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Contribution to the knowledge of *Crataego-Prunetea* Tüxen 1962 class in Bulgaria

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Key words: classification, forest edge, mantle vegetation, shrublands, syntaxonomy.

Ključne besede: klasifikacija, gozdni rob, zastor, grmišča, sintaksonomija.

Abstract

Mantle vegetation includes plant communities dominated mostly by shrubs and occurs in habitats where the typical tree layers meet difficulties to evolve. This study was conducted in three areas of Bulgaria – Western Balkan Range, Western Sredna Gora Mt. and the Fore-Balkan. Numerical classification and ordination were performed by PC-ORD and JUICE software packages. Diagnostic species were determined by calculating the Phi-coefficient. Two associations and one plant community of the *Berberidion* alliance were recognized – *Corno-Ligustretum* Horvat ex Trinajstić & Z. Pavletić 1991, *Pruno spinosae-Ligustretum vulgaris* Tüxen 1952 and *Elytrigia repens-Crataegus monogyna* community. The latter considered as a successional stage of shrub encroachment into the grasslands. Its species composition is very close to that of the ass. *Corno-Ligustretum*. The species composition of ass. *Pruno-Ligustretum* represents a mixture of species characteristic for dry and mesic grasslands, fringe and forest vegetation. The *Crataego-Prunetea* class is still poorly studied in Bulgaria and much more data from all regions in the country have to be collected.

Izvleček

V vegetacijo zastorja vključujemo rastlinske združbe v katerih prevladujejo predvsem grmovnice in jo najdemo na rastiščih, kjer se tipična drevesna plast ne more razviti. Raziskavo smo izvedli v treh območjih v Bolgariji – v zahodnem delu gorovja Balkan, zahodni Sredni Gori in osrednji predbalkanski regiji. Numerično klasifikacijo in ordinacijo smo naredili s programoma PC-ORD in JUICE. Diagnostične vrste smo določili z izračunom fi-koeficienta. Določili smo dve asociaciji in eno rastlinsko združbo - *Corno-Ligustretum* Horvat ex Trinajstić & Z. Pavletić 1991, *Pruno spinosae-Ligustretum vulgaris* Tüxen 1952 in združba *Elytrigia repens-Crataegus monogyna*. Slednja je sukcesijski stadij zaraščanja travišč z grmovnicami. Njena vrstna sestava je zelo podobna asociaciji *Corno-Ligustretum*. Vrstna sestava asociacije *Pruno-Ligustretum* predstavlja mešanico vrst značilnih za suha in mezofilna travišča, gozdni rob in gozdno vegetacijo. Vegetacija razreda *Crataego-Prunetea* je v Bolgariji še vedno slabo raziskana in potrebno bo zbrati podatke še iz vseh regij v državi.

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Introduction

Mantle vegetation includes plant communities dominated by shrubs and small trees regularly presented by seral stages or permanent forest edge phytocoenoses united mainly in *Crataego-Prunetea* Tüxen 1962 (Syn.: *Rhamno-Prunetea* Rivas Goday & Borja Carbonell ex Tüxen 1962) class on a European scale (Mucina et al. 2016, Amigo et al. 2017). This class comprises temperate continental and sub-Mediterranean shrubby structured vegetation developed on mesic to dry, neutro-basic and meso-eutrophic substrates (Theurillat et al. 1995, Sádlo et al. 2013, Mucina et al. 2016). Typically, this vegetation have secondary origin and develops on sites like forest clearings and abandoned seminatural grasslands (Sádlo et al. 2013). Syndynamical relations with the surrounding forest and grassland vegetation also exist (Čarni 1995, Rodwell et al. 2002). Shrub mantle developing around woodlands is not mandatory. Some shade trees, like Spruce (*Picea*), Fir (*Abies*) and Beech (*Fagus*) tend to form low to the ground branches so to prevent thriving of light-loving shrubs (Ellenberg 1988). Natural mantle plant communities occur and thrive in habitats where the typical tree layers have difficulties to evolve (Pignatti & Pignatti 2014).

Typically these are thorn shrublands dominated by species mostly from the genera *Acer*, *Cornus*, *Crataegus*, *Ligustrum*, *Prunus*, *Rhamnus*, *Rosa*, *Rubus* and *Sambucus* (Sádlo et al. 2013, Aguiar & Vila-Viçosa 2017, Fitsailo 2017). The Balkan's temperate scrub and mantle vegetation is classified within *Prunetalia spinosae* Tüxen 1952, while the thermophilous is united under *Paliuretalia* Trinajstić 1978 orders (Mucina et al. 2016).

The *Crataego-Prunetea* class is barely studied in Bulgaria and confirmed so far by one association – *Coryletum avellanae* Soó 1927 and three plant communities only (Dimitrov et al. 2004, Pedashenko et al. 2015). More similar vegetation in Bulgaria is described and classified within different classes. The forest clearings of *Rubetum idaei* Pfeiff. 1936 (*Sambuco-Salicion* Tüxen & Neumann 1950) from Vitosha Mts. are related to class *Epilobietea angustifolii* Tüxen & Preising ex von Roshow 1951 (Dimitrov et al. 2004). Sopotlieva et al. (2016) classified four shrub communities from Eastern Balkan Range [*Pruno tenellae-Syringion* (Jovanović 1979) Čarni et al. 2009] within class *Quercetea pubescentis* (Oberd. 1948) Doing Kraft 1955.

The purpose of this study is to contribute to the knowledge of the mantle vegetation in Bulgaria.

Material and methods

Study area

The study was conducted in three areas of Bulgaria belonging to the districts of Sofia and Gabrovo (Figure 1). The first area is located at the Western Balkan Range (Sofia district), the second at the Western Sredna Gora Mt. (Sofia district), while the third area included Strazhata hill – a part of the Forebalkan (Gabrovo district). All study areas are partially included into the Natura 2000 network by seven Sites of Community Interest (SCIs): Skalsko (BG0000263), Dryanovski manastir (BG0000214), Vitata Stena (BG0000190), Yantra River (BG0000610), Etropole-Baylovo (BG0001043), Dragoman (BG0000322) and Rayanovtsi (BG0002001).

The climate in the studied areas is temperate to continental and characterized by warm summers and cold winters. The precipitation maximum occurs in May and June while the minimum in January and February (Velev 2002). Three main geomorphological units can be recognized in the considered areas: 1) the Balkan Mountain system, which crosses the whole country from west to east and represented in this study by Mala Planina Mt., Murgash Mt. and Etropolska Planina Mt., 2) the Transitional zone including Sredna Gora Mt. and 3) the Forebalkan (including Strazhata hill) with alternating low mountain ridges and depressions (Stefanov 2002). Karst is the most common bedrock type in Strazhata hill, the southern part of Mala Planina Mt. and the northern part of the Western Sredna Gora Mt. Silicate substrates are widespread in the Western Balkan Range (Murgash Mt., Mala Planina Mt. and Sredna Gora Mt.). The soils of Strazhata hill are mosaic of Luvisol and Rendzic Leptosols, comprising more than 40% of carbonates (Ninov 2002). In the Western Balkan Range (part of Stara Planina Mt.) and the Western Sredna Gora Mt. soils are Dystric Cambisols and Umbric Leptosols (Ninov 2002).

Data sampling and analysis

Within the 2015–2018 field seasons 36 relévés from the studied areas were collected following the Braun-Blanquet approach (Braun-Blanquet 1965, Westhoff and van der Maarel 1973). The plot size was 64 m^2, as recommended for shrub communities (Chytrý & Otýpková 2003).

Altitude, slope inclination and location were measured by Garmin eTrex Vista whereas the exposition was determined by a compass. Soil depth was estimated in three degrees as (1) shallow (<10 cm depth), (2) moderately deep (10–20 cm) and (3) deep (>20 cm).

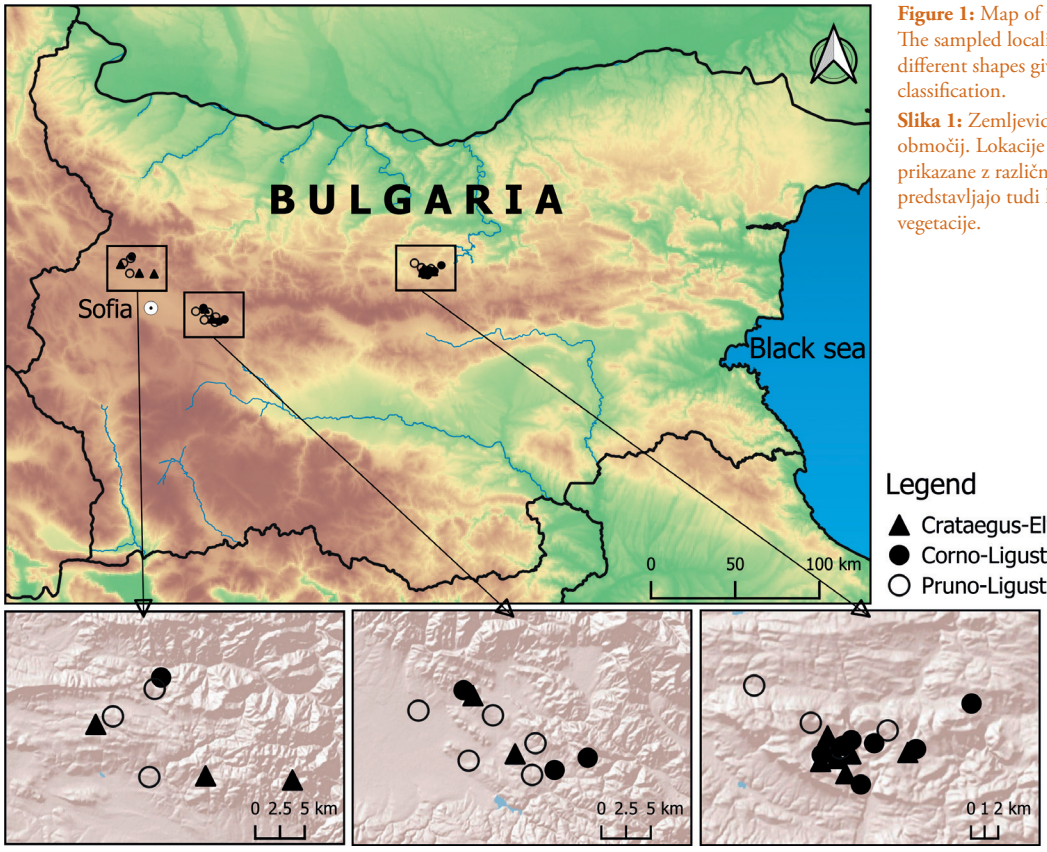

Figure 1: Map of the studied areas. The sampled localities expressed by different shapes giving the vegetation classification.

Slika 1: Zemljevid preučevanih območij. Lokacije vzorčenja so prikazane z različnimi znaki, ki predstavljajo tudi klasifikacijo vegetacije.

All reléves were stored in the Balkan Vegetation Database (Vassilev et al. 2016). The numerical classification was performed by PC-ORD (McCune & Mefford 1999) and JUICE 7.0 (Tichý 2002) software packages. Sørensen (Bray-Curtis) was used as distance measure and similarity was calculated by Ward's clustering method. The species values were square-root transformed and three cut levels (0, 5, 25) were used.

The diagnostic species were determined by calculating the Phi-coefficient (Chytrý et al. 2002). All clusters were standardized to equal size (Chytry et al. 2006). Only the statistically significant Phi-coefficient values evaluated by Fisher's exact test ($P<0.05$) were considered. The threshold value for a species to be considered as diagnostic was set up at Phi-coefficient ≥ 0.3. Species with Phi-coefficient ≥ 0.5 were considered as highly diagnostic. The "Constancy" of the species was presented by percentages in the synoptic table. The relevant literature sources were considered also in order to explain the diagnostic role of the species.

Species with coverage above 50% at least in 5% of the reléves in any cluster were considered as dominants, whereas constant species were those having at least 50% presence in a cluster.

Detrended Correspondence Analysis (DCA) was applied as an indirect ordination technique in order to reveal the major environmental gradients affecting the vegetation. Square root transformation and down-weighting of the rare species were applied.

The habitat's ecological conditions were assessed using the "Ellenberg indicator values" (Ellenberg 1979, Ellenberg et al. 1992) and projected onto the ordination space. Hill et al. (2000) indicated that "Ellenberg indicator values" are applicable to other parts of Europe even though they were originally assigned to the Central European flora.

The nomenclature of vascular plants followed Delipavlov & Cheshmedzhiev (2003) and subsequently standardized according to the Euro+Med PlantBase. Nomenclature of the bryophytes followed Ganeva & Dull (1999) and Natcheva & Ganeva (2005). The floristic elements were interpreted according to Assyov & Petrova (2012). The species life forms assessments were based on the biological type of the species given in Delipavlov & Cheshmedzhiev (2003). The nomenclature of the high rank syntaxa was harmonized with Mucina et al. (2016). We also merged the following species into aggregates: *Heracleum sphondylium* agg. (*Heracleum sphondylium*, *Heracleum sphondylium* subsp. *ternatum*) and *Potentilla recta* agg. (*Potentilla recta*, *Potentilla recta* subsp. *pilosa*).

Results

Vegetation classification and ordination procedures resulted in three well-differentiated groups of relévés (Figs 1, 2). The clusters were well separated in the ordination space (Figure 3). The first axis (eigenvalue = 0.425, gradient length: 2.658) explained 11.35% of the total inertia and could be related to the moisture gradient. Ass. *Pruno spinosae-Ligustretum vulgaris* and *Elytrigia repens-Crataegus monogyna* plant community were found in warm habitats, whereas ass. *Corno-Ligustretum* was characterized by more humid microclimate conditions. The variability expressed by the second axis (eigenvalue = 0.255, gradient length: 2.337) may be associated with the nutrients availability. It explains 6.81% of the total inertia in the data set (3.746).

The clusters obtained were recognized and interpreted as follows:

The syntaxonomical scheme proposed:

Cl. *Crataego-Prunetea* Tüxen1962
Ord. *Prunetalia spinosae* Tüxen 1952
All. *Berberidion vulgaris* Br.-Bl. ex Tüxen 1952
1. Ass. *Corno-Ligustretum* Horvat ex Trinajstić & Z. Pavletić 1991.
2. Ass. *Pruno spinosae-Ligustretum vulgaris* Tüxen 1952.
3. *Elytrigia repens-Crataegus monogyna* plant community.

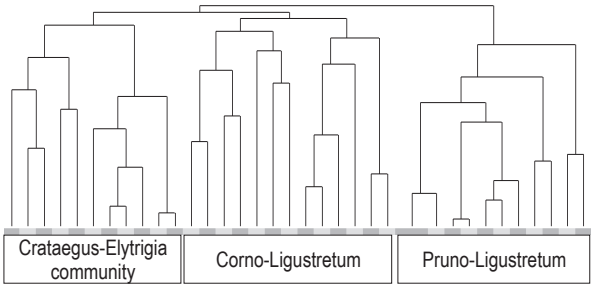

Figure 2: Classification dendrogram of the analyzed data set with clusters syntaxonomically interpreted.
Slika 2: Dendrogram analiziranih podatkov s sintaksonomsko interpretacijo klastrov.

Elytrigia repens-Crataegus monogyna plant community (Table 1, rel. 1–13)

Constant species: *Crataegus monogyna* (100%), *Rosa canina* (92%), *Clinopodium vulgare* (69%), *Agrimonia eupatoria* (69%), *Rubus canescens* (62%), *Prunus spinosa* (62%), *Pyrus communis* subsp. *pyraster* (62%), *Galium verum* (54%), *Fragaria viridis* (54%), *Dactylis glomerata* (54%).

Dominant species: *Crataegus monogyna*, *Syringa vulgaris*, *Rubus canescens*, *Rosa canina*.

Vegetation description: A moderately species-rich community with closed horizontal structure and strongly dominated by *Crataegus monogyna*. It had well-developed shrub and herb layers with cover 55-100% (average 82%) and 30-95% (average 67%) respectively. These communities had well-developed herb layer also with highly abundant species such as *Elytrigia repens*, *Clinopodium vulgare*, *Fragaria viridis*, *Poa pratensis* s.l. and *Brachypodium pinnatum*. Bryophytes and lichens did not form well-defined layers and their cover reached up to 8%. The hemicryptophytes prevailed (H – 51%), followed by therophytes (T – 17%) and chamaephytes (Ch – 11%). Euro-Asiatic (Eur-As – 22%), sub-Mediterranean (subMed – 14%), Euro-Mediterranean (Eur-Med – 11%) and Euro-Siberian (Eur-Sib – 11%) floristic elements were well presented in the species composition.

Ecology and distribution: This plant community type occurred on slightly inclined terrains with varying aspects. Soils were shallow or moderately deep, frequently rich of skeleton materials in the region of Strazhata hill. The vegetation was sampled in the Western Balkan Range – Mala Planina Mt. (between Ponor and Bezden villages, near Vlado Trichkov and Tsarichina villages), Strazhata

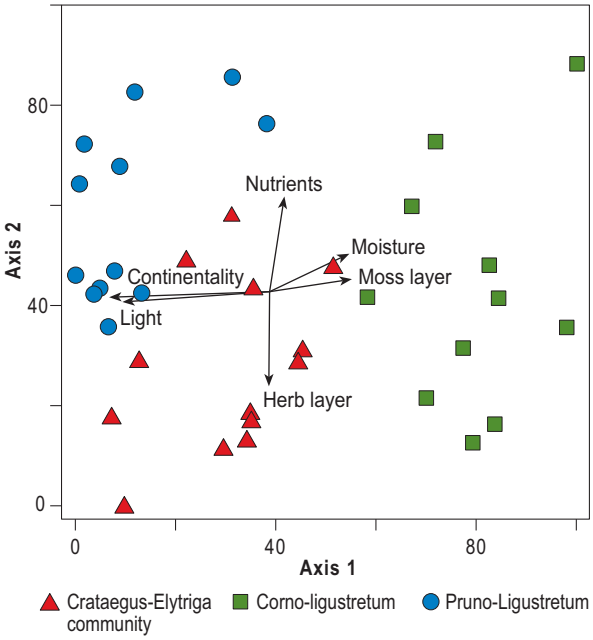

Figure 3: Ordination diagram of the analyzed data set along the first two DCA axes. Variables are passively projected onto the ordination space and articulated by eigenvectors. Vegetation units expressed by figures of different shapes.
Slika 3: Ordinacijski diagram DCA analiziranih podatkov. Spremenljivke so pasivno prikazane v ordinacijskem prostoru in izražene z lastnimi vektorji. Vegetacijske enote so predstavljene z znaki različnih oblik.

hill (near Solari, Gaikinite, Parchovtsi, Spantsi, Shipchenite, between Sedyankovo and Vetrovo villages) and the Western Sredna Gora Mt. (near Negushevo and Belopoptsi villages). The bedrock type was calcareous and silicate.

Association *Corno-Ligustretum* Horvat ex Trinajstić & Z. Pavletić 1991 (Table 1, rel. 14–24)

Constant species: *Crataegus monogyna* (100%), *Rosa canina* (82%), *Quercus cerris* (64%), *Clinopodium vulgare* (64%), *Clematis vitalba* (55%).

Dominant species: *Crataegus monogyna*, *Cornus sanguinea, Ulmus minor, Euonymus latifolius, Acer campestre*.

Vegetation description: Moderately species-rich plant communities with closed horizontal structure and strongly dominated by *Crataegus monogyna*. The shrub layer was well developed with cover between 40 and 100% (average 85%). The herb species diversity was lower compared to the *Elytrigia repens-Crataegus monogyna* community. The most abundant species in the herb layer was *Brachypodium pinnatum*. The shrub layer was composed of species such as *Crataegus monogyna*, *Cornus sanguinea*, *Ulmus minor*, *Prunus communis* subsp. *pyraster* and *Quercus cerris*. Bryophytes covered up to 35% of the soil surface (average 8%). Hemicryptophytes prevailed (H – 55%), followed by chamaephytes (Ch – 15%) and therophytes (T - 12%). The most frequent floristic elements in the species composition were those of Euro-Asiatic (Eur-As – 19%), Euro-Mediterranean (Eur-Med – 13%), sub-Mediterranean (subMed – 11%) and European (Eur – 10%).

Ecology and distribution: This association was found on slightly inclined or flat terrains within mesic to wet habitats along roads, river banks and forest edges. Soils were moderately deep and occasionally nutrient-rich (Figure 3). Bedrock types were predominantly calcareous and occasionally silicate. The sample plots were taken in the Western Balkan Range – Mala Planina Mt. (near Buchin prohod village), Strazhata hill (near Velichkovtsi, Ivanili, Sharanite, Mezhdene, Velkovtsi villages, between Kozi rog - Turhovo and Tsinga - Kopilovtsi villages) and the Western Sredna Gora Mt. (near Negushevo and Baylovtsi villages).

Association *Pruno spinosae-Ligustretum vulgaris* Tüxen 1952 (Table 1, rel. 25–36)
(Syn.: *Crataego monogynae-Prunetum spinosae* Soó 1931)

Constant species: *Crataegus monogyna* (83%), *Rosa canina* (75%), *Quercus cerris* (75%), *Clinopodium vulgare* (75%), *Clematis vitalba* (67%).

Dominant species: *Prunus spinosa*.

Vegetation description: Species-poor plant communities with a high abundance of the shrubs *Crataegus monogyna*, *Prunus spinosa* and *Rosa canina*. The shrub layer cover varied between 80 and 100% (average 91%). The herb layer cover was in the range between 5 and 60% (average 32%). Herb species with high cover and abundance were *Agrimonia eupatoria*, *Elytrigia repens* and *Poa pratensis* s.l. The cryptogam presence varied from a well-developed layer to full absence and had the average cover of 4%. Hemicryptophytes (H – 56%) dominated the species composition followed by the chamaephytes (Ch – 13%) and therophytes (T – 13%). The floristic elements were presented by Euro-Asiatic (24%), Euro-Mediterranean (17%), sub-Mediterranean (6%) and Boreal (6%) species.

Ecology and distribution: This association was found on slightly inclined or flattened terrains along roads, arable fields and forest edges. Soils were shallow to moderately deep, nutrient-rich. The bedrock was calcareous or silicate. This vegetation was sampled in the Western Balkan Range – Mala Planina (near Buchin prohod, Ponor, Beledie Han, Bogyovtsi villages), Strazhata hill (near Parchovtsi, Kozi rog, Turhovo, Mezhdene villages) and the Western Sredna Gora Mt. (near Petkovo, Gorna Malina, Belopoptsi, Gaytanevo villages).

Discussion

The studied locations represent semi-mountainous and mountainous areas with a great diversity of orographic, soil and ecological features. These areas are characterized by a significant variety of vegetation types. Many shrublands have a secondary origin and substitute former natural grassland vegetation types (Meshinev et al. 2000, Apostolova & Meshinev 2001, Yordanova 2001). In the 1990s the share of the semi-natural grasslands has decreased tremendously. During the last 30 years, the shrubland presence significantly increased in the territory of the country. Meshinev et al. (2005) identified two main negative processes in the semi-natural grasslands: the invasion of woodland species due to abandonment and the conversion of pastures to arable lands. Both trends lead to a decrease in the species richness.

We consider the *Elytrigia repens-Crataegus monogyna* plant community as a successional stage of shrub encroachment into the grasslands. The herb layer is still advanced in these communities (Figure 3). The shrub cover will continue to increase while the herb species number and cover will decrease in the course of the successional changes. The species composition of this plant communi-

ty is very close to that of the ass. *Corno-Ligustretum* Horvat ex Trinajstić & Z. Pavletić 1991 (Figure 2, Table 1). Depending on the local moisture available the seral stages have started from the *Elytrigia repens-Crataegus monogyna* community may succeed into ass. *Corno-Ligustretum* (in mesic or wet conditions) or into ass. *Pruno spinosae-Ligustretum vulgaris* (in moderately dry conditions).

The *Corno-Ligustretum* Horvat ex Trinajstić & Z. Pavletić 1991 association is well-known from Croatia (Horvat 1962, Rauš et al. 1985, Trinajstić & Pavletić 1991, Trinajstić 2002, 2008). Syntaxonomically it is very close to ass. *Rhamno catharicae-Cornetum sanguineae* Passarge 1962 found in the Czech Republic (Sádlo et al. 2013). Some of its diagnostic species such as *Acer campestre*, *Ulmus minor*, *Alliaria petiolata* are found in the species composition of the *Corno-Ligustretum*. According to Trinajstić (2002) associations *Corno-Ligustretum, Rhamno catharicae-Cornetum sanguineae* and *Pruno spinosae-Ligustretum vulgaris* of the *Berberidion vulgaris* alliance have very similar species composition.

The species composition of ass. *Pruno spinosae-Ligustretum vulgaris* Tüxen 1952 represents a mixture of species characteristic for dry and mesic grasslands, fringe and forest vegetation. Čarni (1995) pointed out this association as having a large ecological distribution. This association is well-known from the Czech Republic (Sádlo et al. 2013), Slovakia (Hegedüšova & Valachović 2015), Slovenia (Čarni 1995) and Romania (Balazs 2008, Irina 2008, Sanda et al. 2008). Traditionally this association is accepted in Romania as ass. *Crataego monogynae-Prunetum spinosae* Soó 1931, which is a synonym of ass. *Pruno spinosae-Ligustretum vulgaris* Tüxen 1952. The *Pruno-Ligustretum* floristically and ecologically is very close to *Rhamno catharicae-Cornetum sanguineae* and *Corno-Ligustretum* Horvat ex Trinajstić & Z. Pavletić 1991. The shrub layer has similar structure and species composition. In Bulgaria, such vegetation has been studied by Pedashenko et al. (2015) from Kongura reserve, SW Bulgaria, where the *Rosa*, *Crataegus*, *Prunus* plant community was described.

The *Berberidion vulgaris* alliance unites vegetation which is a mixture of species typically for dry and mesic grasslands, ruderal herbaceous vegetation, forest clearings and forest (Sádlo et al. 2013), frequently dominated by continental thorny ans spiny shrub species such as *Berberis vulgaris*, *Crataegus* spp., *Prunus spinosa*, *Pyrus pyraster*, *Rhamnus cathartica*, *Rosa* spp. and *Rubus* spp. In the studied communities only two conservation significant species were found – the Balkan endemics *Cytisus jankae* and *Pastinaca hirsuta*. Alliance *Berberidion* has a wide distribution in North Bulgaria and in the semi-mountainous and mountainous regions of the country. Since the sub-Mediterranean climate influence is present in South Bulgaria this vegetation forms there transitional shrub communities with *Paliurus spina-christi* (ord. *Paliuretalia* Trinajstić 1978), *Pinus nigra*, *Cytisus eriocarpus*, *Jasminum fruticans*. The vegetation of *Prunion fruticosae* Tüxen 1952 alliance is poorly studied in the country (Tzonev et al. 2009). The *Crataego-Prunetea* class is still unwell known in Bulgaria. In order to reveal the whole syntaxonomical diversity of this vegetation type more data need to be collected from all biogeographical regions in Bulgaria.

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Table 1: Analytic table of the *Crataego-Prunetea* Tüxen 1962 class.
Tabela 1: Analitična tabela združb razreda *Crataego-Prunetea* Tüxen 1962.

Life form	Floristic elements	Layer	Ordinal relevé No.	1	2	3	4	5	6	7	8	9	10	11	12	13
			Relevé No. in Balkan Vegetation Database	19177	16399	16374	19223	16352	10341	19032	19059	18967	18944	18947	18979	18952
			Altitude [m]	651	875	827	712	914	622	582	629	486	443	491	655	484
			Exposition [degree]	225	360	270	225	180				180	90	360	360	315
			Inclination [degree]	5	3	5	3	8				3	80	5	2	5
			Total cover (%)	100	95	85	100	95	100	100	100	100	100	100	100	100
			Cover of tree layer (%)	0	0	0	0	0		0	0	0	0	0	0	0
			Cover of shrub layer (%)	80	55	70	85	85	80	100	100	90	85	70	90	90
			Cover of herb layer (%)	95	65	60	55	30	35	50	35	65	80	95	85	90
			Cover of bryophytes (%)	0	0	0	0	0	0	0	0	0	8	0	0	8
			Cover of lichens (%)	5	0	0	0	0	0	0	0	0	0	0	0	5
			Species number	33	26	27	40	18	16	18	21	16	27	23	26	21
Diagnostic species of *Elytrigia repens-Crataegus monogyna* community																
H	Boreal	herb layer	*Elytrigia repens*	3	2	2	2	2	+	+	+	2	2	2	+	1
Ch	SPont	herb layer	*Crataegus monogyna*	4	3	2	3	2	3	3	5	5	4	4	5	5
Diagnostic species of ass. *Corno-Ligustretum*																
Ch	subMed	herb layer	*Cornus sanguinea*	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch	subMed	herb layer	*Ligustrum vulgare*	.	.	.	.	.	2	2	.	.	.	.	.	.
Diagnostic species of ass. *Pruno-Ligustretum*																
Ch	SPont	shrub layer	*Prunus spinosa*	2	2	2	+	2	3	3	.	.	.	.	+	.
Ch	sub-Med	shrub layer	*Rosa canina*	.	2	4	+	2	+	+	2	2	2	2	2	+
Diagnostic species of all. *Berberidion*																
H	Eur-Med	herb layer	*Agrimonia eupatoria*	2	2	.	.	.	+	+	+	2	2	2	+	.
Ch	sub-Med	shrub layer	*Pyrus communis* subsp. *pyraster*	.	.	1	+	.	2	2	.	2	2	2	2	.
Ch	Eur-OT	shrub layer	*Acer campestre*	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch	Eur-Med	shrub layer	*Ulmus minor*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Med	herb layer	*Securigera varia*	.	.	+	.	.	+	.	.	.	.	.	.	+
Ch	Eur-Med	shrub layer	*Viburnum lantana*	.	.	.	2	2	.	.	.	.	.	.	.	.
P	sub-Med	shrub layer	*Fraxinus ornus*	.	.	.	.	.	.	.	.	.	.	.	+	.
P	Eur-Med	shrub layer	*Euonymus verrucosus*	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch	Med-Cas	shrub layer	*Corylus avellana*	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch	subMed	shrub layer	*Cornus mas*	.	.	.	.	.	.	.	.	.	.	.	.	2
T	Eur-Med	shrub layer	*Bifora radians*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur	herb layer	*Asparagus officinalis*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-As	herb layer	*Buglossoides purpurocaerulea*	.	.	.	.	.	.	.	.	.	.	.	.	.
P	subMed	shrub layer	*Prunus avium*	.	.	.	.	.	.	.	.	.	.	.	.	.
Diagnostic species of ord. *Prunetalia spinosae*, cl. *Crataego-Prunetea*																
Ch	Eur	shrub layer	*Clematis vitalba*	2	.	.	2	.	.	+	.	.	.	.	.	.
H	subBoreal	herb layer	*Clinopodium vulgare*	.	2	+	+	.	.	.	+	+	2	2	2	2
H	subBoreal	herb layer	*Geum urbanum*	.	.	.	.	.	.	+	+	.	+	.	.	.
Ch	Eur-As	shrub layer	*Prunus cerasifera*	.	.	.	.	2	.	.	+	.	.	.	.	+
H	Eur-As	herb layer	*Veronica chamaedrys*	.	.	.	.	.	.	.	+	+	1	.	+	+
H	Eur-As	herb layer	*Origanum vulgare*	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch-P	Carp-Bal	shrub layer	*Syringa vulgaris*	.	.	.	.	4	.	.	.	.	.	.	.	.
H	Eur-As	herb layer	*Glechoma hederacea*	.	.	.	.	.	.	.	.	.	.	.	.	.
P	Eur-As	shrub layer	*Euonymus europaeus*	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch	Eur-Med	shrub layer	*Euonymus latifolius*	.	.	.	.	.	.	.	.	.	.	.	.	.
Diagnostic species of cl. *Trifolio-Geranietea*																
H	subBoreal	herb layer	*Fragaria vesca*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Sib	herb layer	*Fragaria viridis*	.	3	.	2	2	1	.	1	.	.	2	2	.

	14	15	16	17	18	19	20	21	22	23	24		25	26	27	28	29	30	31	32	33	34	35	36	
Constancy (%)	19173	19274	16365	19270	18959	18960	18933	19025	19017	19043	18990	Constancy (%)	19213	19195	19156	19122	18970	18957	19013	16357	16351	16366	19204	18984	Constancy (%)
	577	714	872	915	397	434	555	576	474	466	451		721	661	580	571	591	477	623	673	940	826	772	326	
		270	90	135				135	180		360		135				180	270		180		180			
		3	5	10				3	8		8		3				3	5		3		3			
	100	100	85	100	100	100	100	100	100	100	100		100	100	100	100	100	100	100	95	90	95	100	100	
	0	0	0	80	100	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	
	100	100	80	40	40	100	95	100	90	95	90		100	100	100	90	90	90	95	80	80	80	90	100	
	10	10	80	10	85	35	60	20	40	15	80		10	5	50	65	30	25	35	15	40	40	45	20	
	8	5	0	5	30	0	15	35	0	5	0		0	0	0	0	0	0	0	0	0	0	15	30	
	0	0	0	1	0	0	1	0	0	0	0		0	0	0	0	0	0	0	0	0	0	10	30	
	14	24	35	24	30	21	23	20	23	13	24		13	11	11	13	16	21	22	19	19	21	24	16	
100	.	.	.	.	.	.	.	.	.	.	.	0	.	+	2	2	2	2	1	.	2	2	.	+	75
100	5	3	4	2	2	3	5	3	3	2	2	100	2	+	2	2	2	2	2	2	.	.	+	2	83
0	.	.	2	.	2	2	.	4	.	3	4	55	.	.	.	.	.	.	.	.	.	.	.	+	8
15	+	2	.	+	2	1	.	1	.	.	.	55	.	.	.	.	.	.	.	.	.	.	+	2	17
62	.	.	1	.	.	.	.	.	.	.	.	9	5	5	5	4	5	5	5	5	5	4	4	4	100
92	2	+	+	.	2	+	+	+	.	2	2	82	+	+	2	2	2	.	2	+	2	1	.	.	75
69	.	.	.	.	.	+	.	+	+	1	+	45	.	+	.	2	2	2	2	+	1	.	2	2	75
62	.	2	2	.	.	+	+	.	.	2	+	55	.	.	.	.	.	.	.	.	.	.	.	.	0
0	.	.	+	2	4	2	.	.	.	2	+	55	.	.	.	.	.	.	.	.	.	.	.	2	8
0	.	.	.	.	.	4	2	2	5	.	.	36	.	.	.	.	.	.	.	.	.	.	.	.	0
23	.	.	+	.	.	.	.	.	.	.	.	9	.	+	.	.	.	.	.	.	+	.	.	.	17
15	.	+	.	+	+	.	.	.	.	.	.	27	.	.	.	.	.	.	.	.	.	+	+	.	17
8	.	.	+	.	.	.	.	.	2	.	+	27	.	.	.	.	.	.	.	1	.	.	.	.	8
0	+	2	.	+	.	.	.	.	.	.	.	27	.	.	.	.	.	.	.	.	.	.	2	.	8
0	.	.	.	2	+	.	.	.	.	.	.	18	.	.	.	.	.	.	.	.	.	.	.	.	0
8	+	.	.	.	.	.	.	.	.	.	.	9	.	.	.	.	.	.	.	.	+	.	+	.	17
0	.	.	.	.	.	.	.	.	.	.	.	0	.	.	.	.	+	.	.	.	.	.	.	.	8
0	.	.	.	+	.	.	.	.	.	.	.	9	.	.	.	2	.	.	.	.	.	.	.	.	8
0	.	.	.	.	.	.	.	.	.	.	2	9	.	+	.	.	.	.	.	.	.	.	.	.	8
0	.	.	.	.	.	.	+	.	.	.	.	9	.	.	.	.	.	.	.	.	.	.	.	.	0
23	1	.	+	2	2	1	+	.	.	.	.	55	.	.	.	.	.	.	+	.	+	.	1	.	25
69	.	.	+	.	+	+	+	.	+	+	+	64	.	.	.	.	+	.	+	.	.	.	.	.	17
23	1	+	.	+	2	+	+	1	+	.	.	73	+	+	+	.	.	.	.	.	+	.	3	2	50
23	+	3	2	.	.	.	.	2	.	.	.	36	.	.	.	2	.	.	.	.	.	.	.	2	17
38	.	.	.	.	.	.	+	+	+	.	+	36	.	.	.	.	.	.	.	.	.	.	.	.	0
0	.	.	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	.	.	.	.	.	+	.	8
8	.	.	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	.	.	.	.	.	.	.	0
0	.	.	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	.	.	.	.	.	.	+	8
0	.	.	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	.	.	.	+	.	.	.	8
0	.	.	.	4	.	.	.	.	.	.	.	9	.	.	.	.	.	.	.	.	.	.	.	.	0
0	.	+	2	.	2	.	+	+	.	.	.	45	.	.	.	.	.	.	.	.	2	1	.	.	17
54	.	.	.	.	.	.	.	.	2	+	.	18	+	+	.	.	.	2	1	.	.	.	+	.	42

			Ordinal relevé No.	1	2	3	4	5	6	7	8	9	10	11	12	13
H	Eur-As	herb layer	*Galium album*	.	.	.	.	+	.	+	.	2	+	+	+	.
H	Eur-As	herb layer	*Viola hirta*	.	.	.	+	.	.	.	.	.	+	.	+	.
H	Eur-Med	herb layer	*Dorycnium pentaphyllum* subsp. *herbaceum*	2	.	.	1	.	.	.	+	.	.	2	+	.
H	Eur-Sib	herb layer	*Trifolium alpestre*	.	2	2	.	.	.	.	+	.	.	+	+	.
H	subMed	herb layer	*Aremonia agrimonoides*	.	.	.	.	.	.	.	.	.	.	.	.	.
B	subBoreal	herb layer	*Geranium robertianum*	.	.	.	.	.	.	.	.	.	.	.	.	.
Diagnostic species of cl. *Molinio-Arrhenateratea*																
H	Eur-As	herb layer	*Dactylis glomerata*	2	+	.	+	+	.	.	+	2	2	.	.	.
H	subBoreal	herb layer	*Lathyrus pratensis*	.	.	.	.	.	.	+	.	.	+	+	.	.
T-B	Eur	herb layer	*Lysimachia nummularia*	.	.	.	.	.	.	.	.	.	+	.	.	.
H	Boreal	herb layer	*Agrostis capillaris*	.	2	.	.	.	.	.	+	.	.	2	.	.
H	Eur-As	herb layer	*Arrhenatherum elatius*	2	.	.	.	.	.	.	.	3	.	.	.	.
H	Eur-As	herb layer	*Alopecurus pratensis*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Sib	herb layer	*Achillea millefolium*	.	.	.	.	.	.	.	.	.	.	.	.	+
H	Eur-As	herb layer	*Stellaria graminea*	.	.	.	.	.	.	.	.	.	+	+	.	.
H	Eur-subMed	herb layer	*Ranunculus polyanthemos*	.	.	.	.	.	.	.	.	.	+	.	+	.
H	Boreal	herb layer	*Trisetum flavescens*	.	.	.	.	.	.	.	.	.	.	+	.	.
H	Boreal	herb layer	*Festuca rubra*	.	.	.	.	.	.	.	.	.	.	2	.	.
T-B	subMed	herb layer	*Vicia grandiflora*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-As	herb layer	*Lolium perenne*	+	.	.	.	.	.	.	.	.	.	.	.	.
B-H	Eur-Sib	herb layer	*Pastinaca sativa*	.	.	.	.	.	.	.	.	.	.	.	.	.
Diagnostic species of cl. *Festuco-Brometea*																
H	Eur-As	herb layer	*Galium verum*	2	2	+	.	.	+	.	.	.	.	+	+	+
H	subMed	herb layer	*Festuca dalmatica*	.	.	.	+	.	.	.	.	.	.	.	3	3
H	subMed	herb layer	*Teucrium chamaedrys*	.	+	+	2	.	.	.	.	.	.	.	+	2
H	Kos	herb layer	*Poa pratensis* s.l.	2	2	1	2	+	+	.	+	.	2	+	2	2
H	SSib	herb layer	*Brachypodium pinnatum*	.	.	.	2	.	.	3	.	.	2	2	2	+
H	Eur-As	herb layer	*Medicago falcata*	2	.	.	2	+	.	.	.	.	.	.	.	.
H	Eur-subMed	herb layer	*Helleborus odorus*	.	.	.	.	+	.	.	.	.	.	.	.	.
H	Pont-Med	herb layer	*Eryngium campestre*	+	+	+	1	+	.	.	.	.	.	.	.	.
H	Eur-As	herb layer	*Euphorbia seguieriana* subsp. *niciciana*	+	.	.	+	.	.	.	.	.	.	.	.	.
H	Eur	herb layer	*Euphorbia cyparissias*	.	.	.	.	.	.	.	+	.	+	.	.	.
H	Eur-Med	herb layer	*Filipendula vulgaris*	.	.	.	+	.	.	.	+	.	.	2	+	2
H	subMed	herb layer	*Achillea setacea*	+	.	.	.	.	.	.	.	.	.	+	.	.
H	Eur-Med	herb layer	*Festuca pseudodalmatica*	2	2	2	.	.	.	.	.	.	.	.	.	.
H	subBoreal	herb layer	*Sanguisorba minor*	+	.	.	+	.	.	.	.	.	.	.	.	.
T	Ap-Bal	herb layer	*Orlaya grandiflora*	.	.	.	.	+	.	.	.	.	.	.	.	.
H	Pont-Med	herb layer	*Chrysopogon gryllus*	.	.	.	+	.	.	.	.	.	.	.	.	.
H	Pont	herb layer	*Koeleria nitidula*	.	+	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Sib	herb layer	*Vincetoxicum hirundinaria*	.	.	.	.	.	.	.	.	+	.	.	.	.
H	Eur-Sib	herb layer	*Adonis vernalis*	.	.	.	+	.	.	.	.	.	.	.	.	.
H	Eur-Sib	herb layer	*Cota tinctoria*	.	.	.	+	.	.	.	.	.	.	.	.	.
H	subMed	herb layer	*Asperula purpurea*	.	.	+	.	.	.	.	.	.	.	.	.	.
H	Eur	herb layer	*Briza media*	.	.	.	.	.	.	.	.	.	.	.	.	.
B	Eur-As	herb layer	*Medicago lupulina*	+	.	.	.	.	.	.	.	.	.	.	.	.
H	subMed	herb layer	*Onobrychis alba*	.	.	.	+	.	.	.	.	.	.	.	.	.
B-H	Eur-Sib	herb layer	*Scabiosa ochroleuca*	.	.	.	+	.	.	.	.	.	.	.	.	.
H	Pan-Bal	herb layer	*Festuca rupicola*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	subMed-As	herb layer	*Bothriochloa ischaemum*	2	.	.	.	.	.	.	.	.	.	.	.	.
B	Eur-As	herb layer	*Picris hieracioides*	+	.	.	.	.	.	.	.	.	.	.	.	.
H	Kos	herb layer	*Prunella vulgaris*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Med	herb layer	*Primula veris*	.	.	.	.	.	.	.	.	.	.	.	.	.

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			Ordinal relevé No.	1	2	3	4	5	6	7	8	9	10	11	12	13
B	Eur	herb layer	*Verbascum phlomoides*	+	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-OT	herb layer	*Salvia nemorosa*	+	.	.	.	.	.	.	.	.	.	.	.	.
G	Pont-Med	herb layer	*Leopoldia tenuiflora*	.	.	.	+	.	.	.	.	.	.	.	.	.
H	Eur-Sib	herb layer	*Polygala major*	.	.	.	+	.	.	.	.	.	.	.	.	.
H	SPont	herb layer	*Potentilla argentea* s.l.	.	+	.	.	.	.	.	.	.	.	.	.	.
Diagnostic species of cl. *Quercetea pubescentis*																
P	Eur-subMed	low tree layer	*Quercus cerris*	.	.	.	2	.	.	2	+	.	+	.	+	.
H	Eur-As	herb layer	*Brachypodium sylvaticum*	.	.	+	.	.	.	.	2	.	.	.	.	.
P	Eur	low tree layer	*Quercus frainetto*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-As	herb layer	*Galium aparine*	.	.	.	.	.	2	.	.	.	.	.	.	.
H	Boreal	herb layer	*Festuca heterophylla*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-As	herb layer	*Carex remota*	.	.	.	.	.	.	.	.	.	+	.	.	.
H	Eur-subMed	herb layer	*Arum maculatum*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur	herb layer	*Melica uniflora*	.	.	.	.	.	.	.	.	.	.	.	.	.
P	Eur-subMed	low tree layer	*Quercus pubescens*	2	.	.	.	.	.	.	.	.	.	.	.	.
P	subMed	low tree layer	*Carpinus orientalis*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur	herb layer	*Geranium sanguineum*	.	.	.	.	.	.	1	.	.	.	.	.	.
P	Eur-subMed	low tree layer	*Quercus pubescens* agg.	.	.	+	.	.	.	.	.	.	.	.	.	.
H	Eur-As	herb layer	*Viola reichenbachiana*	.	.	.	.	.	.	.	2	.	.	.	.	.
Diagnostic species of cl. *Carpino-Fagetea sylvaticae*																
H	Eur-Sib	herb layer	*Sanicula europaea*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Boreal	herb layer	*Poa nemoralis*	.	.	.	.	.	.	.	.	.	.	.	.	.
P	Eur-subMed	low tree layer	*Carpinus betulus*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur	herb layer	*Euphorbia amygdaloides*	.	.	.	.	.	.	.	.	.	.	.	.	.
Other species																
H	Eur-As	herb layer	*Cirsium arvense*	.	.	.	+	.	.	.	.	.	.	.	.	.
Ch	Eur-Med	shrub layer	*Rubus canescens*	2	.	.	.	.	.	4	3	2	2	2	+	+
B-H	Eur-Med	herb layer	*Tragopogon orientalis*	+	.	+	+	.	.	.	.	.	.	.	.	.
H	Eur-As	herb layer	*Alliaria petiolata*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Med	herb layer	*Lathyrus niger*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-Med	herb layer	*Crepis pulchra*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	subMed	herb layer	*Bupleurum affine*	.	.	+	.	.	.	.	.	.	.	.	.	.
H	Boreal	herb layer	*Carex hirta*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Kos	herb layer	*Calystegia sepium*	.	.	.	.	.	.	.	.	.	.	.	+	.
B	Eur-Med	herb layer	*Dipsacus laciniatus*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Med	herb layer	*Clinopodium nepeta*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Boreal	herb layer	*Cardamine flexuosa*	.	.	.	.	.	.	.	.	.	.	.	.	.
T-B	Kos	herb layer	*Capsella bursa-pastoris*	.	.	.	+	.	.	.	.	.	.	.	.	.
H	subMed-CAs	herb layer	*Cruciata glabra*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Boreal	herb layer	*Anisantha sterilis*	.	.	.	.	.	2	.	.	.	.	.	.	.
H	Eur-subMed	herb layer	*Achillea collina*	.	.	1	.	.	.	.	.	.	.	.	.	.
Ch	Bal	herb layer	*Cytisus jankae*	.	.	.	.	.	.	.	.	.	.	.	.	.
		herb layer	*Ranunculus* sp.	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-As	herb layer	*Taeniatherum caput-medusae*	+	.	.	.	.	.	.	.	.	.	.	.	.
Ch	Pont	herb layer	*Thymus roegneri*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Med	herb layer	*Ranunculus auricomus*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	subMed	herb layer	*Salvia verticillata*	.	.	.	.	.	.	.	.	.	.	.	.	2
H	Ap-Bal	herb layer	*Ranunculus serbicus*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Bal-Anat	herb layer	*Scabiosa argentea*	.	.	.	.	.	.	.	.	.	.	.	.	.
		herb layer	*Taraxacum* sp.	.	.	.	.	.	.	.	.	.	.	.	.	.
B	Eur-Med	herb layer	*Cirsium vulgare*	.	+	.	.	.	.	.	.	.	.	.	.	.
T-B	Eur-As	herb layer	*Conium maculatum*	.	.	.	.	.	.	+	.	.	.	.	.	.
H	Eur-Sib	herb layer	*Cichorium intybus*	.	.	.	.	.	.	.	.	.	.	.	.	.

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			Ordinal relevé No.	1	2	3	4	5	6	7	8	9	10	11	12	13
H	Eur	herb layer	*Carex otrubae*	.	.	.	.	.	.	.	.	.	+	+	.	.
H	Eur-Med	herb layer	*Sambucus ebulus*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-As	herb layer	*Seseli annuum*	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch	Eur	herb layer	*Thymus odoratissimus*	.	+	.	.	.	.	.	.	.	.	.	.	.
B	Eur-Med	herb layer	*Carlina vulgaris*	.	.	.	.	.	.	.	.	.	.	.	.	.
B	Eur-Sib	herb layer	*Knautia arvensis*	.	+	.	+	.	+	.	.	.	.	.	.	.
T	Boreal	herb layer	*Erigeron annuus*	.	.	.	+	.	.	.	.	.	.	.	.	.
H	Boreal	herb layer	*Equisetum sylvaticum*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Kos	herb layer	*Plantago lanceolata*	.	.	.	.	.	.	.	.	.	.	.	.	.
B-H	Eur-As	herb layer	*Falcaria vulgaris*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-Med	herb layer	*Euphorbia platyphyllos*	.	.	.	.	.	.	.	.	.	+	.	.	.
Ch	Eur-Sib	herb layer	*Genista tinctoria*	.	+	.	.	.	.	.	.	.	.	.	.	.
T-B	Eur-Med	herb layer	*Geranium pusillum*	.	.	.	.	.	.	.	.	.	+	.	.	.
H	Eur-Med	herb layer	*Carduus crispus*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Boreal	herb layer	*Bromus hordeaceus*	+	.	.	.	.	.	.	.	.	.	.	.	.
T-B	Eur-As	herb layer	*Lactuca serriola*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Kos	herb layer	*Convolvulus arvensis*	.	+	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Med	herb layer	*Heracleum sphondilium* agg.	.	.	.	.	.	.	.	.	.	.	.	.	.
T-B	subMed	herb layer	*Bromus squarrosus*	.	.	+	.	.	.	.	.	.	.	.	.	.
P	subMed	shrub layer	*Pinus nigra*	.	.	1	.	.	.	.	.	.	.	.	.	.
T	Eur-As	herb layer	*Chaerophyllum nodosum*	.	.	.	.	+	.	.	.	.	.	.	.	.
H	Eur-subMed	herb layer	*Poa compressa*	.	+	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Sib	herb layer	*Hypochaeris maculata*	.	.	.	+	.	.	.	.	.	.	.	.	.
T	Eur-As	herb layer	*Geranium rotundifolium*	.	.	.	.	.	.	.	.	.	.	.	.	.
P	Eur-As/Paleo	herb layer	*Juglans regia*	.	.	.	.	.	.	.	.	.	2	.	.	.
H	Kos	herb layer	*Hypericum perforatum*	.	+	.	.	.	.	.	.	.	.	.	.	.
Ch	Eur-As	shrub layer	*Hedera helix*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	subMed-CAs	herb layer	*Cruciata laevipes*	.	.	.	.	.	.	.	.	+	+	.	+	+
T-B	Eur-As	herb layer	*Daucus carota*	+	.	.	+	.	.	.	.	.	.	.	.	.
H	subMed	herb layer	*Digitalis lanata*	.	.	.	+	+	.	.	.	.	.	.	.	.
H	Med	herb layer	*Potentilla pedata*	.	.	.	+	.	.	.	.	.	.	.	.	.
Ch-P	Eur	herb layer	*Malus sylvestris*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	subMed	herb layer	*Prunella grandiflora*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Boreal	herb layer	*Polygonatum latifolium*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-Sib	herb layer	*Lapsana communis*	.	.	.	.	+	.	+	.	.	.	.	.	.
T	Eur-As	herb layer	*Geranium dissectum*	+	.	.	.	.	+	.	.	+	.	.	+	+
B	subMed	herb layer	*Centaurea stoebe*	+	.	+	.	.	.	.	.	.	.	.	.	.
T	Eur-CAs	herb layer	*Vicia villosa*	.	+	2	.	.	.	.	.	.	.	.	.	.
H	Eur-As	herb layer	*Lysimachia vulgaris*	.	.	.	.	.	.	+	.	.	.	2	.	.
H	Eur-Sib	herb layer	*Aegopodium podagraria*	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch-P	Eur-Med	herb layer	*Malus pumila*	.	.	.	.	.	.	.	1	+	.	.	.	.
T	Med-CAs	herb layer	*Torilis leptophylla*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	subMed	herb layer	*Xeranthemum cylindraceum*	.	.	.	.	.	.	.	.	.	.	.	.	+
T	Eur-CAs	herb layer	*Vicia villosa* agg.	+	.	.	.	.	.	.	.	.	.	.	.	+
T	Eur-As	herb layer	*Torilis japonica*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Boreal	herb layer	*Urtica dioica*	.	.	.	.	.	.	.	.	.	.	.	.	.
		herb layer	*Viola* sp.	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-Sib	herb layer	*Trifolium arvense*	.	.	.	.	.	+	.	.	.	.	.	.	.
T	Eur-As	herb layer	*Odontites vernus*	.	.	+	.	.	.	.	.	.	.	.	.	.
H-Ch	Eur	herb layer	*Thymus pulegioides*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Boreal	herb layer	*Rumex acetosa*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-As	herb layer	*Silene vulgaris*	+	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-Med	herb layer	*Vicia sativa* agg.	+	+	.	.	.	.	.	.	.	.	.	.	.

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			Ordinal relevé No.	1	2	3	4	5	6	7	8	9	10	11	12	13
H	Eur-As	herb layer	*Vicia cracca*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Med	herb layer	*Salvia pratensis*	.	.	.	.	.	.	.	.	.	.	.	.	.
T	Eur-Med	herb layer	*Vicia pannonica*	.	.	.	.	.	.	.	.	.	.	.	.	.
P	Eur	shrub layer	*Tilia platyphyllos*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-As	shrub layer	*Veratrum nigrum*	.	.	.	.	.	.	.	.	.	.	.	.	.
T-B	subMed	herb layer	*Trifolium incarnatum*	.	.	1	.	.	.	.	.	.	.	.	.	.
H	Bal	herb layer	*Pastinaca hirsuta*	.	.	.	.	.	.	.	.	.	.	.	.	.
H	Eur-Med	herb layer	*Potentilla recta* agg.	.	.	+	.	.	.	.	.	.	.	.	.	.
T	Eur-As	herb layer	*Torilis arvensis*	.	.	+	.	.	.	.	.	+	+	.	.	.
T	Kos	herb layer	*Polygonum aviculare* s.l.	.	.	.	+	.	.	.	.	.	.	.	.	.
Ch	Eur-Med	shrub layer	*Ligustrum ovalifolium*	.	.	.	3	.	.	.	.	.	.	.	.	.

1 - Gorna Malina municipality, near Negushevo village, 16.06.2018, N42.70872, E23.71056; 2 - Mala planina mt., near Tsarichina village, 05.07.2015, N42.70873, E23.22315; 3 - Mala planina mt., near Vlado Trichkov village, 13.07.2016, N42.70874, E23.33069; 4 - Gorna Malina municipality, near Belopoptsi village, 27.06.2018, N42.70875, E23.76526; 5 - Mala planina mt., between Ponor and Bezden villages, 01.08.2015, N42.70876, E23.08443, 6 - Gorna Malina municipality, between Negushevo and Stolnik villages, 16.06.2018, N42.70877, E23.73527; 7 - Strazhata hill, near Velkovtsi village, 24.07.2018, N42.70878, E25.36151; 8 - Strazhata hill, between Sedyankovtsi and Vetrovo villages, 27.07.2018, N42.70879, E25.30603; 9 - Strazhata hill, near Spantsi village, 04.07.2018, N42.70880, E25.28901; 10 - Strazhata hill, near Sulari village, 02.07.2018, N42.70881, E25.31035; 11 - Strazhata hill, near Gaikinite village, 02.072018, N42.93939, E25.29759; 12 - Strazhata hill, near Shipchenite village, 05.07.2018, N42.93724, E25.28312; 13 - Strazhata hill, near Parchovtsi village, 03.07.2018, N42.94926, E25.2871; 14 - Gorna Malina municipality, between Gorna Malina and Negushevo villages, 14.06.2018, N42.71331, E23.69862; 15 - Gorna Malina municipality, near Baylovo village, 04.08.2018, N42.64397, E23.81471; 16 - Mala planina mt, near Buchin prohod village, 03.08.2015, N42.97145, E23.16265; 17 - Gorna Malina municipality, near Baylovo village, 03.08.2018, N42.65629, E23.85497; 18 - Strazhata hill, near Ivanili village, 03.07.2017, N42.64397, E25.30305; 19 - Strazhata hill, near Ivanili village, 03.07.2018, N42.95165, E25.3105; 20 - Strazhata hill, near Sharanite village, 01.07.2018, N42.92248, E25.31983; 21 - Strazhata hill, near Velkovtsi village, 23.07.2018, N42.94662, E25.31983; 22 - Strazhata hill, near Mezhdene village, 22.07.2018, N42.94987, E25.31983; 23 - Strazhata hill, between Tsinga and Kopilovtsi villages, 25.07.2018, N42.97739, E25.41811; 24 - Strazhata hill, between Kozi rog and Turhovo villages, 20.07.2018, N42.94151, E25.28404; 25 - Gorna Malina municipality, near Belopoptsi village, 26.06.2018, N42.66765, E23.78989; 26 - Gorna Malina municipality, near Gorna Malina village, 21.06.2018, N42.69152, E23.73611; 27 - Gorna Malina municipality, between Aprilovo and Gaytanevo villages, 13.06.2018, N42.64946, E23.70823; 28 - Gorna Malina municipality, near Petkovo village, 11.06.2018, N42.69318, E23.64388; 29 - Strazhata hill, near Kozi rog village, 04.07.2018, N42.96259, E25.27363; 30 - Strazhata hill, near Parchovtsi village, 03.07.2018, N42.9459, E25.30037; 31 - Strazhata hill, near Mezhdene village, 22.07.2018, N42.9585, E25.34302; 32 - Mala planina mt., between Bogyovtsi and Beledie han villages, 03.08.2015, N42.88069, E23.15369; 33 - Mala planina mt., near Ponor village, 01.08.2015, N42.93418, E23.10527; 34 - Mala planina mt., near Buchin prohod village, 03.08.2015, N42.96085, E23.15528; 35 - Gorna Malina municipality, near Gaytanevo village, 25.06.2018, N42.63873, E23.78717; 36 - Strazhata hill, near Turhovo village, 19.07.2018, N42.98639, E25.22194;

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