipa pennata</i> L. ⁵	<i>H</i>	Eur
<i>Stipa capillata</i> L. ⁵	<i>H</i>	Pont-Med
<i>Stipa epilosa</i> Martinovský ⁵	<i>H</i>	subMed
<i>Trisetum flavescens</i> (L.) P. Beauv.	<i>H</i>	Boreal
<i>Vulpia myuros</i> (L.) C. C. Gmel.	<i>H</i>	subBoreal
Typhaceae		
<i>Typha latifolia</i> L.	<i>H</i>	Kos
Magnoliopsida		
Aceraceae		
<i>Acer pseudoplatanus</i> L.	<i>P</i>	Eur-Med
<i>Acer campestre</i> L.	<i>P</i>	Eur-OT
<i>Acer hyrcanum</i> Fisch.& C. A. Mey.	<i>P</i>	subMed

Table 1. Continued

	Life form / strategy	Floristic element
<i>Acer monspessulanum</i> L.	<i>P</i>	subMed
Adoxaceae		
<i>Adoxa moschatellina</i> L.	<i>H</i>	Boreal
Amaranthaceae		
<i>Amaranthus retroflexus</i> L.	<i>T</i>	Kos
Apiaceae		
<i>Angelica pancicii</i> Vandas	<i>H</i>	Bal
<i>Angelica sylvestris</i> L.	<i>H</i>	Eur-As
<i>Anthriscus nitida</i> (Wahlenb.) Garcke	<i>T</i>	Eur
<i>Anthriscus sylvestris</i> (L.) Hoffm.	<i>H</i>	Eur
<i>Anthriscus nemorosa</i> (M. Bieb.) Spreng.	<i>H</i>	Eur-As
<i>Anthriscus caucalis</i> M. Bieb.	<i>T</i>	Eur-Med
<i>Astrantia major</i> L.	<i>H</i>	subMed
<i>Bifora radians</i> M. Bieb.	<i>T</i>	Eur-Med
<i>Bupleurum affine</i> Sadler ⁵	<i>T</i>	subMed
<i>Bupleurum praealtum</i> L. ⁵	<i>T</i>	subMed
<i>Carum carvi</i> L.	<i>T</i>	Eur-As
<i>Caucalis platycarpus</i> L.	<i>T</i>	Eur-CAs
<i>Chaerophyllum bulbosum</i> L.	<i>H</i>	Eur-As
<i>Chaerophyllum aureum</i> L.	<i>H</i>	Eur-Med
<i>Chaerophyllum temulentum</i> L.	<i>T</i>	Eur-Med
<i>Chaerophyllum hirsutum</i> L.	<i>H</i>	subMed
<i>Daucus carota</i> L.	<i>T</i>	Eur-As
<i>Eryngium campestre</i> L.	<i>H</i>	Pont-Med
<i>Ferulago campestris</i> (Besser) Grecescu	<i>H</i>	Eur-Sib
<i>Ferulago sylvatica</i> (Besser) Rchb.	<i>H</i>	subMed
<i>Heracleum sibiricum</i> L.	<i>H</i>	Eur-As
<i>Heracleum ternatum</i> Velen.	<i>H</i>	Med
<i>Huetia cynapioides</i> (Guss.) P. W. Ball ³	<i>H</i>	Ap-Bal
<i>Laser trilobum</i> (L.) Borkh.	<i>H</i>	Eur-Med
<i>Myrrhoides nodosa</i> (L.) Cannon	<i>T</i>	Eur-As
<i>Oenanthe aquatica</i> (L.) Poir.	<i>H</i>	Eur-Sib
<i>Oenanthe banatica</i> Heuff.	<i>H</i>	Pont
<i>Orlaya grandiflora</i> (L.) Hoffm.	<i>T</i>	Ap-Bal
<i>Pastinaca hirsuta</i> Pančić ²	<i>H</i>	Bal
<i>Pastinaca sativa</i> L.	<i>T</i>	Eur-Sib
<i>Peucedanum alsaticum</i> L.	<i>H</i>	subMed
<i>Pimpinella saxifraga</i> L.	<i>H</i>	Pont-subMed
<i>Pimpinella tragiium</i> Vill.	<i>H</i>	Pont-subMed
<i>Seseli libanotis</i> (L.) Koch	<i>H</i>	Eur-Sib
<i>Seseli peucedanoides</i> (M. Bieb.) Koso-Pol.	<i>H</i>	Med-OT
<i>Seseli rigidum</i> Waldst. & Kit.	<i>H</i>	subMed
<i>Smyrniium perfoliatum</i> L.	<i>T</i>	Eur-Med
<i>Tordylium maximum</i> L.	<i>T</i>	subMed
<i>Torilis japonica</i> (Houtt.) DC.	<i>T</i>	Eur-As
<i>Trinia glauca</i> (L.) Dumort.	<i>H</i>	subMed
Apocynaceae		
<i>Vinca herbacea</i> Waldst. & Kit.	<i>H</i>	Eur-Med
<i>Vinca minor</i> L.	<i>H</i>	Eur-Med
Araliaceae		
<i>Hedera helix</i> L.	<i>Ch</i>	Eur-As
Aristolochiaceae		

Table 1. Continued

	Life form / strategy	Floristic element
<i>Aristolochia clematitis</i> L.	H	Eur-Med
<i>Asarum europaeum</i> L.	H	Eur-Sib
Asclepiadaceae		
<i>Vincetoxicum hirundinaria</i> Medicus	H	Eur-Sib
Asteraceae		
<i>Achillea clypeolata</i> Sm.	H	Bal
<i>Achillea millefolium</i> L.	H	Eur-Sib
<i>Achillea collina</i> J. Becker ex Rchb.	H	Eur-subMed
<i>Achillea crithmifolia</i> Waldst. & Kit.	H	Pann-Bal
<i>Achillea setacea</i> Waldst. & Kit.	H	subMed
<i>Antennaria dioica</i> (L.) Gaertn.	H	Arct-Alp
<i>Anthemis tinctoria</i> L.	H	Eur-Sib
<i>Arctium lappa</i> L.	H	Eur-Med
<i>Artemisia chamaemelifolia</i> Vill. ^{3,4,5}	H	Alp-Caus
<i>Artemisia campestris</i> L.	H	Eur-Sib
<i>Artemisia absinthium</i> L.	H	Pont-Med
<i>Artemisia vulgaris</i> L.	H	subBoreal
<i>Artemisia alba</i> Turra.	H	subMed
<i>Aster amellus</i> L.	H	Eur-Med
<i>Bellis perennis</i> L.	H	Eur-As
<i>Bellis sylvestris</i> Cyr.	H	Med
<i>Carduus candicans</i> Waldst. & Kit.	T	Bal-Dac
<i>Carduus acanthoides</i> L.	H	Eur
<i>Carduus nutans</i> L.	H	Eur-Med
<i>Carlina acanthifolia</i> All.	H	Eur
<i>Carlina vulgaris</i> L.	H	Eur-Med
<i>Centaurea chrysolepis</i> Vis. ²	H	Bal
<i>Centaurea affinis</i> Friv.	H	Bal-Dac
<i>Centaurea phrygia</i> L.	H	Eur
<i>Centaurea jacea</i> L.	H	Eur-Sib
<i>Centaurea scabiosa</i> L.	H	Eur-Sib
<i>Centaurea orientalis</i> L.	H	Pont-Med
<i>Centaurea pannonica</i> (Heuffel) Simonk.	H	Pont-Sib
<i>Centaurea stoebe</i> L.	H	subMed
<i>Centaurea triumfetti</i> All.	H	subMed
<i>Chamomilla recutita</i> (L.) Rauscher	T	Eur-As
<i>Chondrilla juncea</i> L.	T	Eur-Sib
<i>Cichorium intybus</i> L.	H	Eur-Sib
<i>Cirsium heterotrichum</i> Pancic ²	H	Bal
<i>Cirsium rivulare</i> (Jacq.) All.	H	Eur
<i>Cirsium arvense</i> (L.) Scop.	H	Eur-As
<i>Cirsium canum</i> (L.) All.	H	Eur-Med
<i>Cirsium vulgare</i> (Savi) Ten.	H	Eur-Med
<i>Cirsium creticum</i> (Lam.) D'Urv.	H	Med
<i>Cirsium ligulare</i> Boiss.	T	Med
<i>Crepis viscidula</i> Froel	H	Carp-Bal
<i>Crepis pulchra</i> L.	T	Eur-Med
<i>Crepis setosa</i> Haller f.	T	Eur-Med
<i>Crepis paludosa</i> (L.) Moench	H	Eur-Sib
<i>Crepis zacintha</i> (L.) Babcock	T	Med
<i>Crepis biennis</i> L.	H	subMed
<i>Crepis conyzifolia</i> (Gouan) A. Kern.	H	subMed

Table 1. Continued

	Life form / strategy	Floristic element
<i>Crupina vulgaris</i> Cass.	<i>T</i>	subMed
<i>Doronicum columnae</i> Ten.	<i>H</i>	Pont-Med
<i>Echinops sphaerocephalus</i> L. ⁵	<i>H</i>	Eur-Med
<i>Erigeron acer</i> L.	<i>T</i>	Boreal
<i>Eupatorium cannabinum</i> L.	<i>H</i>	Eur-As
<i>Hieracium vulgatum</i> gr.	<i>H</i>	
<i>Hieracium praealtum</i> Vill. Ex Goch.	<i>H</i>	Eur-As
<i>Hieracium pilosella</i> L.	<i>H</i>	Eur-Med
<i>Hieracium caespitosum</i> Dumort.	<i>H</i>	Eur-Sib
<i>Hieracium cymosum</i> L.	<i>H</i>	Eur-Sib
<i>Hypochaeris glabra</i> L.	<i>T</i>	Eur-Med
<i>Hypochaeris radicata</i> L.	<i>H</i>	Eur-Med
<i>Hypochaeris maculata</i> L.	<i>H</i>	Eur-Sib
<i>Inula ensifolia</i> L.	<i>H</i>	Eur-Med
<i>Inula oculus-christi</i> L.	<i>H</i>	Eur-Med
<i>Inula salicina</i> L.	<i>H</i>	Eur-Med
<i>Inula hirta</i> L.	<i>H</i>	Eur-Sib
<i>Inula germanica</i> L.	<i>H</i>	subMed
<i>Jurinea consanguinea</i> DC.	<i>H</i>	subMed-Sib
<i>Lactuca perennis</i> L.	<i>H</i>	Eur
<i>Lactuca serriola</i> L.	<i>T</i>	Pont-As
<i>Lapsana communis</i> L.	<i>T</i>	Eur-Sib
<i>Leontodon hispidus</i> L.	<i>H</i>	Eur-Med
<i>Leontodon autumnalis</i> L.	<i>H</i>	Eur-Sib
<i>Leontodon crispus</i> Vill.	<i>H</i>	Pont-Med
<i>Leucanthemum vulgare</i> Lam.	<i>H</i>	Eur-Sib
<i>Logfia arvensis</i> (L.) Holub	<i>T</i>	Eur-Med
<i>Mycelis muralis</i> (L.) Dumort.	<i>H</i>	Med
<i>Omalotheca sylvatica</i> (L.) Sch. Bip. & F. Schul.	<i>H</i>	Eur-WAs
<i>Onopordum acanthium</i> L.	<i>T</i>	Eur-Med
<i>Petasites hybridus</i> (L.) Gaertn.	<i>H</i>	Eur
<i>Ptilostemon afer</i> (Jacq.) Greuter	<i>T</i>	Med
<i>Scorzonera austriaca</i> Willd.	<i>H</i>	Eur-Sib
<i>Scorzonera cana</i> (C. A. Mey.) Hoffm.	<i>H</i>	Med
<i>Scorzonera hispanica</i> L.	<i>H</i>	Med
<i>Scorzonera laciniata</i> L.	<i>T</i>	Med
<i>Senecio pančićii</i> Degen ^{2,3}	<i>H</i>	Bal
<i>Senecio papposus</i> (Rchb.) Less.	<i>H</i>	Carp-Bal
<i>Serratula tinctoria</i> L.	<i>H</i>	Eur-Sib
<i>Sonchus arvensis</i> L.	<i>H</i>	Eur-As
<i>Tanacetum corymbosum</i> (L.) Sch.Bip.	<i>H</i>	Eur-Med
<i>Taraxacum sp.</i>	<i>H</i>	
<i>Taraxacum officinale</i> Web.	<i>H</i>	Eur-Med
<i>Taraxacum apenninum</i> (Ten.) Ten.	<i>H</i>	subMed
<i>Telekia speciosa</i> (Schreb.) Baumg.	<i>H</i>	subMed
<i>Tragopogon balcanicum</i> Velen. ^{2,3}	<i>T</i>	Bal
<i>Tragopogon pterodes</i> Pančić ²	<i>H</i>	Bal
<i>Tragopogon dubius</i> Scop.	<i>T</i>	Eur-Med
<i>Tragopogon orientalis</i> L.	<i>T</i>	Eur-Med
<i>Tragopogon pratensis</i> L.	<i>T</i>	Eur-Med
<i>Tussilago farfara</i> L.	<i>H</i>	Eur-As
<i>Xeranthemum annuum</i> L.	<i>T</i>	subMed

Table 1. Continued

	Life form / strategy	Floristic element
Berberidaceae		
<i>Berberis vulgaris</i> L.	Ch	Eur-Med
Betulaceae		
<i>Alnus glutinosa</i> (L.) Gaertn.	P	Med-CAs
<i>Betula pendula</i> Roth	P	Eur-Sib
<i>Carpinus betulus</i> L.	P	Eur-subMed
<i>Carpinus orientalis</i> Mill.	P	subMed
<i>Corylus avellana</i> L.	P	Med-CAs
<i>Corylus colurna</i> L.	P	Pont-CAs
Boraginaceae		
<i>Anchusa officinalis</i> L.	T	Pont-Med
<i>Anchusa azurea</i> Mill.	H	subMed
<i>Anchusa barrelieri</i> (All.) Vitman	H	subMed
<i>Asperugo procumbens</i> L.	T	Eur-As
<i>Buglossoides arvensis</i> (L.) I. M. Johnst.	T	Eur-As
<i>Buglossoides purpureo-caerulea</i> (L.) I. M. Johnst.	H	Eur-As
<i>Echium vulgare</i> L.	H	Eur-As
<i>Echium russicum</i> J. F. Gmel. ^{3,4,9}	H	subMed
<i>Myosotis arvensis</i> (L.) Hill	T	Eur-As
<i>Myosotis sparsiflora</i> Mikan ex Pohl	T	Eur-As
<i>Myosotis scorpioides</i> L.	H	Eur-NAm
<i>Myosotis laxa</i> Lehm.	H	subBoreal
<i>Myosotis incrassata</i> Guss.	T	subMed
<i>Myosotis nemorosa</i> Besser	H	subMed-As
<i>Nonea pulla</i> (L.) DC.	H	subMed
<i>Onosma arenaria</i> Waldst. & Kit.	H	Eur
<i>Pulmonaria officinalis</i> L.	H	Eur
<i>Symphytum ottomanum</i> Friv.	H	Bal-Anat
<i>Symphytum tuberosum</i> L.	H	Eur-Med
Brassicaceae		
<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande	H	Eur-As
<i>Alyssum minus</i> (L.) Rothm.	T	Eur-As
<i>Alyssum alyssoides</i> (L.) L.	T	Eur-Med
<i>Alyssum murale</i> Waldst. & Kit.	H	Eur-subMed
<i>Arabidopsis thaliana</i> (L.) Heynh.	T	subBoreal
<i>Arabis glabra</i> (L.) Bernh.	T	Boreal
<i>Arabis hirsuta</i> (L.) Scop.	T	Boreal
<i>Arabis procurrens</i> Waldst. & Kit.	H	Eur
<i>Arabis sagittata</i> (Bertol.) DC.	H	Eur-Med
<i>Arabis nova</i> Vill. ^{3,5}	T	subMed
<i>Arabis turrata</i> L.	T	subMed
<i>Barbarea vulgaris</i> R. Br.	T	Eur-As
<i>Berteroa incana</i> (L.) DC.	H	SPont
<i>Capsella bursa-pastoris</i> (L.) Medicus	T	Kos
<i>Cardamine hirsuta</i> L.	T	Eur-As
<i>Cardamine bulbifera</i> (L.) Crantz	H	subBoreal
<i>Cardaria draba</i> (L.) Desv.	H	Eur-Med
<i>Descurainia sophia</i> (L.) Webb ex Prantl	T	Eur-As
<i>Draba muralis</i> L.	T	Eur-Med
<i>Erophila verna</i> (L.) Chevall.	T	Eur-Med-CAs
<i>Erysimum diffusum</i> Ehrh.	H	CSEur
<i>Erysimum cuspidatum</i> (M. Bieb.) DC.	T	Eur-OT

Table 1. Continued

	Life form / strategy	Floristic element
<i>Lepidium campestre</i> (L.) R. Br.	<i>T</i>	Eur-SMed
<i>Rorippa pyrenaica</i> (L.) Rchb.	<i>H</i>	subMed
<i>Rorripa prolifera</i> (Heuff.) Neilr.	<i>T</i>	Bal-Dac
<i>Rorripa amphibia</i> (L.) Besser	<i>H</i>	Eur-As
<i>Rorripa sylvestris</i> (L.) Besser	<i>H</i>	Eur-As
<i>Sinapis arvensis</i> L.	<i>T</i>	Med
<i>Sisymbrium officinale</i> (L.) Scop.	<i>T</i>	Eur-Sib
<i>Thlaspi perfoliatum</i> L.	<i>T</i>	Eur-Med
<i>Thlaspi arvense</i> Horv.	<i>T</i>	Med-CAs
<i>Thlaspi kovatsii</i> Heuff.	<i>T</i>	Pont-Med
<i>Thlaspi alliaceum</i> L.	<i>T</i>	subMed
<i>Thlaspi praecox</i> Wulfen	<i>H</i>	subMed
Campanulaceae		
<i>Asyneuma limonifolium</i> (L.) Janch.	<i>H</i>	Ap-Bal
<i>Asyneuma anthericoides</i> (Janka) Bornm. ²	<i>H</i>	Bal
<i>Asyneuma canescens</i> (Waldst. & Kit.) Griseb. et Schenk	<i>H</i>	Pont-Bal
<i>Campanula lingulata</i> Waldst. & Kit.	<i>H</i>	Ap-Bal
<i>Campanula jordanovii</i> Ančev & Kovanda ^{2,3,4}	<i>H</i>	Bal
<i>Campanula sparsa</i> Friv. ²	<i>T</i>	Bal
<i>Campanula velebitica</i> Borbas	<i>H</i>	Bal
<i>Campanula trachelium</i> L.	<i>H</i>	Boreal
<i>Campanula trojanensis</i> Kovanda & Ančev ^{2,3}	<i>H</i>	Bul
<i>Campanula transsilvanica</i> Schur ex Andrae ³	<i>T</i>	Carp-Bal
<i>Campanula bononiensis</i> L.	<i>H</i>	Eur
<i>Campanula patula</i> L.	<i>T</i>	Eur
<i>Campanula glomerata</i> L.	<i>H</i>	Eur-OT
<i>Campanula persicifolia</i> L.	<i>H</i>	Eur-Sib
<i>Campanula rapuncululus</i> L.	<i>H</i>	Eur-Sib
Caprifoliaceae		
<i>Lonicera xylosteum</i> L.	<i>Ch</i>	Eur-Sib
<i>Sambucus ebulus</i> L.	<i>H</i>	Eur-Med
<i>Viburnum lantana</i> L.	<i>P</i>	Eur-Med
<i>Viburnum opulus</i> L.	<i>P</i>	Eur-Sib
Caryophyllaceae		
<i>Arenaria leptoclados</i> (Rchb.) Guss.	<i>T</i>	Eur-As
<i>Arenaria serpyllifolia</i> L.	<i>T</i>	Eur-As
<i>Cerastium rectum</i> Friv.	<i>T</i>	Bal-Dac
<i>Cerastium arvense</i> L.	<i>H</i>	Boreal
<i>Cerastium fontanum</i> Baumg.	<i>H</i>	Eur
<i>Cerastium holosteoides</i> Fr.	<i>H</i>	Eur
<i>Cerastium brachypetalum</i> Pers.	<i>T</i>	Eur-Med
<i>Cerastium pumilum</i> Curtis	<i>T</i>	Eur-Med
<i>Cerastium semidecandrum</i> L.	<i>T</i>	Eur-Med
<i>Cerastium tauricum</i> Spreng.	<i>T</i>	Pont-Med
<i>Cerastium banaticum</i> (Rochel) Heuff	<i>H</i>	subMed
<i>Dianthus cruentus</i> Griseb.	<i>H</i>	Bal
<i>Dianthus moesiacus</i> Vis & Pančič ²	<i>H</i>	Bal
<i>Dianthus petraeus</i> Waldst. & Kit.	<i>H</i>	Bal-Dac
<i>Dianthus armeria</i> L.	<i>T</i>	Eur
<i>Dianthus superbus</i> L.	<i>H</i>	Eur-As
<i>Dianthus deltoides</i> L.	<i>H</i>	Eur-Sib
<i>Herniaria glabra</i> L.	<i>T</i>	Eur-As

Table 1. Continued

	Life form / strategy	Floristic element
<i>Herniaria hirsuta</i> L.	<i>T</i>	Eur-As
<i>Lychnis flos-cuculi</i> L.	<i>H</i>	Eur-Sib
<i>Minuartia caespitosa</i> (Ehrh.) Degen	<i>H</i>	Eur-Med
<i>Minuartia viscosa</i> (Schreb.) Schinz & Thell	<i>T</i>	Eur-Med
<i>Minuartia hybrida</i> (Vill.) Schischk.	<i>T</i>	Med-CAs
<i>Moenhia mantica</i> (L.) Bartl.	<i>T</i>	Eur-Med
<i>Petrorhagia illyrica</i> (Ard.) P. W. Ball & Heywood	<i>H</i>	Pont-Med
<i>Petrorhagia saxifraga</i> (L.) Link	<i>T</i>	subMed
<i>Queria hispanica</i> L.	<i>T</i>	subMed
<i>Sagina procumbens</i> L.	<i>H</i>	Boreal
<i>Scleranthus perennis</i> L.	<i>H</i>	Eur-Med
<i>Scleranthus annus</i> L.	<i>T</i>	Eur-Sib
<i>Silene asterias</i> Griseb. ²	<i>H</i>	Bal
<i>Silene roemeri</i> Friv. ²	<i>H</i>	Bal
<i>Silene flavescens</i> Waldst. & Kit.	<i>H</i>	Carp-Bal
<i>Silene vulgaris</i> (Moench) Garcke	<i>T</i>	Eur-As
<i>Silene italica</i> (L.) Pers.	<i>T</i>	Eur-Med
<i>Silene otites</i> (L.) Wibel	<i>H</i>	Eur-Med
<i>Silene bupleuroides</i> Chater & Walters	<i>H</i>	Pont-subMed
<i>Silene conica</i> L.	<i>T</i>	subMed-As
<i>Spergula arvensis</i> L.	<i>T</i>	Kos
<i>Stellaria alsine</i> Grimm	<i>H</i>	Boreal
<i>Stellaria graminea</i> L.	<i>H</i>	Eur-As
<i>Stellaria holostea</i> L.	<i>H</i>	Eur-Sib
<i>Stellaria media</i> (L.) Vill.	<i>T</i>	Kos
<i>Viscaria vulgaris</i> Rohl.	<i>H</i>	Eur-Sib
Celastraceae		
<i>Euonymus verrucosus</i> Scop.	<i>Ch</i>	Eur-Med
Chenopodiaceae		
<i>Chenopodium album</i> L.	<i>T</i>	Kos
Cistaceae		
<i>Fumana procumbens</i> (Dunal) Gren. & Godr.	<i>Ch</i>	Pont-Med
<i>Helianthemum nummularium</i> (L.) Mill.	<i>Ch</i>	Alp-Med
<i>Helianthemum salicifolium</i> (L.) Mill.	<i>T</i>	subMed
<i>Rhodax canus</i> (L.) Fuss.	<i>Ch</i>	Pont
Convolvulaceae		
<i>Convolvulus arvensis</i> L.	<i>H</i>	Kos
<i>Convolvulus cantabrica</i> L.	<i>H</i>	Pont
Cornaceae		
<i>Cornus mas</i> L.	<i>P</i>	subMed
<i>Cornus sanguinea</i> L.	<i>P</i>	subMed
Crassulaceae		
<i>Jovibarba heuffelii</i> (Schott) A. & D. Lóve ³	<i>H</i>	Carp-Bal
<i>Sedum acre</i> L.	<i>H</i>	Eur-Med
<i>Sedum hispanicum</i> L.	<i>T</i>	Eur-Med
<i>Sedum annuum</i> L.	<i>T</i>	Eur-Sib
<i>Sedum maximum</i> (L.) Suter	<i>H</i>	subBoreal
<i>Sedum album</i> L.	<i>H</i>	subMed
<i>Sedum cepaea</i> L.	<i>T</i>	subMed
<i>Sempervivum erytraeum</i> Velen. ^{2,3}	<i>H</i>	Bal
<i>Sempervivum marmoreum</i> Griseb.	<i>H</i>	subMed
Cupressaceae		

Table 1. Continued

	Life form / strategy	Floristic element
<i>Juniperus sibirica</i> Burgsd.	<i>H</i>	Boreal
<i>Juniperus communis</i> L.	<i>H</i>	subBoreal
Cuscutaceae		
<i>Cuscuta approximata</i> Bab.	<i>T</i>	Med-NAm
Dipsacaceae		
<i>Cephalaria flava</i> (Sm.) Szabó ²	<i>H</i>	Bal
<i>Dipsacus laciniatus</i> L.	<i>H</i>	Eur-Med
<i>Knautia drymeia</i> Heuff.	<i>H</i>	Alp-Carp-Bal
<i>Knautia macedonica</i> Griseb. ²	<i>H</i>	Bal
<i>Knautia arvensis</i> (L.) Coult.	<i>H</i>	Eur-Sib
<i>Scabiosa lucida</i> Vill.	<i>H</i>	Alp-Carp
<i>Scabiosa triniifolia</i> Friv. ²	<i>T</i>	Bal
<i>Scabiosa columbaria</i> L.	<i>T</i>	Eur-Med
<i>Scabiosa ochroleuca</i> L.	<i>T</i>	Eur-Sib
<i>Succisa pratensis</i> Moench	<i>H</i>	Eur
Droseraceae		
<i>Drosera rotundifolia</i> L. ^{3,5}	<i>H</i>	Boreal
Ericaceae		
<i>Bruckenthalia spiculifolia</i> (Salisb.) Rechb.	<i>Ch</i>	subMed
<i>Vaccinium myrtillus</i> L.	<i>Ch</i>	Boreal
Euphorbiaceae		
<i>Euphorbia amygdaloides</i> L.	<i>H</i>	Eur
<i>Euphorbia cyparissias</i> L.	<i>H</i>	Eur
<i>Euphorbia heliscopia</i> L.	<i>H</i>	Eur-As
<i>Euphorbia falcata</i> L.	<i>T</i>	Med-As
<i>Mercurialis ovata</i> Sternb. & Hoppe	<i>H</i>	subMed
<i>Mercurialis perennis</i> L.	<i>H</i>	subMed
Fabaceae		
<i>Anthyllis vulneraria</i> L.	<i>H</i>	Eur-Med
<i>Astragalus onobrychis</i> L.	<i>H</i>	Eur-As
<i>Astragalus glycyphyllos</i> L.	<i>H</i>	SPont
<i>Astragalus depressus</i> L.	<i>H</i>	subMed
<i>Chamaecytisus calcareus</i> (Velen.) Kuzmanov ²	<i>Ch</i>	Bal
<i>Chamaecytisus jankae</i> (Velen.) Rothm. ²	<i>Ch</i>	Bal
<i>Chamaecytisus pygmaeus</i> (Willd.) Rothm.	<i>Ch</i>	Bal-Anat
<i>Chamaecytisus glaber</i> (L. f.) Rothm.	<i>Ch</i>	Bal-Dac
<i>Chamaecytisus lejocarpus</i> (A. Kern.) Rothm.	<i>Ch</i>	Bal-Dac
<i>Chamaecytisus hirsutus</i> (L.) Link	<i>Ch</i>	Eur-Sib
<i>Chamaespartium sagittale</i> (L.) Gibbs	<i>Ch</i>	Eur
<i>Coronilla varia</i> L.	<i>H</i>	Eur-Med
<i>Corothamnus rectipilosus</i> (Adamovič) Skalická ²	<i>Ch</i>	Bal
<i>Corothamnus procumbens</i> (Waldst. & Kit.) C. Presl	<i>Ch</i>	Eur-Med
<i>Dorycnium herbaceum</i> Vill.	<i>H</i>	Eur-Med
<i>Genista ovata</i> Waldst. & Kit.	<i>Ch</i>	Eur
<i>Genista pilosa</i> L. ⁴	<i>Ch</i>	Eur
<i>Genista tinctoria</i> L.	<i>Ch</i>	Eur-Sib
<i>Genista januensis</i> Viv.	<i>Ch</i>	subMed
<i>Hippocrepis comosa</i> L.	<i>H</i>	subMed
<i>Lathyrus tuberosus</i> L.	<i>H</i>	Eur-As
<i>Lathyrus vernus</i> Bernh.	<i>H</i>	Eur-Sib
<i>Lathyrus nissolia</i> L.	<i>T</i>	Eur-SMed
<i>Lathyrus setifolius</i> L.	<i>T</i>	Pont-Med

Table 1. Continued

	Life form / strategy	Floristic element
<i>Lathyrus aphaca</i> L.	<i>T</i>	subBoreal
<i>Lathyrus pratensis</i> L.	<i>H</i>	subBoreal
<i>Lathyrus cicera</i> L.	<i>T</i>	subMed
<i>Lathyrus pallescens</i> (M. Bieb.) C. Koch.	<i>H</i>	subMed
<i>Lathyrus sativus</i> L.	<i>T</i>	subMed
<i>Lens nigricans</i> (M. Bieb.) Godr.	<i>T</i>	Pont-Med
<i>Lotus corniculatus</i> L.	<i>H</i>	Eur-Med
<i>Medicago falcata</i> L.	<i>H</i>	Eur-As
<i>Medicago lupulina</i> L.	<i>H</i>	Eur-As
<i>Medicago minima</i> (L.) Bartal.	<i>T</i>	Eur-As
<i>Medicago rigidula</i> (L.) All.	<i>T</i>	Eur-Med
<i>Medicago sativa</i> L.	<i>H</i>	SAs (Adv)
<i>Melilotus officinalis</i> (L.) Pall.	<i>T</i>	Eur-As
<i>Melilotus albus</i> Medicus	<i>T</i>	subBoreal
<i>Onobrychis gracilis</i> Besser	<i>H</i>	Pont-Med
<i>Onobrychis arenaria</i> (Kit.) DC.	<i>H</i>	SPont
<i>Onobrychis alba</i> (Waldst. & Kit.) Desv.	<i>H</i>	subMed
<i>Ononis arvensis</i> L.	<i>H</i>	Eur-As
<i>Trifolium dalmaticum</i> Vis. ²	<i>T</i>	Bal
<i>Trifolium ochroleucon</i> Huds.	<i>H</i>	Eur
<i>Trifolium medium</i> L.	<i>H</i>	Eur-As
<i>Trifolium campestre</i> Schreb	<i>T</i>	Eur-Med
<i>Trifolium dubium</i> Sibth.	<i>T</i>	Eur-Med
<i>Trifolium hybridum</i> L.	<i>H</i>	Eur-Med
<i>Trifolium micranthum</i> Viv.	<i>T</i>	Eur-Med
<i>Trifolium striatum</i> L.	<i>T</i>	Eur-Med
<i>Trifolium alpestre</i> L.	<i>H</i>	Eur-Sib
<i>Trifolium arvense</i> L.	<i>T</i>	Eur-Sib
<i>Trifolium aureum</i> Pollich	<i>T</i>	Eur-Sib
<i>Trifolium repens</i> L.	<i>H</i>	Eur-Sib
<i>Trifolium hirtum</i> All.	<i>T</i>	Med
<i>Trifolium montanum</i> L.	<i>H</i>	SPont
<i>Trifolium pratense</i> L.	<i>H</i>	subBoreal
<i>Trifolium incarnatum</i> L.	<i>H</i>	subMed
<i>Trifolium michelianum</i> Savi	<i>T</i>	subMed
<i>Trifolium pannonicum</i> Jacq.	<i>H</i>	subMed
<i>Trifolium patens</i> Schreb.	<i>T</i>	subMed
<i>Trifolium spadiceum</i> L.	<i>T</i>	subMed
<i>Trigonella gladiata</i> Steven ex M. Bieb.	<i>T</i>	subMed
<i>Vicia pisiformis</i> L.	<i>H</i>	Eur
<i>Vicia angustifolia</i> Grufberg	<i>T</i>	Eur-As
<i>Vicia cracca</i> L.	<i>H</i>	Eur-As
<i>Vicia villosa</i> Roth	<i>T</i>	Eur-CAs
<i>Vicia hirsuta</i> (L.) Gray	<i>T</i>	Eur-Med
<i>Vicia lathyroides</i> L.	<i>T</i>	Eur-Med
<i>Vicia pannonica</i> Crantz	<i>T</i>	Eur-Med
<i>Vicia sativa</i> L.	<i>T</i>	Eur-Med
<i>Vicia tetrasperma</i> (L.) Schreb.	<i>T</i>	Eur-Med
<i>Vicia varia</i> Host.	<i>T</i>	Eur-Med
<i>Vicia grandiflora</i> Scop.	<i>T</i>	subMed
Fagaceae		
<i>Fagus sylvatica</i> L.	<i>P</i>	Eur

Table 1. Continued

	Life form / strategy	Floristic element
<i>Fagus sylvatica</i> L. ssp. <i>moesiaca</i> (K.Maly) Hjelmq.	P	
<i>Quercus frainetto</i> Ten.	P	Eur
<i>Quercus cerris</i> L.	P	Eur-subMed
<i>Quercus pubescens</i> Willd.	P	Eur-subMed
<i>Quercus dalechampii</i> Ten.	P	subMed
Gentianaceae		
<i>Gentiana pneumonanthe</i> L.	H	CAs
<i>Gentiana asclepiadea</i> L.	H	Eur
<i>Gentianella ciliata</i> (L.) Borkh.	T	subMed
<i>Gentianella lutescens</i> (Velen.) Holub	T	subMed
Geraniaceae		
<i>Erodium cicutarium</i> (L.) L'Hér	T	subBoreal
<i>Geranium sanguineum</i> L.	H	Eur
<i>Geranium dissectum</i> L.	T	Eur-As
<i>Geranium lucidum</i> L.	T	Eur-As
<i>Geranium rotundifolium</i> L.	T	Eur-As
<i>Geranium macrorrhizum</i> L.	H	Eur-Med
<i>Geranium pusillum</i> L.	T	Eur-Med
<i>Geranium robertianum</i> L.	T	subBoreal
<i>Geranium columbinum</i> L.	T	subMed
<i>Geranium pyrenaicum</i> Burm. f.	H	subMed
Globulariaceae		
<i>Globularia aphyllanthes</i> Crantz	H	Eur
Hypericaceae		
<i>Hypericum rumeliacum</i> Boiss. ^{2,3}	H	Bal
<i>Hypericum maculatum</i> Crantz	H	Boreal
<i>Hypericum tetrapterum</i> Fr.	G	Eur-Sib
<i>Hypericum perforatum</i> L.	H	Kos
<i>Hypericum linarioides</i> Bosse ³	H	Pont-Med
<i>Hypericum barbatum</i> Jacq.	H	subMed
Juglandaceae		
<i>Juglans regia</i> L.	P	Eur-As/Paleo
Lamiaceae		
<i>Acinos alpinus</i> (L.) Moench	H	Alp-Carp
<i>Acinos arvensis</i> (Lam.) Dandy	T	Eur-Med
<i>Acinos rotundifolius</i> Pers.	T	Med-CAs
<i>Acinos suaveolens</i> (Sm.) Don	H	subMed
<i>Ajuga reptans</i> L.	H	Eur-Med
<i>Ajuga chamaepytis</i> (L.) Schreb.	H	Pont-Med
<i>Ajuga genevensis</i> L.	H	SPont
<i>Ajuga laxmanii</i> (L.) Benth.	H	SSib
<i>Ballota nigra</i> L.	H	Eur-Med
<i>Calamintha nepeta</i> (L.) Savi	H	Eur-Med
<i>Calamintha sylvatica</i> Bromf.	H	Eur-OT
<i>Clinopodium vulgare</i> L.	H	subBoreal
<i>Galeopsis ladanum</i> L.	T	Eur-As
<i>Galeopsis speciosa</i> Mill.	T	Eur-As
<i>Galeopsis tetrachit</i> L.	T	Eur-As
<i>Glechoma hederacea</i> L.	H	Eur-As
<i>Glechoma hirsuta</i> Waldst. et Kit.	H	Eur-Med
<i>Hyssopus officinalis</i> L.	Ch	Eur-As
<i>Lamium amplexicaule</i> L.	T	Eur-As

Table 1. Continued

	Life form / strategy	Floristic element
<i>Lamium garganicum</i> L.	H	Med
<i>Lamium maculatum</i> L.	H	subBoreal
<i>Lamiastrum galeobdolon</i> (L.) Ehrend.	H	Med
<i>Lycopus europaeus</i> L.	H	Eur-As
<i>Marrubium vulgare</i> L.	H	Eur-As
<i>Melissa officinalis</i> L.	H	subMed
<i>Mentha aquatica</i> L.	H	Boreal
<i>Mentha spicata</i> L.	H	Eur
<i>Mentha arvensis</i> L.	H	Eur-As
<i>Mentha longifolia</i> (L.) Huds.	H	Eur-Sib
<i>Nepeta nuda</i> L.	H	Eur-As
<i>Origanum vulgare</i> L.	H	Eur-As
<i>Prunella laciniata</i> (L.) L.	H	Eur
<i>Prunella vulgaris</i> L.	H	Kos
<i>Prunella grandiflora</i> (L.) Scholler	H	subMed
<i>Salvia amplexicaulis</i> Lam.	H	Bal-Dac
<i>Salvia glutinosa</i>	H	Eur-As
<i>Salvia pratensis</i> L.	H	Eur-Med
<i>Salvia nemorosa</i> L.	H	Eur-OT
<i>Salvia argentea</i> L.	H	Med
<i>Salvia verticillata</i> L.	H	subMed
<i>Satureja montana</i> L.	Ch	Pont-Med
<i>Sideritis montana</i> L.	T	subMed
<i>Stachys sylvatica</i> L.	H	Eur-As
<i>Stachys recta</i> L.	H	Eur-Med
<i>Stachys germanica</i> L.	H	Eur-subMed
<i>Stachys officinalis</i> (L.) Trev.	H	subMed
<i>Teucrium polium</i> L.	H	Pont-Med
<i>Teucrium chamaedrys</i> L.	H	subMed
<i>Teucrium montanum</i> L.	H	subMed
<i>Thymus moesiacus</i> Velen.	H	Bal-Anat
<i>Thymus pulegioides</i> L.	H	Eur
<i>Thymus vandasii</i> Velen.	H	Eur-Med
<i>Thymus longicaulis</i> C. Presl	H	Med
<i>Thymus callieri</i> Borbas ex Velen.	H	Pont
Lemnaceae		
<i>Lemna minor</i> L.		Kos
Linaceae		
<i>Linum capitatum</i> Kit. ex Schult.	H	Ap-Bul
<i>Linum bienne</i> Mill.	T	Med
<i>Linum tauricum</i> Willd.	H	Pont-Med
<i>Linum tenuifolium</i> L.	H	Pont-Med
<i>Linum catharticum</i> L.	T	subBoreal
<i>Linum nervosum</i> Waldst. & Kit.	H	subMed
Lythraceae		
<i>Lythrum salicaria</i> L.	H	subBoreal
Malvaceae		
<i>Althaea hirsuta</i> L.	T	Med-As
<i>Malva sylvestris</i> L.	H	Kos
Menyanthaceae		
<i>Menyanthes trifoliata</i> L. ^{3,4,5}	H	Boreal
Oleaceae		

Table 1. Continued

	Life form / strategy	Floristic element
<i>Fraxinus ornus</i> L.	<i>P</i>	Eur-Med
<i>Ligustum vulgare</i> L.	<i>Ch</i>	subMed
<i>Syringa vulgaris</i> L.	<i>P</i>	Carp-Bal
Onagraceae		
<i>Epilobium nutans</i> F. W. Schmidt	<i>H</i>	Eur
<i>Epilobium collinum</i> C. C. Gmel.	<i>H</i>	Eur-Med
<i>Epilobium palustre</i> L.	<i>H</i>	subBoreal
<i>Epilobium parviflorum</i> Schreb.	<i>H</i>	subBoreal
<i>Epilobium lanceolatum</i> Sebast. & Mauri	<i>H</i>	subMed
Orobanchaceae		
<i>Orobanche cumana</i> Wallr.	<i>H</i>	Med-Sib
Oxalidaceae		
<i>Oxalis acetosella</i> L.	<i>H</i>	subBoreal
Papaveraceae		
<i>Corydalis bulbosa</i> (L.) DC.	<i>G</i>	Eur-Med
<i>Corydalis solida</i> (L.) Schwarz	<i>G</i>	Eur-Med-CAs
<i>Fumaria officinalis</i> L.	<i>T</i>	Eur-Sib
<i>Papaver dubium</i> L.	<i>T</i>	Med
Plantaginaceae		
<i>Plantago major</i> L.	<i>H</i>	Boreal
<i>Plantago media</i> L.	<i>H</i>	Boreal
<i>Plantago lanceolata</i> L.	<i>H</i>	Kos
<i>Plantago subulata</i> L.	<i>H</i>	Med
<i>Plantago argentea</i> Chaix	<i>H</i>	subMed
Polygalaceae		
<i>Polygala oxyptera</i> Rchb.	<i>H</i>	Eur
<i>Polygala vulgaris</i> L.	<i>H</i>	Eur-Med
<i>Polygala major</i> Jacq.	<i>H</i>	Eur-Sib
<i>Polygala hospita</i> Heuff.	<i>H</i>	Pann-Bal
<i>Polygala comosa</i> Schruhr	<i>H</i>	subMed
<i>Polygala supina</i> Schreb.	<i>H</i>	subMed
Polygonaceae		
<i>Bilderdykia convolvulus</i> (L.) Dumort.	<i>T</i>	Eur-As
<i>Bistorta major</i> Gray	<i>H</i>	Eur-As
<i>Persicaria maculata</i> (Raf.) Gray	<i>T</i>	Eur-As
<i>Polygonum aviculare</i> L.	<i>T</i>	Kos
<i>Rumex acetosa</i> L.	<i>H</i>	Boreal
<i>Rumex crispus</i> L.	<i>H</i>	Boreal
<i>Rumex conglomeratus</i> Murr.	<i>H</i>	Eur-As
<i>Rumex thyrsoiflorus</i> Fingerh.	<i>H</i>	Eur-As
<i>Rumex obtusifolius</i> L.	<i>H</i>	Eur-Med
<i>Rumex acetosella</i> L.	<i>H</i>	Eur-subMed
Primulaceae		
<i>Anagalis arvensis</i> L.	<i>T</i>	Kos
<i>Androsace elongata</i> L.	<i>T</i>	Eur-Sib
<i>Cyclamen hederifolium</i> Aiton ⁶	<i>G</i>	subMed
<i>Lysimachia nummularia</i> L.	<i>T</i>	Eur
<i>Lysimachia vulgaris</i> L.	<i>H</i>	Eur-As
<i>Primula elatior</i> (L.) Hill	<i>H</i>	Eur
<i>Primula veris</i> L.	<i>H</i>	Eur-Med
Pyrolaceae		
<i>Pyrola rotundifolia</i> L. ^{3,5}	<i>H</i>	Boreal

Table 1. Continued

	Life form / strategy	Floristic element
Ranunculaceae		
<i>Adonis aestivalis</i> L.	<i>T</i>	Eur-subMed
<i>Adonis flammea</i> Jacq.	<i>T</i>	Eur-subMed
<i>Anemone ranunculoides</i> L.	<i>H</i>	Eur-subMed
<i>Caltha palustris</i> L.	<i>H</i>	Eur
<i>Caltha laeta</i> Schott, Nyman & Kotschy	<i>H</i>	subMed
<i>Clematis vitalba</i> L.	<i>Ch</i>	Eur
<i>Clematis integrifolia</i> L.	<i>H</i>	Eur-As
<i>Consolida regalis</i> Gray	<i>T</i>	Eur-Med
<i>Helleborus odoratus</i> Waldst. & Kit.	<i>H</i>	Eur-SMed
<i>Hepatica nobilis</i> Mill.	<i>H</i>	Eur-Sib
<i>Isopyrum thalictroides</i> L.	<i>H</i>	Eur
<i>Nigella arvensis</i> L.	<i>T</i>	subMed
<i>Ranunculus serbicus</i> Vis.	<i>H</i>	Ap-Bal
<i>Ranunculus bulbosus</i> L.	<i>H</i>	Eur
<i>Ranunculus arvensis</i> L.	<i>H</i>	Eur-Med
<i>Ranunculus auricomus</i> L.	<i>H</i>	Eur-Med
<i>Ranunculus flammula</i> L.	<i>H</i>	Eur-Med
<i>Ranunculus ficaria</i> L.	<i>H</i>	Eur-Sib
<i>Ranunculus illyricus</i> L.	<i>H</i>	Eur-subMed
<i>Ranunculus polyanthemos</i> L.	<i>H</i>	Eur-subMed
<i>Ranunculus acris</i> L.	<i>H</i>	Kos
<i>Ranunculus millefoliatus</i> Vahl	<i>H</i>	subMed
<i>Ranunculus repens</i> L.	<i>H</i>	subMed
<i>Thalictrum aquilegifolium</i> L.	<i>H</i>	Eur-As
<i>Thalictrum minus</i> L.	<i>H</i>	Eur-Sib
<i>Trollius europaeus</i> L. ^{3,5}	<i>H</i>	Boreal
Resedaceae		
<i>Reseda lutea</i> L.	<i>H</i>	subBoreal
Rhamnaceae		
<i>Rhamnus catharticus</i> L.	<i>P</i>	Eur-As
Rosaceae		
<i>Agrimonia eupatoria</i> L.	<i>H</i>	Eur-Med
<i>Alchemilla crinita</i> Buser	<i>H</i>	Eur
<i>Alchemilla glabra</i> Neygenf.	<i>H</i>	Eur-Sib
<i>Alchemilla erythropoda</i> Juz.	<i>H</i>	Pont
<i>Alchemilla vulgaris</i> agg.	<i>H</i>	
<i>Amelanchier ovalis</i> Medicus	<i>H</i>	Pont-Med
<i>Amygdalus nana</i> L.	<i>Ch</i>	Eur-As
<i>Aremonia agrimonoides</i> (L.) DC.	<i>H</i>	subMed
<i>Cotoneaster integerrimus</i> Medicus	<i>Ch</i>	Eur-Sib
<i>Cotoneaster nebrodensis</i> (Guss.) C. Koch	<i>P</i>	subMed
<i>Crataegus monogyna</i> Jacq.	<i>Ch</i>	subBoreal
<i>Filipendula vulgaris</i> Moench	<i>H</i>	Eur-Med
<i>Filipendula ulmaria</i> (L.) Maxim.	<i>H</i>	subBoreal
<i>Fragaria viridis</i> Lam.	<i>H</i>	Eur-Sib
<i>Fragaria vesca</i> L.	<i>H</i>	subBoreal
<i>Geum rivale</i> L.	<i>H</i>	subBoreal
<i>Geum urbanum</i> L.	<i>H</i>	subBoreal
<i>Geum coccineum</i> Sm.	<i>H</i>	subMed
<i>Malus sylvestris</i> Mill	<i>P</i>	Eur
<i>Potentilla rupestris</i> L.	<i>H</i>	Boreal

Table 1. Continued

	Life form / strategy	Floristic element
<i>Potentilla ternata</i> C. Koch	<i>H</i>	Carp-Bal
<i>Potentilla cinerea</i> Chaix ex Vill.	<i>H</i>	Eur
<i>Potentilla pilosa</i> Willd.	<i>H</i>	Eur
<i>Potentilla inclinata</i> Vill.	<i>H</i>	Eur-As
<i>Potentilla micrantha</i> Ramond ex DC.	<i>H</i>	Eur-subMed
<i>Potentilla reptans</i> L.	<i>H</i>	Kos
<i>Potentilla pedata</i> Willd.	<i>H</i>	Med
<i>Potentilla alba</i> L.	<i>H</i>	Pan-Pont
<i>Potentilla argentea</i> L.	<i>H</i>	SPont
<i>Potentilla erecta</i> (L.) Raeusch.	<i>H</i>	subBoreal
<i>Potentilla neglecta</i> Baumg.	<i>H</i>	subBoreal
<i>Prunus cerasifera</i> Ehrh.	<i>P</i>	Eur-As
<i>Prunus spinosa</i> L.	<i>Ch</i>	SPont
<i>Prunus avium</i> L.	<i>P</i>	subMed
<i>Pyrus pyraaster</i> Burgsd.	<i>P</i>	subMed
<i>Rosa corymbifera</i> Borkh.	<i>P</i>	Eur-As
<i>Rosa canina</i> L.	<i>P</i>	subMed
<i>Rosa elliptica</i> Tausch	<i>P</i>	subMed
<i>Rosa micrantha</i> Borrer ex Sm.	<i>P</i>	subMed
<i>Rosa pimpinellifolia</i> L.	<i>Ch</i>	subMed
<i>Rosa tomentosa</i> Sm.	<i>P</i>	subMed
<i>Rubus idaeus</i> L.	<i>P</i>	subBoreal
<i>Sanguisorba minor</i> Scop.	<i>H</i>	subBoreal
<i>Sanguisorba officinalis</i> L.	<i>H</i>	subBoreal
<i>Sorbus aria</i> (L.) Crantz	<i>P</i>	Eur
<i>Sorbus aucuparia</i> L.	<i>P</i>	subBoreal
Rubiaceae		
<i>Asperula cynanchica</i> L.	<i>H</i>	Eur-Med
<i>Asperula taurina</i> L.	<i>H</i>	Pont-Med
<i>Asperula purpurea</i> (L.) Ehrend.	<i>H</i>	subMed
<i>Cruciata glabra</i> (L.) Ehrend.	<i>H</i>	SMed-CAs
<i>Cruciata laevipes</i> Opiz	<i>H</i>	SMed-CAs
<i>Galium heldreichii</i> Halácsy	<i>H</i>	Bal-Anat
<i>Galium palustre</i> L.	<i>H</i>	Boreal
<i>Galium album</i> Mill.	<i>H</i>	Eur-As
<i>Galium aparine</i> L.	<i>T</i>	Eur-As
<i>Galium odoratum</i> (L.) Scop.	<i>H</i>	Eur-As
<i>Galium verum</i> L.	<i>H</i>	Eur-As
<i>Galium lucidum</i> All.	<i>H</i>	subMed
<i>Galium rotundifolium</i> L.	<i>H</i>	subMed
<i>Sherardia arvensis</i> L.	<i>T</i>	Med
Rutaceae		
<i>Haplophyllum suavolens</i> (DC.) G. Don	<i>H</i>	Med
Salicaceae		
<i>Salix alba</i> L.	<i>P</i>	Eur-As
<i>Salix purpurea</i> L.	<i>Ch</i>	Eur-Med-CAs
Santalaceae		
<i>Comandra elegans</i> (Rochel ex Rchb.) Rchb. f.	<i>Ch</i>	Bal-Dac-Anat
<i>Thesium simplex</i> Velen.	<i>H</i>	Bal-Dac
<i>Thesium divaricatum</i> Jan ex Mert & Koch	<i>H</i>	Eur-Med
<i>Thesium arvense</i> Horv.	<i>T</i>	Med-CAs
<i>Thesium dollineri</i> Murb.	<i>T</i>	Pont

Table 1. Continued

	Life form / strategy	Floristic element
<i>Thesium bavarum</i> Schrank	<i>H</i>	subMed
<i>Thesium linophyllum</i> L. ³	<i>H</i>	subMed
Saxifragaceae		
<i>Parnassia palustris</i> L.	<i>H</i>	subBoreal
<i>Ribes uva-crispa</i> L.	<i>Ch</i>	subMed
<i>Saxifraga paniculata</i> Mill.	<i>H</i>	Eur-Am
<i>Saxifraga tridactylites</i> L.	<i>T</i>	subBoreal
Scrophulariaceae		
<i>Chaenorhinum minus</i> (L.) Lange	<i>T</i>	Eur-Med
<i>Digitalis grandiflora</i> Mill.	<i>H</i>	Eur-Sib
<i>Digitalis lanata</i> Ehrh.	<i>H</i>	subMed
<i>Euphrasia stricta</i> D. Wolff ex Lehm.	<i>T</i>	Eur-Med
<i>Euphrasia pectinata</i> Ten.	<i>T</i>	subMed
<i>Euphrasia salisburgensis</i> Funck	<i>T</i>	subMed
<i>Linaria vulgaris</i> Mill.	<i>H</i>	Eur-Sib
<i>Linaria genistifolia</i> (L.) Mill.	<i>H</i>	Pont-Sib
<i>Melampyrum pratense</i> L.	<i>T</i>	Eur-Sib
<i>Pedicularis grisebachii</i> Wettst. ²	<i>H</i>	Bal
<i>Rhinanthus angustifolius</i> C. C. Gmel.	<i>T</i>	Eur
<i>Rhinanthus rumelicus</i> Velen.	<i>T</i>	Eur-Med
<i>Rhinanthus minor</i> L.	<i>T</i>	Eur-Sib
<i>Verbascum lychnitis</i> L.	<i>T</i>	Ap-Bal
<i>Verbascum phlomoides</i> L.	<i>H</i>	Eur
<i>Verbascum longifolium</i> Ten.	<i>H</i>	Eur-Med
<i>Verbascum speciosum</i> Schrad.	<i>H</i>	Eur-Med
<i>Verbascum blattaria</i> L.	<i>H</i>	Eur-Sib
<i>Verbascum phoeniceum</i> L.	<i>H</i>	Eur-Sib
<i>Verbascum chaixii</i> Vill.	<i>H</i>	Pann-Bal
<i>Verbascum nigrum</i> L.	<i>H</i>	Pont-CAs
<i>Veronica serpyllifolia</i> L.	<i>H</i>	Boreal
<i>Veronica prostrata</i> L.	<i>H</i>	Eur
<i>Veronica scutellata</i> L.	<i>H</i>	Eur
<i>Veronica beccabunga</i> L.	<i>H</i>	Eur-As
<i>Veronica chamaedrys</i> L.	<i>H</i>	Eur-As
<i>Veronica persica</i> Poir.	<i>T</i>	Eur-As
<i>Veronica polita</i> Fries	<i>T</i>	Eur-As
<i>Veronica austriaca</i> ssp. <i>jacquini</i> (Baumg.) Maly	<i>H</i>	Eur-Med
<i>Veronica hederifolia</i> L.	<i>T</i>	Eur-Med
<i>Veronica arvensis</i> L.	<i>T</i>	Eur-Sib
<i>Veronica officinalis</i> L.	<i>H</i>	Eur-Sib
<i>Veronica barrelieri</i> Schott ex Roem. & Schult.	<i>H</i>	Pont-Bal
<i>Veronica acinifolia</i> L.	<i>T</i>	subMed
Simaroubaceae		
<i>Ailanthus altissima</i> (Mill.) Swingle	<i>P</i>	Adv
Tiliaceae		
<i>Tilia cordata</i> Mill.	<i>P</i>	Eur
<i>Tilia platyphyllos</i> Scop.	<i>P</i>	Eur
<i>Tilia tomentosa</i> Moench	<i>P</i>	Eur-Med
Ulmaceae		
<i>Ulmus minor</i> Mill.	<i>P</i>	Eur-Med
Urticaceae		
<i>Urtica dioica</i> L.	<i>H</i>	Boreal

Table 1. Continued

	Life form / strategy	Floristic element
<i>Urtica urens</i> L.	T	Boreal
Valerianaceae		
<i>Valeriana officinalis</i> L.	H	Eur-Sib
<i>Valerianella carinata</i> Loisel.	T	Eur-Med
<i>Valerianella dentata</i> (L.) Poll.	T	Eur-Med
<i>Valerianella locusta</i> (L.) Laterr.	T	Eur-Med
<i>Valerianella turgida</i> (Steven) Betcke	T	subMed
Verbenaceae		
<i>Verbena officinalis</i> Voss.	H	Kos
Violaceae		
<i>Viola canina</i> L.	H	Boreal
<i>Viola arvensis</i> Murr.	T	Eur
<i>Viola hirta</i> L.	H	Eur-As
<i>Viola reichenbachiana</i> Jord. ex Boreau	H	Eur-As
<i>Viola tricolor</i> L.	T	Eur-As
<i>Viola alba</i> Besser	H	Eur-Med
<i>Viola jordanii</i> Hanry	H	Eur-Med
<i>Viola kitaibeliana</i> Schult.	T	Eur-Med
<i>Viola odorata</i> L.	H	Eur-Med
<i>Viola dacica</i> Borbás	H	Pont-Med

(1999), BANCHEVA, VASSILEV (2006) and STOYANOV (2005).

Another peculiar characteristic of the flora of the study area is the high presence of Cyperaceae and Juncaceae species. On one hand, it is in relation to the topography of Ponor SPA, which is rich of pot-holes and, on the other hand, with the high annual amount of rainfall exceeding 1000 mm (MATEEVA 2002). These conditions are suitable for distribution of species of the genera *Carex*, *Juncus* and *Eriophorum*, which take part in bog communities (TZONEV *et al.* 2014; VASSILEV, PEDASHENKO 2014) located in pot-holes near springs and rivers.

The families with highest number of genera are: Asteraceae (42 genera, 10.4%), Poaceae (37, 9.1%), Apiaceae (25, 6.2%), Fabaceae (23, 5.7%) and Lamiaceae (22, 5.4). The most numerous genera (Table 2) are *Carex* (24), *Trifolium* (20), *Festuca* (13), *Veronica* (13), *Campanula* (12), *Potentilla* (12), *Ranunculus* (11), *Vicia* (11) and *Viola* (10).

Live forms/strategies

Hemicryptophytes are the dominant group in the studied flora (63.51%, Table 1), which is typical for the flora of Temperate-Continental region (BEGON *et al.* 2006) and particularly grasslands (CAIN 1950; FORSETH 2012). Similar result was found by BANCHEVA, VASSILEV (2006), STOYANOV (2005), APOSTOLOVA-STOYANOVA, STOYANOV (2009) from other parts of the country. Therophytes are represent-

ed by 22.52%. Their high presence is typical for dry grassland communities of class *Festuco-Brometea*, which covers most of the study area (VASSILEV, PEDASHENKO 2014).

The presence of Phanerophytes, Cryptophytes and Chamaephytes is negligible (5.54%, 4.39% and 4.04%, respectively). The presence of Phanerophytes is less than the mean percentage of this group for the country, which is 8–9% due to the dominance of grassland vegetation in Ponor SPA, which covers most of its territory (DIMOVA, DIMITROV 2014). Thus, the described spectrum is identical to the spectrum of the temperate biome in general (CRAWLEY 1986; BEGON *et al.* 2006) and grasslands in particular (CAIN 1950; FORSETH 2012).

In the area, the dominant mosses are competitive perennial bryophytes with numerous, very light spores and low reproductive effort (46.6% of all mosses found), characteristic for aquatic habitats as well as short living mosses (23%), typical for flood planes (GLIME 2007). Other 23% of the species with long potential lifespan producing few large spores are present in the area (Table 1). The distribution of bryophytes in the different live-strategy groups shows that most of moss-species diversity (about 70%) is concentrated in bogs as well as purple moor grass and rush pastures, which are scarce in the study area (TZONEV *et al.* 2014; VASSILEV, PEDASHENKO 2014) because of its karst terrains draining water very fast.

Table 2. Distribution of the species and genera according to the families and their relative participation in the floras of Ponor SPA and Bulgaria

Семейство	Genera					Species				
	Ponor	Ponor (%)	BG	BG(%)	Ponor/BG (%)	Ponor	Ponor (%)	BG	BG (%)	Ponor/BG (%)
Asteraceae	42	10.4	87	9.8	48.3	98	11.3	464	11.6	21.1
Poaceae	37	9.1	97	10.9	38.1	81	9.3	317	7.9	25.6
Fabaceae	23	5.7	41	4.6	56.1	79	9.1	287	7.2	27.5
Lamiaceae	22	5.4	31	3.5	71.0	54	6.2	146	3.7	37.0
Caryophyllaceae	15	3.7	30	3.4	50.0	44	5.1	212	5.3	20.8
Rosaceae	17	4.2	28	3.1	60.7	44	5.1	211	5.3	20.9
Apiaceae	25	6.2	62	7.0	40.3	40	4.6	151	3.8	26.5
Brassicaceae	19	4.7	58	6.5	32.8	34	3.9	195	4.9	17.4
Scrophulariaceae	9	2.2	25	2.8	36.0	34	3.9	171	4.3	19.9
Cyperaceae	5	1.2	20	2.2	25.0	31	3.6	108	2.7	28.7
Ranunculaceae	12	3.0	20	2.2	60.0	26	3.0	109	2.7	23.9
Liliaceae	13	3.2	22	2.5	59.1	22	2.5	87	2.2	25.3
Boraginaceae	9	2.2	21	2.4	42.9	19	2.2	94	2.4	20.2
Campanulaceae	2	0.5	9	1.0	22.2	15	1.7	45	1.1	33.3
Juncaceae	2	0.5	2	0.2	100.0	15	1.7	33	0.8	45.5
Rubiaceae	4	1.0	6	0.7	66.7	14	1.6	58	1.5	24.1
Dipsacaceae	5	1.2	7	0.8	71.4	10	1.1	36	0.9	27.8
Geraniaceae	2	0.5	2	0.2	100.0	10	1.1	27	0.7	37.0
Polygonaceae	5	1.2	9	1.0	55.6	10	1.1	44	1.1	22.7
Violaceae	1	0.2	1	0.1	100.0	10	1.1	34	0.9	29.4
Crassulaceae	3	0.7	6	0.7	50.0	9	1.0	34	0.9	26.5
Orchidaceae	4	1.0	25	2.8	16.0	9	1.0	63	1.6	14.3
Primulaceae	5	1.2	10	1.1	50.0	7	0.8	31	0.8	22.6
Santalaceae	2	0.5	3	0.3	66.7	7	0.8	9	0.2	77.8
Betulaceae	4	1.0	5	0.6	80.0	6	0.7	9	0.2	66.7
Euphorbiaceae	2	0.5	5	0.6	40.0	6	0.7	37	0.9	16.2
Fagaceae	2	0.5	3	0.3	66.7	6	0.7	19	0.5	31.6
Hypericaceae	1	0.2	1	0.1	100.0	6	0.7	22	0.6	27.3
Linaceae	1	0.2	2	0.2	50.0	6	0.7	21	0.5	28.6
Polygalaceae	1	0.2	1	0.1	100.0	6	0.7	15	0.4	40.0
Alliaceae	1	0.2	2	0.2	50.0	5	0.6	37	0.9	13.5
Onagraceae	1	0.2	4	0.4	25.0	5	0.6	21	0.5	23.8
Pinaceae	3	0.7	4	0.4	75.0	5	0.6	10	0.3	50.0
Plantaginaceae	1	0.2	1	0.1	100.0	5	0.6	13	0.3	38.5
Valerianaceae	2	0.5	3	0.3	66.7	5	0.6	22	0.6	22.7
Aceraceae	1	0.2	1	0.1	100.0	4	0.5	8	0.2	50.0
Aspleniaceae	2	0.5	3	0.3	66.7	4	0.5	11	0.3	36.4
Caprifoliaceae	3	0.7	3	0.3	100.0	4	0.5	10	0.3	40.0
Cistaceae	3	0.7	5	0.6	60.0	4	0.5	11	0.3	36.4
Gentianaceae	2	0.5	5	0.6	40.0	4	0.5	27	0.7	14.8
Papaveraceae	3	0.7	7	0.8	42.9	4	0.5	31	0.8	12.9
Saxifragaceae	3	0.7	4	0.4	75.0	4	0.5	30	0.8	13.3
Equisetaceae	1	0.2	1	0.1	100.0	3	0.3	7	0.2	42.9
Iridaceae	2	0.5	5	0.6	40.0	3	0.3	26	0.7	11.5
Oleaceae	3	0.7	5	0.6	60.0	3	0.3	8	0.2	37.5
Tiliaceae	1	0.2	1	0.1	100.0	3	0.3	4	0.1	75.0
Apocynaceae	1	0.2	2	0.2	50.0	2	0.2	4	0.1	50.0
Aristolochiaceae	2	0.5	2	0.2	100.0	2	0.2	5	0.1	40.0
Convolvulaceae	1	0.2	3	0.3	33.3	2	0.2	12	0.3	16.7
Cornaceae	1	0.2	1	0.1	100.0	2	0.2	2	0.1	100.0
Cupressaceae	1	0.2	1	0.1	100.0	2	0.2	6	0.2	33.3
Ericaceae	2	0.5	7	0.8	28.6	2	0.2	12	0.3	16.7
Malvaceae	2	0.5	7	0.8	28.6	2	0.2	17	0.4	11.8
Salicaceae	1	0.2	2	0.2	50.0	2	0.2	23	0.6	8.7

Table 1. Continued

Семейство	Genera					Species				
	Ponor	Ponor (%)	BG	BG(%)	Ponor/BG (%)	Ponor	Ponor (%)	BG	BG (%)	Ponor/BG (%)
Urticaceae	1	0.2	2	0.2	50.0	2	0.2	8	0.2	25.0
Adoxaceae	1	0.2	1	0.1	100.0	1	0.1	1	0.0	100.0
Amaranthaceae	1	0.2	1	0.1	100.0	1	0.1	12	0.3	8.3
Araceae	1	0.2	3	0.3	33.3	1	0.1	7	0.2	14.3
Araliaceae	1	0.2	1	0.1	100.0	1	0.1	1	0.0	100.0
Asclepiadaceae	1	0.2	5	0.6	20.0	1	0.1	7	0.2	14.3
Athyriaceae	1	0.2	2	0.2	50.0	1	0.1	4	0.1	25.0
Berberidaceae	1	0.2	4	0.4	25.0	1	0.1	4	0.1	25.0
Celastraceae	1	0.2	1	0.1	100.0	1	0.1	3	0.1	33.3
Chenopodiaceae	1	0.2	14	1.6	7.1	1	0.1	51	1.3	2.0
Cuscutaceae	1	0.2	1	0.1	100.0	1	0.1	10	0.3	10.0
Dioscoreaceae	1	0.2	1	0.1	100.0	1	0.1	1	0.0	100.0
Droseraceae	1	0.2	2	0.2	50.0	1	0.1	2	0.1	50.0
Globulariaceae	1	0.2	1	0.1	100.0	1	0.1	3	0.1	33.3
Juglandaceae	1	0.2	1	0.1	100.0	1	0.1	1	0.0	100.0
Juncaginaceae	1	0.2	1	0.1	100.0	1	0.1	2	0.1	50.0
Lemnaceae	1	0.2	3	0.3	33.3	1	0.1	5	0.1	20.0
Lythraceae	1	0.2	4	0.4	25.0	1	0.1	10	0.3	10.0
Menyanthaceae	1	0.2	2	0.2	50.0	1	0.1	2	0.1	50.0
Ophioglossaceae	1	0.2	2	0.2	50.0	1	0.1	3	0.1	33.3
Orobanchaceae	1	0.2	1	0.1	100.0	1	0.1	26	0.7	3.8
Oxalidaceae	1	0.2	1	0.1	100.0	1	0.1	5	0.1	20.0
Pyrolaceae	1	0.2	3	0.3	33.3	1	0.1	6	0.2	16.7
Resedaceae	1	0.2	1	0.1	100.0	1	0.1	3	0.1	33.3
Rhamnaceae	1	0.2	3	0.3	33.3	1	0.1	7	0.2	14.3
Rutaceae	1	0.2	1	0.1	100.0	1	0.1	5	0.1	20.0
Simaroubaceae	1	0.2	1	0.1	100.0	1	0.1	1	0.0	100.0
Typhaceae	1	0.2	1	0.1	100.0	1	0.1	5	0.1	20.0
Ulmaceae	1	0.2	2	0.2	50.0	1	0.1	5	0.1	20.0
Verbenaceae	1	0.2	2	0.2	50.0	1	0.1	3	0.1	33.3

Chorological spectrum

All vascular plants (mosses excluded) were classified into 60 chorological groups. In the analysis of the chorological spectrum, the dominants are sub-Mediterranean (13.7%), Euro-Mediterranean (13.4%), Euro-Asiatic (13.2%), European (8.2%), Euro-Siberian (8%) and Boreal (7.4%) floristic elements (Table 3). Species with southern centre of distribution are typical for xerothermic and xeromesophytic grassland communities, which are predominant in the region (VASSILEV, PEDASHENKO 2014). Boreal elements are well presented in wet grasslands. Interesting feature of the flora of Ponor SPA is the two-fold larger amount of Euro-Mediterranean, Euro-Siberian and Euro-sub-Mediterranean elements in comparison with those in Bulgarian flora (ASSYOV, PETROVA 2006). In contrast, Mediterranean, Balkan and Bulgarian elements are underrepresented in the local flora due to the location of the study area close to the northern border of the Balkan Peninsula and its high altitude.

The temperate floristic element (15 species, 25.9%) was dominant among moss species, followed by species with boreal occurrence (Table 1): boreal (10, 17%), sub-boreal (9, 16%), boreal-montane (7, 12%) and sub-boreal-montane (4, 7%). Taking into account their general distribution, one third of them belong to the group of holarctic species, which is followed by the cosmopolites.

Endemism and rare species

Only 2% of the species found in the area are Balkan or Bulgarian endemics (Table 1), which reveals the lack of specific features of the studied flora. *Artemisia chamaemelifolia* Vill. is a species, which deserves more attention because of its general distribution. Nowadays, this species is known from Bulgaria with a single population located in Ponor Mt (PEEV *et al.* 2011; PEDASHENKO *et al.* 2010). This locality appears as intermediate occurrence between those in Spain and the Alps, on one hand, and those in Russia, Turkey, Armenia, Azerbaijan, Georgia and Iran, on

Table 3. Phytogeographical elements of the flora of Ponor SPA (according to Assyov & Petrova 2006). For abbreviations see Table 1

Floristic element	Total Ponor	Ponor %	BG %
subMed	119	13.7	13.0
Eur-Med	116	13.4	7.0
Eur-As	114	13.2	9.9
Eur	71	8.2	7.4
Eur-Sib	69	8.0	4.1
Boreal	64	7.4	6.0
subBoreal	41	4.7	2.6
Kos	32	3.7	3.1
Bal	30	3.5	8.6
Med	29	3.3	9.3
Pont-Med	27	3.1	4.4
Eur-subMed	21	2.4	0.9
Bal-Dac	11	1.3	0.8
Carp-Bal	11	1.3	1.5
Pont	9	1.0	2.5
SPont	7	0.8	0.4
Ap-Bal	6	0.7	0.6
Bal-Anat	6	0.7	1.6
Eur-OT	6	0.7	0.4
Med-CAs	6	0.7	1.3
Pann-Bal	5	0.6	0.4
Pont-subMed	5	0.6	0.3
Alp-Carp	3	0.3	0.3
Alp-Carp-Bal	3	0.3	1.1
Bul	3	0.3	4.7
Eur-Med-CAs	3	0.3	0.1
Eur-SMed	3	0.3	0.4
Pont-CAs	3	0.3	0.6
SSib	3	0.3	0.1
Alp-Med	2	0.2	0.7

Floristic element	Total Ponor	Ponor %	BG %
Arct-Alp	2	0.2	0.7
Eur-CAs	2	0.2	0.2
Med-As	2	0.2	0.4
Med-OT	2	0.2	0.5
Pont-Bal	2	0.2	0.3
Pont-Sib	2	0.2	0.9
SMed-CAs	2	0.2	0.1
subMed-As	2	0.2	0.3
Adv	1	0.1	1.2
Alp-Caus	1	0.1	0.3
Ap-Bul	1	0.1	0.1
Arct	1	0.1	0.3
Bal-Dac-Anat	1	0.1	0.4
CAs	1	0.1	0.1
CSEur	1	0.1	0.1
Eur-Am	1	0.1	0.1
Eur-As/Paleo	1	0.1	0.2
Eur-NAm	1	0.1	0.2
Eur-Pont	1	0.1	0.2
Eur-WAs	1	0.1	0.1
Med-NAm	1	0.1	0.3
Med-Sib	1	0.1	0.1
NAm(Adv)	1	0.1	0.5
Pan-Pont	1	0.1	0.1
Pont-As	1	0.1	0.2
Pont-SAs	1	0.1	0.0
SAs (Adv)	1	0.1	0.2
SMed-As	1	0.1	0.3
subMed-Anat	1	0.1	0.5
subMed-Sib	1	0.1	0.1

the other hand. JORDANOV (1923) was the first who reported *A. chamaemelifolia* for the Bulgarian flora. He assigned this taxon to the interglacial or postglacial relict species. The same is stated by MEUSEL, JÄGER (1992) who characterized the Bulgarian locality of the species as glacial.

On the other hand, the plant species with conservation status in Ponor SPA were totally 75 (8.6% of the species on the area), some of which fall into more than one category (Table 1). The obtained results invoke the conclusion that there is a great number of rare, threatened and protected species occurring in the studied area that are of primary scientific and conservation interest.

Dry grasslands, which dominate the landscape in the study area and which are renowned for their species richness, host many species with conservation status such as *Bromus moesiacus*, *Sesleria latifolia*, *Stipa pennata*, *S. capillata*, *S. epilosa*,

Centaurea chrysolepis, *Tragopogon balcanicum*, *T. pterodes*, *Echium russicum*, *Campanula jordanovii*, several Orchidaceae species and others.

The large number of rare species in wetlands is striking despite the small area that they cover. An example is the genus *Shagnum* with 8 out of 10 species known for the mountain included in Annexes 2 or 3 of the Bulgarian Biological Diversity Act, and the other two are Balkan endemics. Other rare species that could be found in bogs and along streams are *Gymnadenia frivaldii*, *Drosera rotundifolia*, *Menyanthes trifoliata*, *Epipactis palustris*, *Pyrola rotundifolia* and *Trollius europaeus*. Another sparsely presented habitat type, rich in rare species, is beech woodland (DIMOVA, DIMITROV 2014) where *Erythronium dens-canis*, *Lilium martagon* and *Scilla bifolia* are common.

Species diversity and particularly rare species richness are thought to be positively influenced by

land abandonment in the area (VASSILEV *et al.* 2011). Authors of the same study propose extensive agricultural practices for maintaining a high biodiversity in the area.

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