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THE ASSOCIATION *QUERCO-OSTRYETUM* HT. 1938 IN SLOVENIA

ASOCIACIJA *QUERCO-OSTRYETUM* HT. 1938 V SLOVENIJI

Mitja ZUPANČIČ[1], Vinko ŽAGAR[2] & Branko VREŠ[3]

ABSTRACT UDC 581.55:582(497.4)

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The association *Querco-Ostryetum* Ht. 1938 in Slovenia was studied and simultaneously reviewed on the basis of comparison with similar or related associations in the region of the Illyrian floral province.

Key words: phytocoenology, ecology, *Ostrya carpinifolia*, *Quercus pubescens*, *Q. petraea*, Slovenia.

IZVLEČEK UDK 581.55:582(497.4)

Asociacija *Querco-Ostryetum* Ht. 1938 v Sloveniji

Proučena je asociacija *Querco-Ostryetum* Ht. 1938 v Sloveniji in hkrati revidirana na osnovi primerjanj s podobnimi ali sorodnimi asociacijami na območju ilirske florne province.

Ključne besede: fitocenologija, ekologija, *Ostrya carpinifolia*, *Quercus pubescens*, *Q. petraea*, Slovenija.

1 Dr., SAZU, Novi trg 3, SI – 1000 Ljubljana
2 Bevkova cesta 1, SI – 1290 Grosuplje
3 Dr., Biološki inštitut Jovana Hadžija ZRC SAZU, Novi trg 5, SI – 1000 Ljubljana

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1 INTRODUCTION

The first description of the association *Querco-Ostryetum carpinifoliae* is that of I. Horvat (1938), which presents sixteen phytocoenological relevés, of which eleven relevés represent the central typical forms of the association (*Querco-Ostryetum typicum*). According to the findings of I. Horvat (1938). the association *Querco-Ostryetum* belongs in the widest sense to the order *Quercetalia pubescentis* Br.-Bl. (1931) 1932 (or the alliance *Quercion pubescentis-petraeae* Br.-Bl. 1931), which has its optimal area of distribution in the sub-Mediterrannean and on the edge of the Mediterrannean, and in favourable conditions can also appear deep into the continental region. Into this order are classified associations with numerous plant species that grow on carbonate and non-carbonate bedrock in optimal ecological conditions, but appear in less favourable ecological conditions outside the area of this order or on the edge of it area of distribution towards the continental region only on a carbonate base (I. Horvat 1938).

The general ecological character of the association *Querco-Ostryetum* according to I. Horvat (1938) is that it grows on steep, limestone or dolomite, sunny, warm slopes with early spring thaws, on shallow humus soils (mull rendzina) in which extreme ecological conditions predominate. It is normally formed of stands of open thermophilous forest, coppice, which develops phenologically late. It is considered an extra-zonal association.

In Vegetation Südosteuropas (I. Horvat, Glavač & Ellenberg 1974: 385–386) there is a supplementary description of the association *Querco-Ostryetum*. It is defined as thermophilous Illyrian low forest or scrub with Illyrian species in the Illyrian phytogeographic region, which grows on the limestone and dolomite hills of Slovenia, Croatia and Bosnia. The stress is on certain species, such as: *Peucedanum oreoselinum*, *Geranium sanguineum*, *Trifolium rubens*, *Mercurialis ovata*, *Aster amellus*, *Melittis melissophyllum*, *Tanacetum corymbosum*, *Buglossoides purpurocaerulea*, *Silene italica* ssp. *nemoralis*, *Cornus mas*, *Euonymus verrucosa*, *Quercus pubescens*, *Q. cerris*, *Ostrya carpinifolia*, *Fraxinus ornus* and *Sorbus torminalis*.

I. Horvat (1958, 1959) draws attention in his studies to new findings, mainly to differences between continental and coastal phytocoenoses of the *Ostryetum* type, in particular differences in the syndynamics of the phytocoenoses. He raised the question of the existence of an alliance of continental thermophilous associations of the type *Querco-Ostryetum,* in which there are not a lot of sub-Mediterrannean species. I. Horvat believed that his new alliance *Ostryo-Carpinion orientalis* Ht. 1954 em. 1958 is satisfactory for the Illyrian-Adraitic region, for both coastal and continental associations with the species *Quercus pubescens* and *Ostrya carpinifolia* and added that some thermophilous sub-Mediterranean species are also present in continental associations.

Furthermore, he drew attention to the division of the association *Querco-Ostryetum* s. lat. into two independent sub-associations so that he raised the sub-association *Querco-Ostryetum quercetosum petraeae* into an independent association *Lathyro nigrae-Quercetum petraeae*, while the sub-association *Querco-Ostryetum typicum* represents the basic association *Querco* (*pubescentis*)-*Ostryetum* s. str.

I. Horvat's (1938) desire to combine Aichinger's (1933) association *Ostryo-Fraxinetum orni* Aichinger 1933 (= *Ostrya carpinifolia-Fraxinus ornus-Association*) into his association *Querco-Ostryetum* as a sub-association is interesting.

In Slovenia, M. Wraber (1960) followed the ideas of I. Horvat and reported on both associations. He added to the ecological description of the association *Querco-Ostryetum* that the vegetation is basiphilous-calcophilous on rendzinas or proto-rendzinas, a plant rich and varied association, which unites many submediterranean species, and is rich in shrubs »reminiscent of the coastal association *Seslerio-Ostryetum*, and within which are inserted mesophilous elements from sessile oak-hornbeam and beech forest«. His thesis, though: »In such ecologically extreme sites it can be preserved as a remnant from warmer post-glacial period« , is unacceptable. Viewed developmentally, the vegetation in different time periods probably changed and was in some cases was even more or less similar to todays. M. Wraber found that there are locations of it in Zasavje, Posotlje, Posavinje, in the Polhoc gradec hills, the upper Sava valley and the Soča valley.

For the association *Lathyro-Quercetum* M. Wraber (1960) cites locations mainly in eastern Slovenia, i.e., Posotlje, on Macelj and in Halože and Zasavje. He says that the association thrives on moderately acid soils, where there is often brown rendzina, and sensitive thermophilous and basal species are rarer on these habitats, and downy oak (*Quercus pubescens*) very rare.

Because of the relatedness or similarity of continental hop hornbeam associations (*Ostryetum »continentale«* s. lat.) and related sessile oak associations (*Quercetum petraeae* s. lat.) in our narrower western Dinarid space, which borders on the southeast Alpine region, we carried out a comparison with the following associations: *Lathyro nigrae-Quercetum* of the authors I. Horvat (1938), Cimperšek (2008), Zupančič & Žagar (in situ), *Erico-Ostryetum* of I. Horvat (1959), *Cytisantho-*

Ostryetum of M. Wraber (1961), *Ostryo-Fraxinetum orni* Aichingerja (1933), *Rhododendro hirsuti-Ostryetum* of Franz (2002) and *Asplenio adianti-nigri-Quercetum* of Cimperšek (2008).

Poldini (1988), Ž. Košir (1994), Marinček et al. (2002) etc. also wrote about thermophilous hop hornbeam (*Ostrya carpinifolia*) forests and related or similar associations in the southeast European-Dinarid region.

Our occasional investigations of the association *Querco-Ostryetum* s. lat. in Slovenia go back to the years from 1962 to 1984, with specific floristic comparisons and supplements in 2008. We justify the delay in final study and publication by the fact that we relied throughout on the more or less well-founded study of the association by I. Horvat (1938, 1959 and 1974 et al.) and we did not feel the need for confirmtion of these in Slovenia. We believe that we have now brought new insights through comparison of similar or related associations, especially in confirming their characteristic and distinguishing species.

During the phytocoenological research, we used the standard Central European method (Braun-Blanquet). The floristic nomenclature of Mala flora Slovenije (Martinčič et al. 1999, 2007) and Register flore Slovenije (Trpin & Vreš 1995) has been used. We used Raunkier's division according to Poldini (1991) for the life forms of plants, and also determined the horological groups of geoelements by it.

2 THE ASSOCIATION *QUERCO-OSTRYETUM* HT. 1938 IN SLOVENIA

The association *Querco-Ostryetum* Ht. 1938 is widespread in Slovenia, mainly in the pre-Alpine, pre-Dinarid, Dinarid region and on the edge of the sub-Pannonian phytogeographic region. In the Alpine phytogeographic region, it is replaced by the associations *Ostryo-Fraxinetum orni* and *Cytisantho-Ostryetum*. In the area of the sub-Mediterranean region it is replaced by the associations *Seslerio-Ostryetum* and *Amelanchiero-Ostryetum*.

2.1 ECOLOGICAL AND FLORISTIC CONDITIONS OF THE ASSOCIATION

2.1.1 Ecological conditions

According to data from the Atlas of Climate SFRY (1969) mean annual precipitation of 1000 to 1500 mm was recorded and a mean annual air temperature of 10 °C for the period 1931–1960 in the area of the association *Querco-Ostryetum*. Weather conditions are in general favourable in the area of the association. Extreme habitats, i.e., very steep, warm slopes, exposure to scorching heat, more or less water permeable carbonate bedrock and shallow, dry soils, provide unfavourable living conditions, which the association *Querco-Ostryetum* masters more or less successfully.

Habitats of the association *Querco-Ostryetum* are constructed of carbonate rocks, often dolomite, less frequently limestone. In accordance with our phytocoenological relevés, we determined the geological basis as follows. In the area of Škocjan, it is Cretaceous dark grey limestone, in Zaplana and Boronica it is Triassic main dolomite, on Boč and Podčrtek it is Triassic solid grainy or merely solid dolomite, in Kočevje it is Upper Cretaceous grey dense limestone with insertions of grainy dolomite, on Šmarna gora it is Triassic unlayered dolomite and in the wider area of Zasavje, Triassic grey dolomite alternates with inserts of chert, with layers of marl or thick grained dolomite or Triassic dolomite. Although the carbonate base is favourable for growth, the soil on these extreme sites is shallow and parched. The majority of these soils are shallow rendzinas or even protorendzinas, very occasionally they are shallow brown rendzinas.

In the treatment of ecological conditions, we also took into account the results of palinological research, which provides testimony of plant species in the past. The settlement of Mediterranean and sub-Mediterranean and Illyrian-Dinarid species in the interior of Slovenia was most expressed in the warm period of the Holocene. The species *Ostrya carpinifolia* began to appear when climatic conditions began to improve after the last glaciation. Culiberg (1991) found that the improvement of climatic conditions in the Bølling, and the even more climatically favourable Allerød, interstadial enabled the development of more varied vegetation (e.g., *Quercus*, *Corylus*, *Fagus*). In Culiberg's diagrams can be traced the appearance of the species *Ostrya carpinifolia* in Jezerce (Jelovica) already at the 440 cm depth profile, on Ljubljansko barje by Malenščica at the 190 cm depth profile and in Log at depths of 990–930 cm and 390–350 cm. From the pollen diagrams of Šercelj (1996) from Ledine and Jezerce on Jelovica, Šijco, Bled lake, Poklјuka, Gorjance and Koper, it is clear that the species *Ostrya carpinifolia* appeared from the middle to the end of the Boreal, which was very warm and dry, and from the end of the Atlantic onwards, which was warm and humid, through the sub-Boreal, which was warm and

dry, to today's sub-Atlantic which is humid and cooler. It began to warm up in the late glacial when the species *Fagus*, ***Quercus***, *Ulmus*, *Tilia*, ***Ostrya***, *Corylus* and even *Abies* appeared (Šercelj 1996). These trees survived in ecological or refugial niches, which were warmer than the surroundings, or in which the temperature oscillated. Forest or more thermophilous vegetation then spread from these niches during favourable climatic conditions (Šercelj 1996). Šercelj's (1970) pollen diagram from Bovec is interesting, which indicates average annual temperatures of only 2 °C less than today for the second Würm interstadial (from the period before 59,000 and 53,000 years). Over the entire 180 cm deep palinological profile, the species *Ostrya carpinifolia* appears with minor gaps at a depth of 80 cm and between 60 and 50 cm. In view of the aforementioned findings, we can conlude with the thought of Culiberg, Šercelj & Zupančič (1981): »*Ostrya* was already a pioneer in the Boreal on sunny and warm slopes, and, in the most recent time, again achieved greater distribution on the same slopes, at that time because of human activity.« This must be supplemented with the fact that the species *Ostrya carpinifolia* also occasionally appeared earlier in the late glacial (Bølling, Allerød, Würm).

2.1.2 Biological spectrum

The ratio between living (biological) forms of the plants that construct the association shows the kind of living environment in which the association *Querco-Ostryetum* thrives. The modesty of the habitat due to the extreme living conditions is confirmed by the biological spectrum of the association, with almost half of the plants present being hemicrytophytes, the majority of which are stalked. Because of the unfavourable living conditions, the majority are phanerophytes or clump and shrub forms, or are climbers; these are a seventh of all species in the association or more than two-thirds of the phanerophytes. All these do not achieve the minimum height of the trees (above 5 m). There are a few tree species that belong to stalked phanerophytes, these construct the lower tree layer and achieve a maximum 10 m height, and some only develop as shrubs. The majority of the shrubby phanerophytes confirm the difficult living conditions of the association. The lower tree layer achieves for the most part a cover of around 20%, here and there up to 70%. Table 1 shows the ratios between the life forms of plants in the association *Querco-Ostryetum* in Slovenia.

Table 1: Biological spectrum of the association Querco-Ostryetum

Living form	**No.**	**%**
PHANEROPHYTES (Phanerophyta)	**50**	**23.2**
Stemmed (P. scap.)	18	8.3
Clump (P. caesp.)	20	9.3
Climbing or hanging (P. scand.)	3	1.4
Nanophanerophytes (NP)	9	4.2
CHAMAEPHYTES (Chamaephyta)	**28**	**13.0**
Shrubby (Ch. suffr.)	19	8.8
Climbing (Ch. rept.)	2	0.9
Succulent (C. succ.)	1	0.5
Fruiting (Ch. frut.)	3	1.4
Mossy (B. Ch.)	3	1.4
HEMICRIPTOPHYTES (Hemicriptophyta)	**100**	**46.3**
Stemmed (H. scap.)	70	32.4
Rosetted (H. ros.)	11	5.1
Clumped (H. caesp.)	12	5.5
Climbing (H. rept.)	6	2.8
Biannual (H. bien.)	1	0.5
GEOPHYTES (Geophyta)	**33**	**15.2**
with rhizomes (G. rhiz)	25	11.5
with tubers (G. bulb.)	7	3.2
with bulbs (G. rad.)	1	0.5
THEROPHYTES (Therophyta)	**2**	**0.9**
Stemmed (T. scap.)	2	0.9
UNDEFINED BIOLOGICAL FORM	**3**	**1.4**
TOTAL	**216**	**100.0**

The biological spectrum of the association *Querco-Ostryetum* differs from the biological spectrum of the moderate (i.e., »normal«) belt in having a higher percentage of phanerophytes, hamaephytes and a lower percentage of geophytes and therophytes; the percentage of hemicriptophytes is much the same. The biologi-

cal spectrum of the association shows that it could be classified among syntaxa with living conditions that predominate in the moderate and partially mediterranean belt. The small percentage of therophytes indicates living conditions similar to those in the arctic belt while the higher percentage of phanerophytes indicates an approximation to the living conditions of the tropical belt. The biological spectrum of the association *Querco-Ostryetum* confirms the extreme living conditions of the association or habitats. These are scorched, parched habitats in the vegetation period, low temperatures in winter, the possibility of late spring or early autumn frosts and very shallow soils (rendzinas and protorendzinas).

2.1.3 Horological groups

Analysis of the horological groups shows that there are most cryophilic geoelements present in the association *Querco-Ostryetum*, around three fifths, and two fifths thermophilous geoelements. This ratio confirms the finding of the above analysis of the biological spectrum. The association *Querco-Ostryetum* thrives above all in living conditions partially similar to those in the Mediterranean belt. Of the cryophilic geoelements, the most frequent are European, then Euroasian and Eurosiberian geoelements, the presence of the remainder is negligible, although, e.g., circumboreal and paleotemperate geoelements, though small in number, indicate the unfavourable cold conditions that allow cryphilic species to grow in this association. In the group of thermophilous geoelements, Mediterranean montane and Pontic geoelements predominate, which are not extremely thermophilous and in certain habitats exposed to heat adapt to conditions of the continental moderate belt and thrive more or less successfully. The Mediterranean influence is more stressed by the small number of Mediterranean-Atlantic, Mediterranean-Pontic, Southeast European and Southern Illyrian and northern Illyrian geoelements that have found shelter in the extremely warm nooks of the association *Querco-Ostryetum*. A more detailed analysis of horological groups is given in Table 2.

2.1.4 Phytocoenological groups

As expected, best represented are species of the class *Querco-Fagetea* s. lat., in which the most (a fifth) are species of the order *Quercetalia pubescentis* s. lat., which gives the association *Querco-Ostryetum* the synsystematic and synecological stamp of a thermophilous association. To the thermophilous character of the association in the group of the class *Querco-Fagetea* s. lat. are added species of the order *Prunetalia* s. lat. and the alliance *Carpinion* s. lat. Of forest classes, species of the class *Erico-Pinetea* s. lat. indicate the thermophilous, open and degraded nature of the habitats. To these ecological indicators are added non-forest species of the class *Festuco-Brometea* s. lat., *Trifolio-Geranietea* s. lat., *Molinio-Arrhenatheretea* s. lat., with an average ten percent participation of species of each class, as well as species of the class *Sedo-Scleranthetea* s. lat. with a significantly smaller percentage. The appearance of species of the class *Scorzoneretalia villosae* s. lat. is interesting,

Table 2: Horological groups in the association Querco-Ostryetum

GEOELEMENTS	ALL GEOELEMENTS		THERMOPHILOUS		CRYOPHILIC	
	no.	in %	no.	in %	no.	in %
Euromediterranean	15	6.9	15	6.9		
Mediterranean-montane	23	10.7	23	10.7		
Mediterranean-Atlantic	3	1.4	3	1.4		
Mediterranean-Pontic	5	2.3	5	2.3		
Pontic	22	10.2	22	10.2		
Southeast European	9	4.2	9	4.2		
South Illyrian	4	1.8	4	1.8		
North Illyrian	4	1.8	4	1.8		
European	49	22.7			49	22.7
Euroasian	30	13.9			30	13.9
Eurosiberian	23	10.7			23	10.7
Paleotemperate	9	4.2			9	4.2
Circumboreal	7	3.2			7	3.2
Cosmopolite	2	0.9			2	0.9
Alpine	2	0.9			2	0.9
Alpine-Carpathian	2	0.9			2	0.9
East Alpine	1	0.5			1	0.5
Undefined species	6	2.8				
TOTAL	**216**	**100.0**	**85**	**39.3**	**125**	**57.9**

which are typical of non-forest (grassland) vegetation of the Mediterranean. Despite the small presence of these species, they stress the thermophilous and open nature of habitats of the association *Querco-Ostryetum* is stressed and the influence of the invasion of warm waves from the sub-Mediterranean into some continental areas (e.g., Šmarna gora, Zasavje with Posavje, Kolpska dolina etc.). Just under a sixth are fagetal species from the order *Fagetalia* and class *Querco-Fagetea*, which, despite everything, find a place to settle in this extreme thermophilous association. The majority withstand the dryness and warmth or are adapted to these ecological conditions, including some that are more or less thermophilous (e.g., *Acer platanoides, Asarum europaeum, Cephalanthera damasonium*, *C. rubra, Clematis vitalba*, *Convallaria majalis, Digitalis grandiflora, Epipactis helleborine, Lonicera xylosteum, Melampyrum nemorosum* subsp. *nemorosum, Primula vulgaris* etc.). Among the fagetal species, southeast European-Illyrian species of the Illyrian alliance *Aremonio-Fagion* have a special place (*Anemone trifolia, Cyclamen purpurascens, Epimedium alpinum, Hacquetia epipactis*, *Helleborus niger* subps. *niger*, *Knautia drymeia* subsp. *drymeia*), which, with the southeast European-Illyrian species *Aposeris foetida, Genista januensis*, *Chamaecytisus purpureus*, *Scabiosa triandra* (=*S. gramuntia*), *Dianthus monspessulanus* and the relatively endemic *Galium laevigatum, Lilium carniolicum* and *Scabiosa hladnikiana* determine the phytogeographic position of the association *Querco-Ostryetum*. We classify it in the Illyrian province of the Eurosiberian-Northamerican region. The scarce presence of species of the class *Seslerietea* indicates the poor, dry, carbonate habitat, which suits heliophylic and thermophilous mountain grasslands. Analysis of the phytocoenological groups confirms the ecological conditions of the association *Querco-Ostryetum* established to date. Table 3 gives exemplary ratios among the phytocoenological groups.

2.1.5 Flora and its particularities

The association *Querco-Ostryetum* under discussion is biotically very diverse, since it includes around 180 different taxa of higher plants (Phytocoenological Table 1), which represents 5 percent of the ferns and vascular plants in Slovenia. They include 3 notables (Wraber T. 1990), 14 protected Slovene species (Skoberne 2007) and 6 species from the Red List of the Republic of Slovenia (UL RS 82/2002); altogether 18 (0.52 % of all Slovene or a tenth of all species present in the association). Most numerous in terms of species are wild orchids, the majority of species of which, because of the threat to them, are on both the list of protected species and on the Slovene Red List. Invasive or potentially invasive species were not found in the association under discussion (Richardson 2000, Jogan 2007). The relatively large share of protected and threatened species of Slovene flora and the absence of invasive species indicates the exceptional conservation importance of the association in Slovenia and, at the same time, in Europe, but also the relative »sensitivity« in ecological (changes in living conditions) and anthropogenic senses (impact of human interventions). The absence of foreign or inva-

Table 3: Phytocoenological groups in the association Querco-Ostryetum

PHYTOCOENOLOGICAL GROUPS	QUERCO-OSTRYETUM		QUERCO-FAGETEA	
	no.	%	no.	%
Querco-Fagetea s. lat.	104*	48.1*		
Quercetalia pubescentis			40	18.5
Prunetalia			11	5.1
Aremonio-Fagion			6	2.8
Fagetalia sylvaticae			22	10.2
Quercetalia roboris-petraeae			4	1.8
Querco-Fagetea s. str.			21	9.7
Erico-Pinetea	19	8.8		
Vaccinio-Piceetea	5	2.3		
Betulo-Adenostyletea (=Mulgedio-Aconitetea)	2	0.9		
Scorzoneretalia villosae	7	3.2		
Trifolio-Geranietea	17	7.9		
Nardo-Callunetea	2	0.9		
Seslerietea	5	2.3		
Festuco-Brometea	25	11.6		
Sedo-Scleranthetea	6	2.8		
Molinio-Arrhenatheretea	14	6.5		
Asplenietea trichomanis	1	0.5		
Other species	9	4.2		
TOTAL	216	100.0	104*	48.1*

sive species also indicates the stability of its floristic composition in the sense of being autochthonous, which similarly increases its nature conservation importance and gives a unique seal to the biotic diversity of the association discussed. The presence of »notable« Slovene plants in the association in question does not have particular value from a nature conservation point of view, but it supplements the importance of the biotic diversity in the sense of the cultural historical (historical botanical) aspect.

Furthermore, it seemed to us justified also to present the following findings. In the area in which the association *Querco-Ostryetum* thrives on Šmarnogorska Grmada, the undergrowth (herb layer of the association) contains in addition to the species cited in Phytological Table 1, also the following species: *Asperula tinctoria*, *Dianthus sylvestris* (protected and notable), *Grafia golaka* (notable) and *Scrophularia scopolii* (notable). The first enumerated species is not found in any of the above mentioned lists or sources but, in view of the small number of known habitats for it in Slovenia (Jogan et al. 2001), it deserve attention. Its habitat in the area of the association *Querco-Ostryetum* on Šmarnogorska Grmada lies in quadrant 9852/4 in the Central European floristic mapping (or in UTM in quadrant 33T VM50 by the method of European floristic mapping, and supplements the map of distribution (Figure 1) of the species in Slovenia (Jogan & al. 2001). This also applies for the species *Aster linosyris* (Figure 2). The appearance of both the aforementioned species in the area of Šmarna gora (from the wider point of view) was already documented in older sources (Fleischmann 1844, Petauer & al. 1977, Šuštar 1998, etc.), but was overlooked in the preparation of the distribution map (Jogan et al. 2001). In the period of research, we documented the species with herbarium examples, preserved in the working herbarium of the Biological Institute ZRC SAZU. For a presentation of the distribution of species, a location of Scopoli's scrophulus (*Scrophularia scopolii*) is also new (Figure 3), while *Grafia golaka* and wood pink (*Dianthus sylvestris*) are already marked for quadrat 9852/4 on published distribution maps (Jogan et al. 2001).

2. 2 REASONING OF THE CHARACTERISTIC SPECIES OF THE ASSOCIATION

I. Horvat (1938) did not precisely define the characteristic species for the association *Querco-Ostryetum*. He highlighted that some species in the association appear constantly, in large number and we can conclude that they are narrowly bound to the association. These species are »*Corylus avellana*, *Lonicera caprifolium*, *Staphylea pinnata*, *Prunus avium, Acer campestre, Lithospermum purpureo-caeruleum, Garanium sanguineum*, *Trifolium rubens, Aster amellus*« and he stated many others as characteristic species of the association and alliance in the phytological tables. Characteristic species were not more precisely specified even later (I. Horvat, Glavač & Ellenberg 1974). Only some species are cited which are most bound to the association and they add the further species »*Peucedanum oreoselinum*, *Mercurialis ovata*, *Melittis melissophyllum*, *Tanacetum corymbosum* and *Silene italica* subsp. *nemoralis*« (ibid 385).

M. Wraber (1960) accepted Horvat's choice of characteristic species of the associatiation also for Slovenia, even extended it and said: »The association is rich in characteristic species (*Quercus pubescens*, *Ostrya carpinifolia*, *Fraxinus ornus*, *Cornus mas*, *Amelanchier ovalis*, *Cotinus coggygria*, *Viburnum lantana*, *Geranium sanguineum*, *Polygonatum odoratum*, *Peucedanum cervaria*, *Trifolium rubens*, *Lithospermum purpureo-coeruleum*, *Anthericum ramosum*, *Cynanchum vincetoxicum*, *Mercurialis ovata*, *Orchis purpurea*, *Lactuca perennis* etc.).«

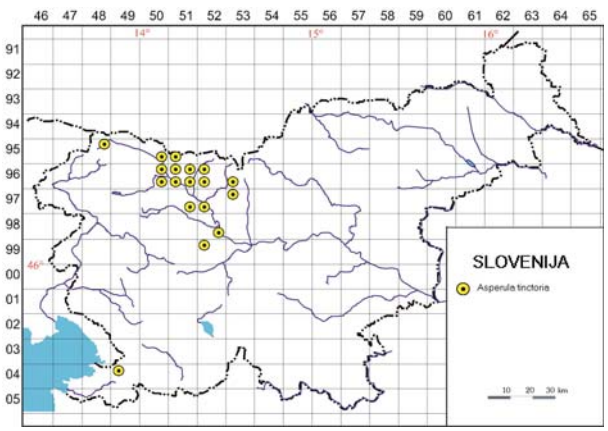

Figure 1: Distribution of Asperula tinctoria in Slovenia.
Slika 1: Razširjenost vrste Asperula tinctoria v Sloveniji.

A critical review and comparison with similar and related associations, taking into account the division of the association *Querco-Ostryetum* into two or even three independent associations, enabled us to more firmly establish the characteristic species of the association *Querco-Ostryetum* s. str. (Phytocoenological Table 2). Among the selected characteristic species were confirmed the foreseen characteristic species of I. Horvat of 1938, which are *Geranium sanguineum*, *Trifolium rubens* and *Aster amellus*, and from 1974 *Mercurialis ovata*.

To these characteristic species we added the species *Peucedanum cervaria*, *Inula hirta* and *Quercus pubescens*. The enumerated characteristic species very well characterise the association ecologically, thus their thermophilous-heliophilous character, openness of stands and poverty of the habitat, which is formed by very steep and dry slopes. Four characteristic species *Quercus pubescens*, *Peucedanum cervaria*, *Trifolium rubens* and *Mercurialis ovata* classify (taking into account at the same

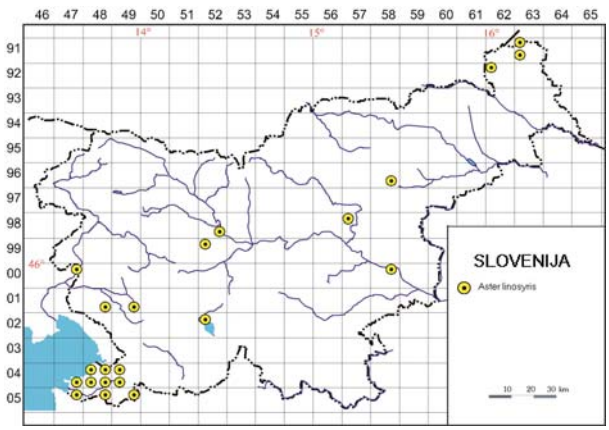

Figure 2: Distribution of Aster linosyris in Slovenia.
Slika 2: Razširjenost vrste Aster linosyris v Sloveniji.

time the ecological conditions) the association *Querco-Ostryetum* synsystematically into the order *Quercetalia pubescentis*, which is also confirmed by numerous other characteristic species of this order present in the association.

2.2.1 Ecology of characteristic species

We summarise the ecological designation of the characteristic species according to Oberdofer (1979) and as necessary supplement it on the basis of our own experience in the field.

The species ***Quercus pubescens* Willd**. grows on dry, warm slopes, often in scrub of oak, hop hornbeam and flowering ash. It prefers a limestone geological base, but is also found on dolomite and in the coastal region on flysch. Rocky or clayey soils are normally rich in nutrients and bases, medium deep, with a neutral mild humus horizon. The species is heliophious and deeply rooted. It is ranked among characteristic species of the order *Quercetalia pubescentis*.

The species ***Geranium sanguineum* L**. is found on the margins of or in dry scrub and forests of heliophilous oak and pine forests on exposed slopes. It grows on warm in summer, dry, poor, usually limestone soils, which are base rich and where there is a light, moderately acid, mild humus. The soils can be on rocky rubble or limestone gravel, also clayey or light, sometimes deep. The species is characterised by creeping roots. It is a thermophilous and heliophilous (semi-shade) species which is ranked among characteristic species of the alliance *Geranion sanguinei*, and by some authors of the alliances *Quercion pubescentis* or *Berberidion*.

The species ***Peucedanum cervaria* (L.) Lap.** occupies scrub, its edges, hedgerows and thermophilous oak and pine forest. It prefers warm in summer, medium deep clayey, light nutrient and base moderately rich soils, sometimes also occurring on limestone gravel. It is classified among characteristics of the alliance *Geranion sanguinei*, some authors also as a characteristic species of the alliance *Quercion pubescentis* or even the alliance *Mesobromion*.

The species ***Trifolium rubens* L**. is frequent in scrub, hedges, in thermilous open oak (also pine) forests and on their margins. It prefers warm, dry, shallow to deep, clayey or light, base rich soils, on which there is a soft, light humus. It is a thermophilous to semi-shade species, which is deeply rooted. It is classified among characteristic species of the alliance *Quercion pubescentis*.

The species ***Aster amellus* L.** thrives in thermophilous scrub and forests or on their margins, it is frequent along the boundaries of thermophilous pine forests or on dry pastures. It grows on warm in summer, moderately dry, medium deep to deep, usually limestone rich soils with neutral mild, light humus. It is a characteristic species of the class *Festuco-Brometea*, some authors also classify it among characteristic species of the alliance *Geranion sanguinei*. It is considered to be among heliophilous to semi-shade species.

The species ***Mercurialis ovata* Sternb. & Hoppe** appears in oak, oak-pine, thermophilous beech forests and thermophilous scrub on moderately dry, stony, clayey-silty, more or less nutrient or base rich soils with light, soft humus. It is a semi-shade species. European authors classify it among characteristic species of the alliance *Quercion pubescentis*. Tomažič (1940) considers it one of the characteristic species of the alliance *Fraxino orni-Ostryion* in the area of the southeast Alpine-Dinarid space. Tomažič's classifification is in our opinion correct.

The species ***Inula hirta* L**. grows in heliophilous oak and pine and other thermophilous open forests, in scrub and on the edges of forests and scrub. The soils of its habitats are normally moderately warm in summer, dry, deep, neutral, limestone, loamy or clayey with a light humus. In the area of the (sub)Mediterranean it also

grows on flysch. Creeping roots are characteristic of it. It is a semi-shade to heliophilous plant. We classify it among characteristic species of the alliance *Geranion sanguinei*, and some authors as a characteristic species of the alliance *Quercetalia pubescentis* or even the alliance *Festucion valesiacae*.

It can be seen from the above analysis of the ecological designations of the characteristic species of the

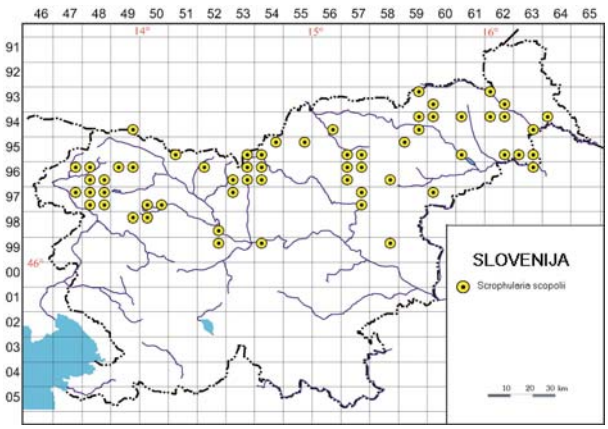

Figure 3: Distribution of Scrophularia scopolii in Slovenia.
Slika 3: Razširjenost vrste Scrophularia scopolii v Sloveniji.

association *Querco-Ostryetum* that they are ecologically very similar or related. All occupy habitats of thermophilous forests and scrub or forests with gaps, mostly oak and pine forests on carbonate rocks. In warmer (Mediterranean) regions they also grow on other rocks, e.g., in Slovenia on flysch. The soils are normally rocky, gravelly, sandy, light, loamy, dry, neutral reaction, with soft, light humus. The majority are heliophilous to semi-shade species. Syntaxonomically they are classified for the most part into the group of characteristic species of the alliance *Quercion pubescentis* or the order *Quercetalia pubescentis* or non-forest synsystematic units, which are ecologically in accordance with the order *Quercetalia pubescentis*.

The lectotype of the association is relevé 11 from I. Horvat's Phytocoenological Table 1 (I. Horvat 1938, križaljka br. 1).

2.2.2 Typical combination and synsystematic classification of the association

We made two comparisons of the typical combination of species (Table 4), namely, on the basis of our analytical Phytocoenological Table 1 and synthesis Phytocoenological Table 2, taking also into account I. Horvat's tables (columns 1 and 2). The first and second analyses indicate the predominance of species of the class *Querco-Fagetea* over other synsystematic units. If we articulate the class *Querco-Fagetea* into lower synsystematic units, it can be seen that species of the order *Quercetalia pubescentis* absolutely predominate over species of other synsystematic units. Species from the order *Prunetalia* are represented in considerable numbers. Species of the order *Fagetalia* are subordinate in the analysis of the typical combination of species, which is perhaps not very evident in the analytical Phytocoenological Table 1, but which is evident in synthesis Phytocoenological Table 2. Species of the orders *Trifolio-Geranietea* and *Festuco-Brometea* stand out to some extent. The chosen typical combination of species confirms the synsystematic definition and ecological designations of the association *Querco-Ostryetum,* which is clear from the analytical and synthesis phytocoenological tables. The association *Querco-Ostryetum* is correctly classified in the order *Quercetalia pubescentis* Br.-Bl. (1931) 1932 and in the Illyrian alliance *Fraxino orni-Ostryion* Tomažič 1940. We also justify the classification of the association *Querco-Ostryetum* into Tomažič's Illyrian alliance *Fraxino orni-Ostryion* on its phytogeographic position in the Illyrian floral province, which is supported by the presence of some southeast European-Illyrian species, stated in Phytocoenological Tables 1 and 2 and in section 2.1.4 Phytocoenological Groups (p. 132–133).

The synsystematic division in the analytical (Phytocoenological Table 1) and synthesis (Phytocoenological Table 2; columns 1 and 2) tables and the typical combination of species do not confirm I. Horvat's placement of the association *Querco-Ostryetum* into the alliance *Ostryo-Carpinion orientalis* Ht. (1954) 1958. From this alliance, only the species *Asparagus tenuifolius* is poorly represented. With the higher synsystematic classification of the association *Querco-Ostryetum* we took into account the alliance *Fraxino orni-Ostryion* Tomažiča (1940), which unites continental thermophilous deciduous associations and is correctly classified by Tomažič into the order *Quercetalia pubescentis*. I. Horvat (1954, 1958) incorrectly combined Tomažič's alliance *Fraxino orni-Ostryion* into his own alliance *Orneto-Ericion* Ht. 1958 (=*Fraxino orni-Pinion nigrae-sylvestris* /Ht. 1953/ Zupančič 2007), which includes pine forests of the Dinarid region (Zupančič 2007). In Slovenia and in Croatia, in the area of distribution of the association *Querco-Ostryetum*, there are present four species of the west European alliance *Quercion pubescentis* Br.-Bl. 1931, but this is not sufficient to place the association in this alliance.

The complexes of stands with gaps, the heliophilous and thermophilous nature of the association *Querco-Os-*

tryetum also confirm the selection in the typical combination of species of some characteristic species from the classes *Trifolio-Geranietea* and *Festuco-Brometea*, which are concordant with the order *Quercetalia pubescentis*.

The typical combination of species confirms the appropriateness of the selection of characteristic species of the association *Querco-Ostryetum* since, of the seven present, six of characteristic species of the association are in the typical combination.

2.3 TYPOLOGICAL ARTICULATION OF THE ASSOCIATION

Because of ecological conditions and anthropogenic influences, the association *Querco-Ostryetum* is divided into at least three sub-associations: – *genistetosum januensis*, – *cotonoasteretosum tomentosae* and – *chamaecytisetosum purpureae*. There is a question over a fourth sub-association – *quercetosum petraeae* - which I. Horvat (1958, 1959) raised to the rank of an independent association *Lathyro nigrae-Quercetum petraeae* Ht. (1938) 1958 and will be the subject of discussion in section 2.5. All sub-associations, in view of the representation of species of individual synsystematic species, are more or less balanced. Species of one or another synsystematic units recorded in Phytocoenological Table1 in no case stand out.

2.3.1 Sub-association *Querco-Ostryetum genistetosum januensis* subass. nova

The sub-association *Querco-Ostryetum genistetosum januensis* subass. nova is the most widespread. It appears most often on steep, warm slopes of Zasavje and Posavje. It can be defined as the typical or central sub-association, in which there are relatively the most favourable ecological conditions, although even these are relatively bad. The selected distinguishing species *Genista januensis* Vis., *Clematis recta* L., *Allium pulchellum* G. Don, *Campanula persicifolia* L., *Scabiosa triandra* L. (=*S. gramuntia* L.) and *Dianthus monspessulanus* L. well characterise the habitat, since they thrive in thermophilous scrub and forests, in well lit, forest and scrub with gaps or along the edges of forest or scrub. These distinguishing species grow on warm in summer, rocky or sandy, more or less nutrient and lime rich soils with light humus. All are thermophilous, heliophilous or semi-shade species (Oberdorfer 1979). Despite their different synsystematic affilations, because of their thermohilous or heliophilous nature they tend to appear in associations that belong to the order *Quercetalia pubescentis* or the class *Trifolio-Geranietea, Sedo-Scleranthetea, Festuco-Brometea* ipd.

The holotype of the sub-association is relevé 1 in Phytocoenological Table 1.

2.3.2 Sub-association *Querco-Ostryetum cotonoasteretosum tomentosae* subass. nova

The sub-association *Querco-Ostryetum cotonoasteretosum tomentosae* subass. nova covers the warmest exposed locations on shallow soils. For the most part it is scrub, very occasionally low forest. The distinguishing species *Cotoneaster tomentosus* Lindl. and *Inula conyza* L. are indicators of these ecological conditions. They mainly appear in scrub or on the edges of forests or in heliophilous and thermophilous oak and pine forests with gaps. They prefer warm in summer, rocky or sandy, limestone, nutrient and base rich soils with mild, neutral humus on exposed southern exposures. They are thermophilous and heliophilous species. The species *Cotoneaster tomentosus* is a characteristic species of the alliance *Fraxino orni-Pinion nigrae-sylvestris*, which often appears in associations of the alliances *Quercion pubescentis* or *Berberidion*. The species *Inula conyza* is a characteristic species of the order *Quercetalia pubescentis*, and is also found in associations of the class *Trifolio-Geranietea*, orders *Prunetalia* and *Erico-Pinetalia* (Oberdorfer 1979).

The holotype of the sub-association is relevé 18 in Phytocoenological Table 1.

2.3.3 Sub-association *Querco-Ostryetum chamaecytisetosum purpureae* subass. nova

The sub-association *Querco-Ostryetum chamaecytisetosum purpureae* subass. nova is somewhat impoverished of plant species. In some cases, several species of the order *Prunetalia* appear, which indicates the degradation phenomenon of the already modest habitat. We chose as distinguishing species *Juniperus communis* L. and *Chamaecytisus purpureus* Scop., which highlight the degradation process in this phytocoenosis. The species *Juniperus communis* is often met on degraded, sunny, dry grasslands, on which there is extensive grazing and moderately acid humus appears. In the studied stands, we cannot talk of grazing, but it has probably been marked by occasional anthropozoogenic influences on this extremely labile thermophilous habitat. It is interesting that there are grazed areas in the vicinity (Boč, Slivnica). We conclude that the phytocoenosis is secondary on the habitat of thermophilous beech forest.

Table 4: Typical combination of species in the association Querco-Ostryetum

Alliance – order – class	Species in Phytocoen. Table 1	Species in Phytocoen. Table 2
FRAXINO ORNI-OSTRYION	*Fraxinus ornus*	*Fraxinus ornus*
	Ostrya carpinifolia	*Ostrya carpinifolia*
	Mercurialis ovata *	*Mercurialis ovata**
QUERCION ROBORIS-PETRAEAE		*Trifolium rubens**
		Buglossoides purpurocaerulea
		Tamus communis
QUERCETALIA PUBESCENTIS	*Melittis melissophyllum*	*Melittis melissophyllum*
	Sorbus aria II	*Sorbus aria II*
	Peucedanum oreoselinum	*Peucedanum oreoselinum*
	*Quercus pubescens**	*Quercus pubescens**
	Rhamnus catharticus	*Rhamnus catharticus*
	Viola hirta	*Viola hirta*
	Dictamnus albus	*Dictamnus albus*
	Polygonatum odoratum	*Polygonatum odoratum*
		Tanacetum corymbosum
		*Peucedanum cervaria**
		Lathyrus niger
		Campanula persicifolia
		Sorbus torminalis II
PRUNETALIA SPINOSAE	*Viburnum lantana*	*Viburnum lantana*
	Crataegus monogyna	*Crataegus monogyna*
	Cornus mas	*Cornus mas*
		Cornus sanguinea
		Juniperus communis
		Berberis vulgaris
CARPINION		*Pyrus pyraster II*
AREMONIO-FAGION	*Cyclamen purpurascens*	*Cyclamen purpurascens*
FAGETALIA SYLVATICAE	*Primula vulgaris*	*Primula vulgaris*
		Symphytum tuberosum
QUERCETALIA ROBORIS-PETRAEAE		*Galium lucidum*
ERICO-PINETEA	*Buphthalmum salicifolium*	*Buphthalmum salicifolium*
	Chamaecytisus hirsutus	*Chamaecytisus hirsutus*
	Genista januensis	*Genista januensis*
TRIFOLIO-GERANIETEA	*Vincetoxicum hirundinaria*	*Vincetoxicum hirundinaria*
	Anthericum ramosum	*Anthericum ramosum*
	*Geranium sanguineum**	*Geranium sanguineum**
	Dorycnium germanicum	*Dorycnium germanicum*
		Calamintha clinopodium
SESLERIETEA	*Sesleria albicans*	*Sesleria albicans*
FESTUCO-BROMETEA	*Teucrium chamaedrys*	*Teucrium chamaedrys*
	Carex flacca	*Carex flacca*
	Brachypodium rupestris	*Brachypodium rupestris*
	Euphorbia cyparissias	*Euphorbia cyparissias*
	*Aster amellus**	*Aster amellus**
		Hypochoeris maculata
		Silene italica
MOLINIO-ARRHENATHERETEA		*Serratula tinctoria*
		Veronica chamaedrys
		Dactylis glomerata
OTHER SPECIES		*Rosa sp.*

** Characteristic species of the association Querco-Ostryetum*

The species *Chamaecytisus purpureus*, which only appears here with greater coverage, also highlights the degradation phenopmenon. The distinguishing species prefer sunny, dry grassland and well-lit forest, but also grow on rockfields, rocks or even cliffs. The soils are moderately dry, but can also occasionally be fresh, sandy, with a moderately acid humus. The species are thermophilous and characterise secondary scrub and degraded habitats.

2.4 GEOGRAPHIC VARIANT OF THE ASSOCIATION

The association *Querco-Ostryetum* differs slightly in Slovenia from that first described in Croatia. The differences are mainly in the permanence and median cover values of its characteristic species. In relation to the Croatian variant, the optimal, Slovene variant is poorer in characteristic species. The reason for the modest appearance of characteristic species in Slovenia is its extreme north-western area of distribution. In Slovenia, there is already a difference in the median cover value of the dominant characteristic tree species *Quercus pubescens,* which is two and a half times greater in Croatia. It is similar with the species *Geranium sanguineum*. The characteristic species *Peucedanum cervaria* and *Trifolium rubens* are also more represented in Slovenia, both in terms of constancy and in median cover values, especially the latter, since they achieve constancy between 40 and 60% and between 20 and 40 %, respectively. The characteristic species *Mercurialis ovata* has greater constancy and median cover value in Slovenia. The characteristic species *Inula hirta* has two and a half times greater cover value here. There are also differences in the constancy and median cover values in the diagnostically important order *Quercetalia pubescentis* s. lat., in which we classify the association *Querco-Ostryetum*, whereby the Croatian variant has precedence. It is similar with species of the order *Prunetalia*, which are a constituent part of the association. The Slovene variant is richer in fagetal and pinetal species, which indicates a specific secondarity of the association on beech habitats, and pioneer character in relation to the appearance of a number of pinetal species. Nor is the modest appearance of species of the class *Seslerietea* negligible, which indicates a minor influence of the nearby Alps.

The enumerated differences between the Slovene and Croatian phytocoenoses are not enough reason for the establishment of two geographic variants. There is a possibility of determining a geographic variant for the Croatian association with the tree species *Acer obtusatum* as the phytogeographic distinguishing species. The species *Acer obtusatom* L. is a central-eastern Illyrian-Dinarid species. In Slovenia it extends only to the narrowest southeastern belt in Kolpska dolina (Poljanska dolina in Bela krajina and in Kočevsko), and here and there it also appears also in the sub-Mediterranean. In view of its optimal area of distribution in Croatia, it can also be considered a good phytogeographic distinguishing species. **The geographic variant *Querco-Ostryetum* var. geogr. *Acer obtusatum* var. geogr. nova** represents the optimal form of the phytocoenosis. **The holotype of the geographic variant is relevé 1 from I. Horvat's phytocoenological Table 1 (1938, križaljka br. 1).**

2.5 COMPARISON WITH THE ASSOCIATION LATHYRO-QUERCETUM HT. (1938) 1958 (=SERRATULO-QUERCETUM) AND THE SYNSYSTEMATIC QUESTION

2.5.1 Ecological conditions

We took for comparison five analytical phytocoenological tables by the authors I. Horvat (1938, I. Horvat et al. 1974), Cimperšek (2008) and Zupančič et al. (*in situ*) of the associations *Querco-Ostryetum* and *Lathyro-Quercetum*, which are presented in the synthesis Phytocoenological Table 2 in columns 1–5. The phytocoenoses in I. Horvat's and our tables (Zupančič et al) (Phytocoenological Table 2, columns 1–4) are for the most part floristically the same, so we dealt with them together, both for the association *Querco-Ostryetum* (Phytocoenological Table 2, columns 1 in 2) and for the association *Lathyro-Quercetum* (Phytocoenological Table 2, columns 3 in 4) and then mutually compared them. Cimperšek's phytocoenological table of the association *Lathyro-Quercetum* (Phytocoenological Table 2, column 5) is floristically richer than I. Horvat's and ours, and we therefore dealt with it separately. There is a total of 176 plant species n the association *Lathyro-Quercetum* in the tables of I. Horvat and Zupančič et al., in Cimperšek's 224 species have been recorded, which is 48 species more than in both of the aforementioned tables. The explanation for such a difference is the method of determining the relevé area. I. Horvat and Zupančič et al. inventoried the phytocoenosis *sensu stricto*, thus were strictly limited to more or less optimal forms of the association *Lathyro-Quercetum*. Zupančič et al. adhered firmly to the provisions of a method that recommends a standard area of 400 m^2. I. Horvat for the most part kept to this standard or slightly reduced the area several times in order to embrace the optimal form of the phytocoenosis. Cimperšek increased the inventory area to 800 m^2 (only in one case to 450 m^2) and thus embraced the association very widely – *sensu lato*. His relevés include initial forms of the association or even the transition from surrounding vegetation. We thus made the comparison between the associations *Querco-Ostryetum* and *Lathyro-Quercetum* separately in Cimperšek's case. The results of the comparison with Cimperšek's tables are more favourable for an independent association *Lathyro-Quercetum*.

In the fifties of the last century, I. Horvat considered raising the sub-association *Querco-Ostryetum querceto-*

sum petraeae Ht. 1938 into the rank of an independent association *Lathyro nigrae-Quercetum petraeae* Ht. (1938) 1958, because of the dominance of sessile oak (*Quercus petraea*) and edaphic and relief differences. In comparison with the association *Querco-Ostryetum*, which thrives on shallow earthy soils (mull rendzinas), the association *Lathyro-Quercetum* grows on deeper, moderately acid, slightly fresher soils – brown rendzinas. The appearance of these soils enables the relief formation of a habitat that is protected from stronger sunlight and in some cases is also less steep. This habitat enables greater species representation of mesophilous plants and enables the growth of more sensitive thermophilous species (I. Horvat 1938, I. Horvat et al. 1974, M. Wraber 1960). Cimperšek (2008) states the following about the association *Lathyro-Quercetum*: »On solid limestone, on limestone conglomerate and dolomiticised limestone, nutrient and base saturated, variously deep, not infrequently patchy, carbonated soils develop.«. Our experience confirms some of the above findings, above all the edaphic-relief findings. Slopes can be gentle or steep, steep with hollows, less exposed warm exposures (northwest, west, southeast) and the soils are therefore slightly deeper – brown rendzinas.

Because of the aforementioned ecological conditions, there are some differences in the species and, consequently, in the vegetation. Several thermophilous species are rarer in the association *Lathyro-Quercetum,* and some do not appear at all. It is similar with heliophilous species. There are a few more mesophilous species. Seen from the vegetational point of view, there are fewer species from the orders *Quercetalia pubescentis* and *Scorzoneretalia villosae* and the classes *Erico-Pinetea*, *Trifolio-Geranietea*, *Festuco-Brometea*, *Sedo-Scleranthetea* and *Molinio-Arrhenatheretea*. There are a small number more species from the order *Fagetalia*, in this group there are most species of the alliance *Carpinion* s. lat. and class *Vaccinio-Piceetea*. The differences in the characteristic species of the association *Querco-Ostryetum* is representative; in the association *Lathyro-Quercetum* they are barely observable. There is a clear difference in the presence of the tree species *Quercus pubescens*, which does not occur in the association *Lathyro-Quercetum* or is very rare (coincidental), so we were justified in classifying it among characteristic species of the association *Querco-Ostryetum*. Comparison of the phytocoenological groups in the associations *Querco-Ostryetum* (I. Horvat 1938 and Zupančič et al. in situ) and *Lathyro-Quercetum* (I. Horvat 1938 and Zupančič et al. in situ andr Cimperšek 2008) confirms this analysis.

In addition to comparison of the phytocoenological groups (Table 5), analysis of the horological groups, with a smaller participation of thermophilous geoelements, of which there are only 31.8%, or in Cimperšek's (2008, Table 1) tables 29.8 %, and in the association *Querco-Ostryetum* 39.3 % (see Table 2), also indicates the moderately mesophilous nature of the association *Lathyro-Quercetum*. Above all, there are fewer Euromediterranean (5.7 % or 4.9 %) and mediterranean-montane (6.8 % or 6.7 %) and more cryophilic European (25 % or 29 %) and circumboreal (5.1 % or 7.1 %) geoelements (See Table 2.).

The biological spectrum of the association *Lathyro-Quercetum* more approximates to phytocoenoses of the moderate belt or normal zone. The 26 %, or 21 %, phanerophytes indicates the specific thermophilous nature of the association, which is characteristic of warmer belts (Mediterranean, desert, tropical zones). There is also a difference between the associations *Querco-Ostryetum* and *Lathyro-Quercetum* in the biological spectrum, which indicates the relatively more favourable ecological conditions for the association *Lathyro-Quercetum* (Table 6).

The association *Querco-Ostryetum* has an initial, pioneer, degradation character, with more open shrub-tree complexes with gaps, the soils are shallow rendzinas, proto-rendzinas, in which thermophilous-heliophilous species thrive, less sensitive to the water regime, especially in the summer period, very exposed to sun, in short the vegetation is thermophilous and approaches similar phytocoenoses of the sub-Mediterranean/Mediterranean. Downy oak – *Quercus pubescens* dominates in the tree-shrub layer. The association *Lathyro-Quercetum* is ecologically relatively stable, moderately thermophilous, enriched with mesophilous flora on more favourable, deeper, sometimes moderately acidified brown rendzinas. The tree-shrub layer is condensed. Extremely thermophilous species are rare or even non-existent. Mesophilous sessile oak – *Quercus petraea* dominates in the tree-shrub layer.

The question is whether these ecological, floristic and vegetational differences are persuasive enough for arguing an independent association *Lathyro-Quercetum* or are only sufficient for identifying a well-expressed sub-association *Querco-Ostryetum quercetosum petraeae*, as I. Horvat originally envisaged in 1938.

In the comparison of the associations, in addition to ecological, floristic and vegetational analyses, we were further aided by calculation of Sørensen's index of similarity of phytocoenoses. Comparison between the associations *Querco-Ostryetum* and *Lathyro-Quercetum* (I. Horvat and Zupančič et al: Phytocoenological Table 2, columns 1, 2, 3 and 4) gave an index of σ 77, which indicates similarity between the phytocoenoses. In another comparison (I. Horvat and Zupančič et al. and Cimperšek: Phytocoenological Table 2, columns 1, 2 and

5) the index is σ 53, which indicates differences of the phytocoenoses. The last index is more favourable for the establishment of an independent association. However, we are sceptical about Cimperšek's method of inventorying the phytocoenosis (note: inventory areas too large), since the index of similarity is not realistic. Irrespective of the above calculated indexes of similarity of the phytocoenoses, we accept the opinion of I. Horvat on the establishment of an independent phytocoenosis *Lathyro-Quercetum*, which we base on the following findings. The phytocoenoses differ slightly in terms of ecological conditions and stands are constructed from two diagnostically significantly different tree species, namely the thermophilous species *Quercus pubescens* in the association *Querco-Ostryetum* and the mesophilous species *Quercus petraea* in the asscoiation *Lathyro-Quercetum.*

2.5.2 Characteristic species of the association *Lathyro-Quercetum* (=*Serratulo-Quercetum*)

The characteristic species of the association *Lathyro-Quercetum* are more or less relative, especially in comparison to the associations *Querco-Ostryetum* and *Asplenio-Quercetum*. Their diagnostic value is reflected in the high median cover values and proportionately higher level of presence than the characteristic species of the association *Lathyro-Quercetum* achieve in the associations *Querco-Ostryetum* and *Asplenio-Quercetum* (Phytocoenological Table 2, columns 1, 2, 3, 4, 5 and 6). We selected the species *Quercus petraea*, *Serratula tinctoria, Lathyrus niger* and *Tamus communis* as relative characteristic species.

Cimperšek (2008), on the basis of comparison between the associations *Lathyro-Quercetum* and *Asplenio-Quercetum* selected the following distinguishing species for the association *Lathyro-Quercetum*: *Melica uniflora, Melittis melisophyllum, Cornus mas, Cyclamen purpurascens, Ostrya carpinifolia, Bromopsis ramosa* subsp. *benekenii, Peucedanum austriacum* and *Buglossoides purpurocaerulea*. It is true that locally, in the area of Obsotelje and Kozjansko, they differ in terms of the aforementioned species, but these have no weight in the wider concept of continental thermophilous phytocoenoses with hop hornbeam or oak. These species are generally widespread in them, as is evident from synthesis Phytocoenological Table 2.

We here briefly describe the ecological conditions in which the characteristic species of the association *Lathyro-Quercetum* (=*Serratulo-Quercetum*) thrive according to Oberdorfer (1979) and our own experience.

The species ***Quercus petraea* (Mattuschka) Liebl**. grows in oak forests on mountainous and hilly terrain, on dry to fresh soils, base poor, occasionally also richer medium deep, unstable rocky or loamy soils. Trees are deeply rooted. It is a characteristic species of the class *Querco-Fagetea*, present in associations of the alliances *Quercion roboris-petraeae* and *Luzulo-Fagion*.

The species ***Serratula tinctoria* L.** thrives in heliophilous deciduous forests on alternating fresh to dry, nutrient and base moderately rich, moderately acid, medium deep soils with rotted humus. It occurs on carbonate and non-carbonate rocks. The plant is deeply rooted, it is a thermophilous, heliophilous to semi-shade species. It is characteristic of the order *Molinietalia*, and is found in associations of the order *Quercetalia pubescentis* and alliance *Carpinion* s. lat.

The species ***Lathyrus niger* (L.) Bernh**. grows in oak or mixed oak-pine forests, on forest margins and scrub, on moderately dry, sometimes impoverished but base rich, moderately calcareous, medium deep loamy or silty soils with neutral to moderately acid humus. It favours warm in summer habitats, but is a semi-shade species. It is a characteristic species of the order *Quercetalia pubescentis*, and also thrives in associations of the alliances *Carpinion* s. lat. and *Geranion*.

The species ***Tamus communis* L**. thrives in hedgerows, scrub, on the edge of forests and in well-lit forests, on fresh, nutrient and base rich rocks and loamy fresh soils, with a light soft humus. It is classified among thermophilous species and is an indicator of nutritious soils.

Table 5: Comparison of the phytocoenological groups of the associations Querco-Ostryetum and Lathyro-Quercetum

PHYTOCOENOLOGICAL GROUPS	QUERCO-OSTRYETUM	LATHYRO-QUERCETUM	
	Ht. + Zup	Ht. + Zup	Cimperšek
	v %	v %	v %
Querco-Fagetea	**48,1**	**59,1**	**58,9**
Vaccinio-Piceetea	2,3	**4,0**	**4,9**
Erico-Pinetea	**8,8**	7,4	5,8
Scorzoneretalia villosae	**3,2**	1,8	1,4
Seslerietea	**2,3**	1,1	0,9
Festuco-Brometea	**11,6**	7,4	6,7
Sedo-Scleranthetea	**2,8**	1,1	0,9
Molinio-Arrhenatheretea	**6,5**	5,1	4,9

It is a characteristic species of the alliance *Quercion pubescentis-petraeae*, and is found in associations of the orders *Prunetalia* and *Fagetalia*.

The characteristic species are ecologically related or similar, and indicate habitats in which there are fresh, deep, but rocky soils, sometimes moderately acid, more or less nutrient and base rich. All are thermophilous, heliophilous to semi-shade species that are deeply rooted.

The lectotype of the association is relevé 16 from I. Horvat's (1938, križaljka br. 1) Phytocoenological Table 1, or our relevé 28 from Phytocoenological Table 1.

The establishment of the independent association of I. Horvat (1958) designated *Lathyro nigrae-Quercetum petraeae* Ht. (1938) 1958, in the opinion of Poldini (1988) is questionnable or the name used is invalid (nom. inval.). The name of the association *Lathyro nigrae-Quercetum petraeae* is said to be the valid name for Richard's association on an acid base, established in 1961 in Switzerland. We believe that I. Horvat (1958) has precedence over Richard in naming the association. In both cases, the name of the association is poorly chosen, since the species *Lathyrus niger* appears in a number of phytocoenoses, both in thermophilous carbonate and in mesophilous non-carbonate associations. We must also take into account the fact that both the described associations, Richard's (1961) and I. Horvat's (1958), belong to different higher synsystematic units in the rank of order. Because of the confusion created (homonyms) in the naming of the two phytocoenoses, irrespective of precedence in naming the association *Lathyro-Quercetum* Ht. (1938) 1958, we propose a new name, which is ecologically more appropriate and based on a mutual comparison of similar phytocoenoses.

***Serratulo tinctoriae-Quercetum petraeae* Ht. ex Zupančič & Žagar nom. nov. The lectotype of the association is relevé 16 from I. Horvat's (1938, križaljka br. 1) Phytocoenological Table 1, or our relevé 28 from Phytocoenological Table 1 (Zupančič & Žagar). The synonym is *Lathyro nigrae-Quercetum petraeae* Ht. (1938) 1958 nom. inv.**

2.5.3 Geographic variant

Just as we envisaged a geographic variant for the association *Querco-Ostryetum,* such also appears in the context of the association *Serratulo-Quercetum* (=*Lathyro-Quercetum*). It has the same phytogeographic distinguishing species *Acer obtusatum* L. We envisage for the Croatian region a geographic variant ***Serratulo-Quercetum* var. geogr. *Acer obtusatum* var. geogr. nova,** which is not so explicitly stressed as with the association *Querco-Ostryetum*. It represents an optimal form of the phytocoenosis, which differs from the association in Slovenia. In the region of Slovenia, the association *Serratulo-Quercetum* (=*Lathyro-Quercetum*) is somewhat more mesophilous, richer in fagetal, piceetal and pinetal species. **The holotype of the geographic variant is relevé 12 from I. Horvat's (1938, križaljka br. 1) Phytocoenological Table 1.**

2.5.4 Question of the synsystematic stability of the association *Serratulo-Quercetum* (=*Lathyro-Quercetum* nom. inv.)

The association *Serratulo-Quercetum* (=*Lathyro-Quercetum*) is classified in the alliance *Fraxino-Ostryion*, order *Quercetalia pubescentis* and class *Querco-Fagetea*. Both associations, *Querco-Ostryetum* and *Serratulo-Quercetum* (=*Lathyro-Quercetum*), belong to the same higher synsystematic rank, which is understandable in view of the first classification of the sub-association *Querco-Ostryetum quercetosum petraeae*. There is no reason for a different synsystematic classification, mainly because of the very similar floristic content of the two associations. Floristically, with small differences, the associations are fairly similar. The characteristic species of the association *Serratulo-Quercetum* (=*Lathyro-Quercetum*) are relative and are represented in both associations but they differ in appearance and participation in the individual associations. The relative characteristic species of the association *Serratulo-Quercetum* (=*Lathyro-Quercetum*) and the considerable floristic

Table 6: Biological spectrum of the associations Querco-Ostryetum and Lathyro-Quercetum

Biological form	Moderate belt	Querco-Ostryetum	Lathyro-Quercetum	
	Normal zone		Ht. & Zup. et al.	Cimperšek
	no. of species	no. of species	no. of species	no. of species
I. Phanerophytes (Phanerophyta)	7	23	26	21
II. Chamaephytes (Chamaephyta)	3	13	10	9
III. Hemicryptophytes (Hemicryptophyta)	50	47	43	50
IV. Geophytes (Geophyta)	22	15	19	17
V. Therophytes (Therophyta)	15	1	1	2
VI. Unspecified biological form	-	1	1	1

similarity with the association *Querco-Ostryetum* cause the association *Serratulo-Quercetum* (=*Lathyro-Quercetum*) not to have great synsystematic stability as an independent association. There is greater stress on the ecological conditions, which differ in some segments. With further research and with a higher number of phytocoenological relevés over a wider area it will be possible to confirm the independence of the association or to reject it and again classify it as a sub-association *Querco-Ostryetum quercetosum petraeae,* as was proposed in 1938.

2.6 FLORISTIC AND ECOLOGICAL DIFFERENCE OF SIMILAR ASSOCIATIONS

For a better understanding of continental thermophilous associations with dominant species *Ostrya carpinifolia* and *Quercus petraea*, and especially the association *Querco-Ostryetum*, we compared some associations that in our opinion are more or less floristically and ecologically similar. We chose seven associations from the region of the Illyrian floral province of the pre-Alpine and pre-Dinarid, partially from the edge of the pre-Pannonian world. More precisely, already in section 2.5 we made a comparison between the associations *Querco-Ostryetum* and *Serratulo-Quercetum* (=*Lathyro-Quercetum* nom. inv.). The subjects of comparison in this section are the associations *Erico-Ostryetum*, *Cytisantho-Ostryetum*, *Ostryo-Fraxinetum orni*, *Rhododendro-Ostryetum* and *Asplenio-Quercetum*.

2.6.1 *Erico carneae-Ostryetum* Ht. 1958

I. Horvat derived the association *Erico-Ostryetum* from the sub-association *Querco-Ostryetum ericetosum* Ht. 1950 in the fifties of the last century. The association is floristically very impoverished (around 80 species). The herb layer is dominated by the species *Erica carnea,* with degradation elements such as *Pteridium aquilinum*, *Carex alba* and *Leontodon incanus*. *Ostrya carpinifolia* dominates in the tree-shrub layer, with the southeast European-Illyrian species *Acer obtusatum* is codominant, and *Fagus sylvatica* sometimes appears in larger numbers. In addition to the enumerated species, the association *Erico-Ostryetum* differs from the association *Querco-Ostryetum* in the smaller representation of the tree species *Quercus pubescens* and species from the orders *Quercetalia pubescentis* and *Fagetalia sylvaticae* and classes *Trifolio-Geranietea*, *Nardo-Callunetea*, *Festuco-Brometea*, *Sedo-Scleranthetea* and *Molinio-Arrhenatheretea*; the cause of this is the density of spring heather (*Erica carnea*). The considerable presence of *Hepatica nobilis* is interesting. The soils are fairly acid and fresh. In the opinion of M. Wraber (1960), the phytocoenosis is anthropogenically conditioned, which is also confirmed by the research of Accetto (oral). We also agree with this finding. Locations of the association *Erico-Ostryetum* in Slovenia are in the pre-Dinarid and pre-Alpine region. The similarity between the associations *Querco-Ostryetum* and *Erico-Ostryetum* according to Sørensen is 42, which indicates low similarity between the associations and considerable independence of the association *Erico-Ostryetum*.

The following species were excluded from the comparison of the associations as exclusive characteristic species, which appear in no other compared phytocoenoses (Phytocoenological Table 2): *Helleborus multifidus* Vis., *Acer monspessulanum* L., *Cotoneaster nebrodensis* (Guss.) C. Koch and *Sesleria juncifolia* Wulf. ex Suffr. The enumerated characteristic species grow on dry, rocky and warm slopes and in, well-lit stands with gaps. In addition to the characteristic species, the species *Pteridium aquilinum* (L.) Kuhn, *Carex alba* L. and *Leontodon incanus* (L.) Schrank are diagnostically important, which thrive in similar ecological conditions as the aforementioned characteric species, and are at the same time indicators of degradation processes.

2.6.2 *Cytisantho-Ostryetum* M. Wraber 1961

The Alpine-pre-Alpine shrub vegetation of *Cytisantho-Ostryetum* occupies steep limestone-dolomite, extremely warm, rocky or conglomerate slopes, on rendzinas (proto-rendzinas to brown rendzinas), sometimes on very shallow brown soils. In places there are powerful denudation processes. This basiphilous-neutrophilous association, which thrives in the Slovene southeast Alps at an altitude from 600 to 1000 m, is floristically medium rich (around 140 species), but poorer than the association *Querco-Ostryetum* (216 species). It is primarily impoverished of thermophilous species of the order *Quercetalia pubescentis,* as well as fagetal species, but richer in species of the classes *Seslerietea*, *Festuco-Brometea* and *Sedo-Scleranthetea*. The species *Ostrya carpinifolia* completely dominates the shrub-tree layer. The similarity between the associations *Querco-Ostryetum* and *Cytisantho-Ostryetum* according to Sørensen is 56, which confirms the justification of an independent association. The related association *Ostryo-Fraxinetum orni* appears in the Alpine-pre-Alpine region of the southeast Alps, so we also compared the association *Cytisantho-Ostryetum* with it and by means of Sørensen's index of similarity (σ = 44) the low similarity between them and its justifiable independence. Phytocoenologi-

cal Table 2 clearly shows the differences between the associations.

M. Wraber (1961) chose two characteristic species for the association *Cytisantho-Ostryetum*: *Cotinus coggygria* and *Allium pulchellum*. Both are relative characteristic species, because they also appear in other similar or related continental thermophilous scrub in which the species *Ostrya carpinifolia* dominates. We propose that only the species *Allium pulchellum* G. Don is retained of the characteristic species given by M. Wraber. The species *Allium pulchellum* is present, though, to a certain extent in the association *Querco-Ostryetum* and is one of the distinguishing species of the sub-association *Querco-Ostryetum genistetosum januensis*, which indicates a certain inter-relatedness of the phytocoenoses. In addition to the species *Allium pulchellum,* characteristic species are *Genista radiata* (L.) Scop., *Betonica alopecuros* L, *Dianthus sternbergii* Siber and *Iris pallida* Lam. subsp. *cengialti* (Ambrosi) Foster (=*I. cengialti* Ambrosi f. *vochinensis* Paulin), which characterise the association ecologically, phytogeographically and floristically. We propose the species *Anemone trifolia* L. as the distinguishing species of the association, which, together with some other species in the phytocoenosis, indicates the »Illyrian nature« of the phytocoenosis (northern edge of the Illyrian floral province).

2.6.3 *Ostryo-Fraxinetum orni* Aichinger 1933

In the previous section 2.6.2, we compared the southeast Alpine association *Ostryo-Fraxinetum orni* with the similar or related association *Cytisantho-Ostryetum* in the foothills of the Julian Alps. Despite the clear differences, the species *Amelanchier ovalis*, *Cotoneaster tomentosa* and *Calamagrostis varia* are very widespread in both the named phytocoenoses, which indicates their initial character and, at the same time, the difference with the association *Querco-Ostryetum*. The association *Ostryo-Fraxinetum orni* is the most floristically impoverished (around 70 species) of the continental thermophilous scrub or low forest associations discussed. Comparison with the association *Querco-Ostryetum* shows considerable impoverishment of species from the orders *Quercetalia pubescentis* and *Fagetalia* and the classes *Trifolio-Geranietea, Festuco-Brometea* and *Molinio-Arrhenatheretea*. There are also fewer species from the order *Prunetalia* and class *Erico-Pinetea*. There are very few similarities between them, Sørensen's index is 34, which excludes the idea of I. Horvat (1938) that the association *Ostryo-Fraxinetum orni* is part of the association *Querco-Ostryetum,* or its initial sub-association. Above all, there is no oak in the association *Ostryo-Fraxinetum orni*. The horological or phytogeographic and, to some extent, ecological nature is also different. It settles steep, rocky limestone-dolomite slopes in locations where there are no extreme temperature oscillations, especially in spring, and it constructs thermophilous islands in the middle of mesophilous fagetal vegetation in the montane belt. It is mostly or almost always scrub. Its eastern boundary of distribution is in Slovenia, where the Noric floral province meets the Illyrian.

2.6.4 *Asplenio adianti-nigri-Quercetum* Ž. Košir ex Cimperšek 2008

On the edge of the pre-Pannonian world, Cimperšek (2008) correctly and with tabular material confirmed the association *Asplenio adianti-nigri-Quercetum petraeae*, which Ž. Košir had provisionally envisaged but not shown scientifically. Cimperšek (2008), in addition to the newly described association *Asplenio-Quercetum,* also presented in the discussion I. Horvat's association *Serratulo-Quercetum* (=*Lathyro-Quercetum*), which is also a subject of our discussion. He made ecological, biological, floristic-geographic and sociological comparisons between them. Despite clear differences of the treated associations, a comparison of similarity according to Sørensen between the associations *Querco-Ostryetum*, *Serratulo-Quercetum* (=*Lathyro-Quercetum*) and *Asplenio-Quercetum* interested us, aware of considerable edaphic differences, since the association *Asplenio-Quercetum* thrives on non-carbonate rocks and moderately acid to neutral soils. On the basis of Cimperšek's (2008) phytocoenological tables (Tables 2 and 3) it appeared that Sørensen's index is 67, which means some similarities between the associations *Serratulo-Quercetum* (=*Lathyro-Quercetum*) and *Asplenio-Quercetum*. However, we are of the opinion that the associations are independent and confirm Cimperšek's decision on the basis of the above mentioned ecological and floristic analyses. In comparing the associations *Querco-Ostryetum* and *Asplenio-Quercetum*, though, Sørensen's index of similarity is low (σ = 44), which we also expected.

2.6.5 *Rhododendro hirsuti-Ostryetum* Franz 1991

The association *Rhododendro-Ostryetum* is not comparable with the association *Querco-Ostryetum* or with other similar or related thermophilous continental associations with dominant species *Ostrya carpinifolia* and *Quercus petraea*. In synthesis Phytocoenological

Table 2 we took it into account more because of its interesting appearance in the Karavanke here and in Austria (Franz 2002) and in Bovec (Dakskobler 2004), around Trebuša (Dakskobler 2003) and the watershed Prešnica by Borovnica (Accetto 2008). This is an initial or even a primary association on a limestone or dolomite base (ribble), with shallow soils, poor in humus. It grows on colder positions from the montane to the sub-Alpine belt, where there is less extreme temperature oscillation. Floristically, the association is extremely modest, the majority of species are from the classes *Vaccinio-Piceetea* and *Erico-Pinetea*. Of thermophilous species, *Ostrya carpinifolia*, *Fraxinus ornus*, *Sorbus aria* and *Amalenchier ovalis* are present. Willner & Grabherr (2007), with the approval of the author, Franz, included his association *Rhododendro hirsuti-Ostryetum* in the association *Erico-Ostryetum* Ht. 1959 as a sub-association *Erico-Ostryetum rhododendretosum hirsuti*.

3 CONCLUSIONS

I. Horvat (1950, 1954, 1958, 1959) conceived the idea of two independent continental thermophilous associations with the species *Ostrya carpinifolia* on extreme habitats of the pre-Pannonian (pre-Dinarid) region of western Croatia with a first review of forest associations of Yugoslavia and then confirmation with synthesis studies on synsystematic relations of thermophilous oak and pine forests of southeast Europe. He divided the uniform association *Querco-Ostryetum* Ht. 1938, with two sub-associations, into two associations, namely into the original *Querco-Ostryetum* (*Q.-O. typicum*) and a new *Lathyro-Quercetum* (*Q.-O. quercetosum petraeae*). He explained its existence with the diversity of floristic and ecological conditions in individual associations. After the years 1958–1959, we accepted I. Horvat's thesis about two independent associations. Doubt later occurred about the possibility of the existence of the association *Lathyro-Quercetum*. Poldini (1988) doubts the independence of the association *Lathyro-Quercetum* and thinks that there are no essential floristic differences between the associations *Lathyro-Quercetum* and *Querco-Ostryetum* and that the association *Lathyro-Quercetum* does not have its own characteristic or distinguishing species and that the name of the association was already previously used for another association. He proposed that the association *Lathyro-Quercetum* be again accepted into the sub-association *Querco-Ostryetum quercetosum petraeae*, as I. Horvat did in 1938.

Th. Müller (in Oberdorfer 1992) drew attention that the name of the association *Lathyro-Quercetum* is misleading and proposed a temporary name *Genista sagitalis – Quercus petraea*. Similarly, Ž. Košir (1994) drew attention to the duplication of the name of the association. Cimperšek (2008) also touched on the problem of the naming of the association *Lathyro-Quercetum* se and decided on the name that I. Horvat had proposed in 1958: *Lathyro nigrae-Quercetum petraeae* (1938) Ht. 1958.

The main task of our discussion is to confirm the appearance of the association *Querco-Ostryetum* Ht. 1938 in Slovenia, to establish possible differences and, finally, to resolve the problem of its characteristic species in relation to similar or related continental thermophilous associations with dominant species *Ostrya carpinifolia* and *Quercus petraea*. The general finding is that the association *Querco-Ostryetum* is slightly mesophilous in Slovenia and more initial that the representatively described association in Croatia. We therefore propose that we also define the Croatian phytocoenosis with the central-east-Illyrian-Dinarid (southeast-European-Illyrian) species *Acer obtusatum*, which represents the standard form of the phytocoenosis. However, the Croatian and Slovene phytocoenoses do not essential differ in species of the order *Quercetalia pubescentis*, in which we classify the association, nor in species of the order *Prunetalia* and class *Trifolio-Geranietea*, which ecologically supplement the designation of thermophilous continental association. The similarity of the Croatian and Slovene phytocoenoses according to Sørensen's index ($\sigma = 61$) indicates their similarity and at the same time the justification of establishing a geographic variant.

Comparison of seven similar or related continental thermophilous associations of the type *Ostrya carpinifolia* or *Quercus petraea* enabled us a cogent selection of characteristic species, not only of the association *Querco-Ostryetum*, but also relative characteristic species of the association *Serratulo tinctoriae-Quercetum petraeae* (= *Lathyro nigrae-Quercetum petraeae*) and correction and supplementation of the characteristic species of the associations *Erico-Ostryetum*, *Cytisantho-Ostryetum*, *Ostryo-Fraxinetum orni* and *Rhododendro-Ostryetum*.

We were unable to pass the association *Lathyro-Quercetum* without comment. Our final decision is that the somewhat different ecological conditions of the association *Lathyro-Quercetum* influence its floristic composition, if not so much the diversity of flora, and

above all the difference of its appearance, i.e., differences of presence and cover values and that we thus satisfactorily solved the problem of the characteristic species of the association. **In order to avoid confusion in the name of the association, we propose the syntaxonomically and, at the same time, ecologically more suitable name of the association *Serratulo tinctoriae-Quercetum petraeae*. We believe that restoring the association to a subordinate position of sub-association *Querco-Ostryetum quercetosum petraeae* is not sensible.**

Use of the numerical Sørensen's method of similarity is relative. There is even greater relativity in the threshold level that is supposed to decide when associations are similar and must be considered a uniform phytocoenosis and when they are below the threshold level and should be considered independent. Perhaps methods such as the method of hierarchical accumulation or the method based on minimum increase of the sum of squares of remains or the method of main coordinates are more precise, but they are still relative. The capacity of the researcher to be able to diagnose *in situ* and decide what synsystematic rank a phytocoenosis achieves is important. Empirical assessment of a phytocoenological relevé used for an exact mathematical-numerical method is still relative. Irrespective of the mathematical-numerical method, on the basis of many years of experience we came to the conclusion that two independent associations appear in nature, *Querco pubescentis-Ostryetum carpinifoliae* and *Serratulo tinctoriae-Quercetum petraeae* (=*Lathyro nigrae-Quercetum petraeae*).

Phytocoenological Table 2 clearly shows the classification of individual associations in higher synsystematic units. The associations *Querco-Ostryetum*, *Serratulo-Quercetum* (=*Lathyro-Quercetum*), *Erico-Ostryetum, Cytisantho-Ostryetum, Ostryo-Fraxinetum orni* and *Asplenio-Quercetum* are classified in the Illyrian alliance of continental thermophilous associations *Fraxino orni-Ostryion* Tomažič 1940. The alliance *Fraxino orni-Ostryion* belongs in the order *Quercetalia pubescentis* Br.-Bl. (1931) 1932, which embraces a wider extent of phytocoenoses of the cooler Mediterranean (where deciduous dendroflora is still present), sub-Mediterranean and thermophilous continental phytocoenoses. The association *Asplenio-Quercetum* is somewhat impoverished in relation to species of the alliance *Fraxino orni-Ostryion* and order *Quercetalia pubescentis*, but for the moment it cannot be classified otherwise than in these two synsystematic units.

The most difficult to classify into a higher synsystematic unit is the association *Rhododendro-Ostryetum*. The author of the association Franz (2002), in our opinion classified it correctly into the alliance *Erico-Pinion mugo* Leibungut 1948 nom. inv. The further classification into order and class is questionnable. On the basis of the opinion of Wallnöfer (in Mucina et al. 1993), Franz (2002) classified it into the order *Erico-Pinetalia* Ht. 1959 and class *Erico-Pinetea* Ht. 1959. Zupančič (2007) believes that it belongs in the alliance *Erico-Pinion mugo* in the order *Vaccinio-Piceetalia* (Pawlowski 1928) Br.-Bl. v Br.-Bl. et al. 1939 em. K. Lund 1967 and class *Vaccinio-Piceetea* Br.-Bl. v Br.-Bl. et al. 1939 em. Zupančič (1976) 1980. We will stick with the latter classification.

Recently, Willner & Grabherr (2007) explained the appearance of continental scrub/forests of the type *Ostryetum* s. lat. differently for the region of Austria. They introduced the association *Erico-Ostryetum* Ht. 1959 as leading/bearing and included in it the associations *Ostryo-Fraxinetum orni* Aichinger 1933, *Cytisantho-Ostryetum* M. Wraber 1961 and *Rhododendro hirsuti-Ostryetum* Franz 1991, the last as the sub-association *Erico-Ostryetum rhododendretosum hirsuti*.

We agree with the opinion of M. Wraber (1960) and Accetto (oral) that the association *Erico-Ostryetum* is anthropogenically caused, with many degradational, floristic and edaphic elements. Because of its syndynamics, it is unsuitable as a leading phytocoenosis. We must take into account in this that the associations *Ostryo-Fraxinetum orni*, *Cytisatho-Ostryetum* and *Rhododendro hirsuti-Ostryetum* each have their own specific syndynamics, considerable syntaxonomic stability and are thus mutually distinguished (see Phytocoenological Table 2).

Finally, we can establish that Slovenia is rich in continental thermophilous associations, which further increases its rich biotic diversity of flora and vegetation.

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POVZETEK

5.1 UVOD

Prvi opis asociacije *Querco-Ostryetum carpinifoliae* je opis I. Horvata (1938) s predstavitvijo šestnajstih fitocenoloških popisov, med katerimi enajst popisov predstavlja osrednjo tipično obliko asociacije (*Querco-Ostryetum typicum*). Po ugotovitvah I. Horvata (1938) pripada asociacija *Querco-Ostryetum* v najširšem smislu redu *Quercetalia pubescentis* Br.-Bl. (1931) 1932 (oziroma zvezi *Quercion pubescentis-petraeae* Br.-Bl. 1931), ki ima svoje optimalno območje razširjenosti v submediteranu in na obrobju mediterana, v ugodnih razmerah pa se lahko pojavlja tudi globoko v celinskem območju. V ta red so uvrščene asociacije s številnimi rastlinskimi vrstami, ki poraščajo karbonatno in nekarbonatno matično podlago v optimalnih ekoloških razmerah, v manj ugodnih ekoloških razmerah, izven območja tega reda ali na robu njegovega areala proti kontinentalnemu območju pa se pojavljajo le na karbonatni podlagi (I. Horvat 1938).

Splošna ekološka oznaka asociacije *Querco-Ostryetum* po I. Horvatu (1938) je, da poraščа strma, apnenčasta ali dolomitna, osončena, topla pobočja z zgodnjimi pomladanskimi odjugami, na plitvih sprsteninastih tleh (mull rendzina), kjer vladajo ekstremne ekološke razmere. Navadno je to sestojno odprt termofilni gozd, panjevec, ki se fenološko pozno razvije. Šteje jo za ekstraconalno združbo.

V knjigi Vegetation Südosteuropas (I. Horvat, Glavač & Ellenberg 1974: 385–386) je dopolnjen opis asociacije *Querco-Ostryetum*. Opredeljena je kot termofilni ilirski nizki gozd ali grmišče z ilirskimi vrstami v ilirskem fitogeografskem območju, ki poraščа apnenčasta in dolomitna hribovja Slovenije, Hrvaške in Bosne. Poudarek je na nekaterih vrstah, kot so: *Peucedanum oreoselinum*, *Geranium sanguineum*, *Trifolium rubens*, *Mercurialis ovata*, *Aster amellus*, *Melittis melissophyllum*, *Tanacetum corymbosum*, *Buglossoides purpurocaerulea*, *Silene italica* ssp. *nemoralis*, *Cornus mas*, *Euonymus verrucosa*, *Quercus pubescens*, *Q. cerris*, *Ostrya carpinifolia*, *Fraxinus ornus* in *Sorbus torminalis*.

V svojih študijah I. Horvat (1958, 1959) opozarja na nove ugotovitve, predvsem na razlike med kontinentalnimi in primorskimi fitocenozami tipa *Ostryetum*, zlasti na razlike v sindinamiki fitocenoz. Postavlja vprašanje obstoja zveze kontinentalnih termofilnih asociacij tipa *Querco-Ostryetum,* v katerih ni veliko submediteranskih vrst. I. Horvat meni, da njegova nova zveza *Ostryo-Carpinion orientalis* Ht. 1954 em. 1958 zadostuje za ilirsko-jadransko območje, in sicer tako za primorske kot za kontinentalne združbe z vrstama *Quercus pubescens* in *Ostrya carpinifolia* in dodaja, da je tudi v kontinentalnih združbah prisotnih nekaj termofilnih submediteranskih vrst.

Nadalje opozarja na razdvojitev asociacije *Querco-Ostryetum* s. lat. na dve samostojni asociaciji tako, da subasociacijo *Querco-Ostryetum quercetosum petraeae* poviša v samostojno asociacijo *Lathyro nigrae-Quercetum petraeae*, subasociacija *Querco-Ostryetum typicum* pa predstavlja osnovno asociacijo *Querco* (*pubescentis*)*-Ostryetum* s. str.

Zanimiva je težnja I. Horvata (1938) po spojitvi asociacije Aichingerja (1933) *Ostryo-Fraxinetum orni* Aichinger 1933 (= *Ostrya carpinifolia-Fraxinus ornus-Association*) v njegovo asociacijo *Querco-Ostryetum* kot subasociacijo.

V Sloveniji M. Wraber (1960) sledi ideji I. Horvata in poroča o obeh asociacijah. K ekološkemu opisu asociacije *Querco-Ostryetum* dodaja, da je vegetacija bazifilno-kalcifilna na rendzinah ali protorendzinah, rastlinsko bogata in pestra združba, ki združuje mnogo submediteranskih vrst, je bogata z grmovnicami, »spominjajoč na primorsko združbo *Seslerio-Ostryetum*, mednje pa vdirajo mezofilni elementi iz gradnovo-gabrovega in bukovega gozda«. Nesprejemljiva pa je njegova teza: »Na takšnem ekološko ekstremnem rastišču se je lahko ohranila kot ostanek iz toplejše poledenele dobe.« Razvojno gledano se je vegetacija v različnih časovnih obdobjih verjetno spreminjala in bila v nekaterih primerih morda celo bolj ali manj podobna današnji. M. Wraber ugotavlja, da so njena nahajališča v Zasavju, Posotelju, Posavinju, v Polhograjskem hribovju, Zgornjem Posavju in Posočju.

Za asociacijo *Lathyro-Quercetum* M. Wraber (1960) navaja nahajališča predvsem v vzhodni Sloveniji, to je v Posotelju, na Maclju in v Halozah ter v Zasavju. Pravi, da združba uspeva na zmerno zakisanih tleh, kjer je pogosta rjava rendzina, na teh rastiščih pa so redkejše občutljive termofilne in bazične vrste, zelo redek je puhasti hrast (*Quercus pubescens*).

Zaradi sorodnosti ali podobnosti kontinentalnih gabrovčevih združb (*Ostryetum »continentale«* s. lat.) in sorodnih gradnovih združb (*Quercetum petraeae* s. lat.) v našem ožjem zahodnodinarskem prostoru, ki meji na jugovzhodno alpsko območje, smo medsebojno primerjali še naslednje asociacije: *Lathyro nigrae-Quercetum* avtorjev I. Horvata (1938), Cimperška (2008), Zupančiča & Žagarja (in situ), *Erico-Ostryetum* I. Horvata (1959), *Cytisantho-Ostryetum* M. Wraberja (1961), *Ostryo-Fraxinetum orni* Aichingerja (1933), *Rhododendro hirsuti-Ostryetum* Franza (2002) in *Asplenio adiantinigri-Quercetum* Cimperška (2008).

O termofilnih gozdovih gabrovca (*Ostrya carpinifolia*) in njim sorodnim ali podobnim združbam v jugovzhodnoevropsko-dinarskem območju so pisali še Poldini (1988), Ž. Košir (1994), Marinček et al. (2002) idr.

Naše priložnostne raziskave asociacije *Querco-Ostryetum* s. lat. v Sloveniji segajo v čas od leta 1962 do 1984, z določenimi florističnimi primerjanji in dopolnitvami pa v leto 2008. Odlašanje z dokončno študijo in objavo opravičujemo s tem, da smo se vseskozi naslanjali na bolj ali manj utemeljene študije asociacije I. Horvata (1938, 1959 in 1974 s sodelavci) in nismo čutili potrebe po potrditvi le-teh v Sloveniji. Menimo, da smo sedaj s primerjavo podobnih ali sorodnih asociacij doprinesli nova spoznanja, zlasti pri utrjevanju njihovih značilnic in razlikovalnic.

Pri fitocenoloških raziskavah smo uporabljali standardno srednjeevropsko metodo (Braun-Blanquet). Floristična nomenklatura je uporabljena po Mali flori Slovenije (Martinčič et al. 1999, 2007) in Registru flore Slovenije (Trpin & Vreš 1995). Pri življenjskih oblikah rastlin smo uporabili Raunkierjevo delitev po Poldiniju (1991) in po njem določili tudi horološke skupine geoelementov.

5.2 ASOCIACIJA *QUERCO-OSTRYETUM* Ht. 1938 v SLOVENIJI

Asociacija *Querco-Ostryetum* Ht. 1938 je v Sloveniji razširjena predvsem v predalpskem, preddinarskem, dinarskem območju in na obrobju subpanonskega fitogeografskega območja. V alpskem fitogeografskem območju jo zamenjujeta asociaciji *Ostryo-Fraxinetum orni* in *Cytisantho-Ostryetum*. Na območju submediteranskega območja pa jo nadomeščata asociaciji *Seslerio-Ostryetum* in *Amelanchiero-Ostryetum*.

5.2.1 EKOLOŠKE IN FLORISTIČNE RAZMERE ASOCIACIJE

5.2.1.1 Ekološke razmere

Po podatkih Atlasa klime SFRJ (1969) za obdobje 1931–1960 je na območju asociacije *Querco-Ostryetum* zabeležena srednja letna količina padavin od 1000 do 1500 mm, srednja letna temperatura zraka pa 10 °C. Na območju asociacije so vremenske razmere na splošno ugodne. Ekstremna rastišča, to so zelo strma, topla pobočja, izpostavljena pripeki, bolj ali manj za vodo prepustna karbonatna matična podlaga ter plitva in sušna tla, pa ustvarjajo neugodne življenjske razmere, ki jih asociacija *Querco-Ostryetum* obvladuje bolj ali manj uspešno.

Rastišče asociacije *Querco-Ostryetum* gradijo karbonatne kamnine, pogosto dolomiti, manj apnenci. Skladno z našimi fitocenološkimi popisi v Fitocenološki tabeli 1 smo geološko podlago določili takole. Na območju Škocjana je kredni temnosivi apnenec, v Zaplani in Borovnici je triadni glavni dolomit, na Boču in v Podčetrtku je triadni masivni zrnati ali samo masivni dolomit, na Kočevskem je zgornjekredni sivi gosti apnenec z vložki zrnatega dolomita, na Šmarni gori je triadni neplastoviti dolomit ter na širšem območju Zasavja se triadni sivi dolomit menjava z gomolji roženca, s plastmi laporja ali debelozrnatim dolomitom oziroma triadnim dolomitom. Karbonatna podlaga je sicer ugodna za rast, vendar so na teh ekstremnih rastiščih tla plitva in sušna. Večinoma so to plitve rendzine ali celo protorendzine, zelo redke so plitve rjave rendzine.

Pri obravnavi ekoloških razmer upoštevamo tudi izsledke palinoloških raziskav, ki nam pričajo o pojavljanju rastlinskih vrst v preteklosti. Naselitve termofilnih mediteranskih in submediteranskih ter ilirsko-dinarskih vrst v notranjost Slovenije je bila najizrazitejša v toplem obdobju holocena. Vrsta *Ostrya carpinifolia* se je začela pojavljati, ko so se izboljšale klimatske razmere po zadnji poledenitvi. Culiberg (1991) ugotavlja, da je izboljšanje klimatskih razmer v böllinškem in še bolj klimatsko ugodnejšem alleröd skem interstadialu omogočilo razvoj pestrejše vegetacije (npr. *Quercus*, *Corylus*, *Fagus*). V diagramih Culibergove zasledimo pojavljanje vrste *Ostrya carpinifolia* na Jezercih (Jelovica) že v globini profila 440 cm, na Ljubljanskem barju ob Malenščici v globini profila 190 cm ter Logu v globini 990–930 cm in 390–350 cm. Iz pelodnih diagramov Šercl ja (1996) na Ledinah in Jezercih na Jelovici, Šijcu, Blejskem jezeru, na Pokljuki, Gorjancih in v Kopru je razvidno, da se vrsta *Ostrya carpinifolia* pojavlja od srede do konca boreala, ki je bil najtoplejši in suh, ter od konca atlantika naprej, ki je bil topel in vlažen, prek subboreala, ki je bil topel in suh, do današnjega subatlantika, ki je vlažen in hladnejši. V kasnem glacialu se je začela otoplitev, ko se pojavljajo vrste *Fagus*, ***Quercus***, *Ulmus*, *Tilia*, ***Ostrya***, *Corylus* in celo *Abies* (Šercelj 1996). To drevje je preživelo v ekoloških oziroma refugialnih nišah, ki so bile toplejše od okolice oziroma v katerih je temperatura nihala. Iz teh niš se je nato v ugodnih klimatskih razmerah gozdna oziroma topoljubnejša vegetacija širila (Šercelj 1996). Zanimiv je Šercljev (1970) pelodni diagram iz Bovca, ki za drugi würmski interstadial (iz obdobja pred 59.000 in 53.000 leti) nakazuje povprečno letno temperaturo le za 2 °C manjšo kot danes. V celotnem 180 cm visokem palinološkem profilu se pojavlja vrsta *Ostrya carpinifolia* z manjšimi presledki v globini 80 cm in med 60 in 50 cm. Glede na gornje ugotovitve lahko sklenemo z mislijo Culibergove, Šercl ja & Zupančič a (1981): »*Ostrya* je bila že v borealu pionir na prisojnih in toplih pobočjih, v najmlajšem času pa je spet dosegla na istih pobočjih večjo razširjenost, tokrat zaradi človekovega delovanja.« To misel moramo dopolniti, da se je vrsta *Ostrya carpinifolia* občasno pojavljala tudi že prej v kasnem glacialu (bölling, alleröd, würm).

5.2.1.2 Biološki spekter

V kakšnem življenjskem okolju uspeva asociacija *Querco-Ostryetum*, nam kaže razmerje med življenjskimi (biološkimi) oblikami rastlin, ki gradijo združbo. Skromnost rastišča zaradi ekstremnih življenjskih razmer nam potrjuje biološki spekter asociacije s skoraj polovično prisotnostjo hemikriptofitov, med katerimi je največ steblastih. Zaradi neugodnih življenjskih razmer je večina fanerofitov ali šopaste in grmovne oblike ali pa so vzpenjavke; teh je sedmina od vseh vrst v združbi ali več kot dve tretjini med fanerofiti. Vsi ti ne dosegajo minimalne višine dreves (nad 5 m). Malo je drevesnih vrst, ki pripadajo steblastim fanerofitom, le-ti gradijo nižjo drevesno plast in dosegajo največ 10 m višine, nekateri pa se razvijejo le kot grmi. Večina grmičastih fanerofitov potrjuje težje življenjske razmere združbe. Nižja drevesna plast dosega večinoma pokrovnost okoli 20 %, tu in tam do 70 %. Tabela 1 prikazuje razmerja med življenjskimi oblikami rastlin v asociaciji *Querco-Ostryetum* v Sloveniji.

Od biološkega spektra zmernega (t.i. »normalnega«) pasu se biološki spekter asociacije *Querco-Ostryetum* razlikuje v večjem odstotku fanerofitov, hamefitov ter v manjšem odstotku geofitov in terofitov, uravnotežen je odstotek hemikriptofitov. Biološki spekter asociacije kaže, da bi jo lahko uvrstili med sintaksone z življenjskimi razmerami, ki vladajo v zmernem in deloma mediteranskem pasu. Majhen odstotek terofitov kaže na življenjske razmere podobne tistim v arktičnem pasu, medtem ko višji odstotek fanerofitov nakazuje približevanje k življenjskim razmeram tropskega pasu. Biološki spekter asociacije *Querco-Ostryetum* potrjuje ekstremne življenjske razmere združbe oziroma rastišča, to pa so pripeka, sušnost rastišča v vegetacijski dobi, nizke temperature v zimskem obdobju, možnost poznih pomladanskih in zgodnjih jesenskih pozeb ter zelo plitva tla (rendzine in protorendzine).

5.2.1.3 Horološke skupine

Analiza horoloških skupin kaže, da je v asociaciji *Querco-Ostryetum* prisotnih največ hladnoljubnih geoelementov, okoli tri petine, dve petini je topoljubnih geoelementov. To razmerje potrjuje ugotovitve prejšnje analize biološkega spektra. Asociacija *Querco-Ostryetum* uspeva predvsem v življenjskih pogojih, ki jih nudi zmerni pas, vendar na ekstremnih rastiščih, kjer so življenjske razmere deloma podobne kot v mediteranskemu pasu. Od hladnoljubnih geoelementov so najpogostejši evropski, nato evroazijski in evrosibirski geoelementi, ostali so s svojo prisotnostjo zanemarljivi, vendar npr. cirkumborealni in paleotemperatni geoelementi, čeprav maloštevilni, nakazujejo neugodne hladne razmere, ki omogočajo hladnoljubnim vrstam rast v tej združbi. V skupini topoljubnih geoelementov prevladujejo mediteransko-montanski in pontski geoelementi, ki niso ekstremno topoljubni in se v določenih toplotno izpostavljenih rastiščih prilagodijo razmeram celinskega zmernega pasu in bolj ali manj zadovoljivo uspevajo.

Mediteranski vpliv bolj poudarjajo sicer maloštevilni mediteransko-atlantski, mediteransko-pontski, jugovzhodnoevropski ter južnoilirski in severnoilirski geoelementi, ki so našli zatočišče v ekstremno toplih kotičkih asociacije *Querco-Ostryetum*. Podrobnejšo analizo horoloških skupin nam kaže Tabela 2.

5.2.1.4 Fitocenološke skupine

Po pričakovanju so najbolj zastopane vrste razreda *Querco-Fagetea* s. lat., v katerem je največ (petino) vrst iz reda *Quercetalia pubescentis* s. lat., ki daje asociaciji *Querco-Ostryetum* sinsistematski in sinekološki pečat toploljubne združbe. K toploljubni oznaki združbe v skupini razreda *Querco-Fagetea* s. lat. dodajajo še vrste reda *Prunetalia* s. lat. in zveze *Carpinion* s. lat. Od gozdnih razredov vrste razreda *Erico-Pinetea* s. lat. kažejo toploljubnost, odprtost in degradacijo rastišča. K tej ekološki oznaki štejemo še negozdne vrste razreda *Festuco-Brometea* s. lat., *Trifolio-Geranietea* s. lat., *Molinio-Arrhenatheretea* s. lat. s povprečno desetino udeležbe vrst vsakega razreda in še vrste razreda *Sedo-Scleranthetea* s. lat. s precej manjšim odstotkom. Zanimivo je pojavljanje vrst reda *Scorzoneretalia villosae* s. lat., ki je tipičen za negozdno (traviščno) vegetacijo mediterana. Kljub majhni prisotnosti teh vrst je poudarjena toploljubnost in odprtost rastišča asociacije *Querco-Ostryetum* in vpliv vdora toplotnega vala iz submediterana na nekatera celinska območja (npr. Šmarna gora, Zasavje s Posavjem, Kolpska dolina idr.). Slabo šestino je fagetalnih vrst iz reda *Fagetalia* in razreda *Querco-Fagetea*, ki kljub vsemu v tej ekstremni toploljubni združbi najdejo mesto za svojo naselitev. Večina jih prenaša sušnost in toploto oziroma so prilagojene tem ekološkim razmeram, med njimi so nekatere, ki so bolj ali manj toploljubne (npr. *Acer platanoides, Asarum europaeum, Cephalanthera damasonium*, *C. rubra, Clematis vitalba*, *Convallaria majalis, Digitalis grandiflora, Epipactis helleborine, Lonicera xylosteum, Melampyrum nemorosum* subsp. *nemorosum, Primula vulgaris* idr.). Med fagetalnimi vrstami imajo posebno mesto jugovzhodnoevropsko-ilirske vrste ilirske zveze *Aremonio-Fagion* (*Anemone trifolia, Cyclamen purpurascens, Epimedium alpinum, Hacquetia epipactis*, *Helleborus niger* subps. *niger, Knautia drymeia* subsp. *drymeia*), ki še z jugovzhodnoevropsko-ilirskimi vrstami *Aposeris foetida, Genista januensis*, *Chamaecytisus purpureus*, *Scabiosa triandra* (=*S. gramuntia*), *Dianthus monspessulanus* in relativnimi endemiti *Galium laevigatum, Lilium carniolicum* in *Scabiosa hladnikiana* določajo fitogeografski položaj asociacije *Querco-Ostryetum*. Uvrščamo jo v ilirsko provinco evrosibirsko-severnoameriške regije. Pičla prisotnost vrst razreda *Seslerietea* kaže na revno, suho karbonatno rastišče, ki ustreza heliofilnim in termofilnim vrstam gorskih travišč. Analiza fitocenoloških skupin potrjuje dosedaj ugotovljene ekološke razmere asociacije *Querco-Ostryetum*. Nazorna razmerja med fitocenološkimi skupinami nam kaže Tabela 3.

5.2.1.5 Flora in njene posebnosti

Obravnavana asociacija *Querco-Ostryetum* je biotsko zelo raznolika, saj vključuje okoli 180 različnih taksonov višjih rastlin (Fitocenološka tabela 1), kar predstavlja 5 odstotkov praprotnic in semenovk v Sloveniji. Med njimi najdemo 3 znamenite (Wraber T. 1990), 14 zavarovanih slovenskih vrst (Skoberne 2007) ter 6 vrst z Rdečega seznama Republike Slovenije (UL RS 82/2002); skupno 18 (0,52 % vseh slovenskih oz. desetina vseh prisotnih vrst združbe). Vrstno najštevilčnejše med njimi so kukavičevke, katerih večina vrst je zaradi ogroženosti tako na seznamu zavarovanih kot tudi na slovenskem rdečem seznamu. Invazivnih in potencialno invazivnih vrst v obravnavanih asociacijah nismo zasledili (Richardson 2000, Jogan 2007). Relativno velik delež zavarovanih in ogroženih vrst slovenske flore ter odsotnost invazivk nakazuje izjemen naravovarstveni pomen združbe v Sloveniji in hkrati v Evropi, vendar tudi relativno »občutljivost« v ekološkem (spremembe življenjskih razmer) ter antropogenem smislu (vpliv človekovih posegov). Odsotnost tujerodnih oziroma invazivnih vrst hkrati nakazuje stabilnost njene floristične sestave v smislu avtohtonosti, kar prav tako povečuje njen naravovarstveni pomen in daje svojstven pečat biotski raznolikosti obravnavane združbe. Prisotnost »znamenitih« slovenskih rastlin v obravnavani asociaciji sicer nima posebne vrednosti iz naravovarstvenega vidika, dopolnjuje pa pomen biotske raznolikosti v smislu kulturno zgodovinskega (zgodovinsko-botaničnega) vidika.

Dodatno se nam je zdelo utemeljeno predstaviti še naslednje ugotovitve. Na območju uspevanja asociacije *Querco-Ostryetum* na Šmarnogorski Grmadi so v podrasti (zeliščni plasti združbe) prisotne poleg v Fitocenološki tabeli 1 navedenih še naslednje vrste: *Asperula tinctoria*, *Dianthus sylvestris* (zavarovana in znamenita), *Grafia golaka* (znamenita) in *Scrophularia scopolii* (znamenita). Prve od naštetih vrst sicer ne najdemo na katerem od zgoraj navedenih seznamov oziroma virov, vendar glede na maloštevilnost njenih poznanih nahajališč v Sloveniji (Jogan et al. 2001), zasluži vso pozornost. Njeno nahajališče na območju asociacije *Querco-Ostryetum* na Šmarnogorski Grmadi leži v kvadrantu 9852/4

srednjeevropskega floističnega kartiranja (oziroma v UTM vkvadrantu 33T VM50 po metodi evropskega floističnega kartiranja) in dopolnjuje karto razširjenosti (slika 1) vrste v Sloveniji (Jogan et al. 2001). Podobno velja za vrsto *Aster linosyris* (slika 2). Pojavljanje obeh navedenih vrst na območju Šmarne gore (širše gledano) je že bilo dokumentirano v starejših virih (Fleischmann 1844, Petauer et al. 1977, Šuštar 1998, idr.), vendar pri pripravi arealne karte (Jogan et al. 2001) spregledano. V obdobju raziskave smo vrsti dokumentirali s herbarijskimi primerki, shranjenimi v delovnem herbariju Biološkega inštituta ZRC SAZU. Za prikaz razširjenosti vrst je novo tudi nahajališče Scopolijeve črnobine (*Scrophularia scopolii*; slika 3), medtem ko sta kranjska selivka (*Grafia golaka*) in divji klinček (*Dianthus sylvestris*) že označena za kvadrant 9852/4 na objavljenih arealnih kartah (Jogan & al. 2001).

5.2.2 UTEMELJITEV ZNAČILNIC ASOCIACIJE

I. Horvat (1938) ni natančno določil značilnic za asociacijo *Querco-Ostryetum*. Opozoril je, da se nekatere vrste v asociaciji pojavljajo stalno, v velikem številu in lahko sklepamo, da so ozko vezane na asociacijo. Te vrste so »*Corylus avellana*, *Lonicera caprifolium*, *Staphylea pinnata*, *Prunus avium, Acer campestre, Lithospermum purpureo-caeruleum, Garanium sanguineum*, *Trifolium rubens, Aster amellus*« in še mnoge druge, ki jih je navedel kot značilnice asociacije in zveze v fitocenološki tabeli. Tudi pozneje značilnice asociacije niso bile natančneje določene (I. Horvat, Glavač & Ellenberg 1974). Navajajo le vrste, ki so najbolj vezane na asociacijo in dodajajo še vrste »*Peucedanum oreoselinum*, *Mercurialis ovata*, *Melittis melissophyllum*, *Tanacetum corymbosum* in *Silene italica* subsp. *nemoralis*« (ibid 385).

M. Wraber (1960) sprejema Horvatov izbor značilnic združbe tudi za Slovenijo, ga celo razširja ter pravi: »Združba je bogata z značilnicami (*Quercus pubescens*, *Ostrya carpinifolia*, *Fraxinus ornus*, *Cornus mas*, *Amelanchier ovalis*, *Cotinus coggygria*, *Viburnum lantana*, *Geranium sanguineum*, *Polygonatum odoratum*, *Peucedanum cervaria*, *Trifolium rubens*, *Lithospermum purpureo-coeruleum*, *Anthericum ramosum*, *Cynanchum vincetoxicum*, *Mercurialis ovata*, *Orchis purpurea*, *Lactuca perennis* idr.).«

Kritični pregled in primerjava med podobnimi ali sorodnimi asociacijami z upoštevanjem delitve asociacije *Querco-Ostryetum* na dve oziroma tri samostojne asociacije nam je omogočil trdnejšo postavitev značilnic asociacije *Querco-Ostryetum* s. str. (Fitocenološka tabela 2). Med izbranimi značilnicami so bile potrjene predvidene značilnice I. Horvata iz leta 1938, te so *Geranium sanguineum*, *Trifolium rubens* in *Aster amellus*, ter iz leta 1974 *Mercurialis ovata*. K tem značilnicam smo dodali še vrste *Peucedanum cervaria*, *Inula hirta* in *Quer-*

Tabela 1: Biološki spekter asociacije Querco-Ostryetum

Življenjska oblika	**Število**	**%**
FANEROFITI (Phanerophyta)	**50**	**23,2**
Steblasti (P. scap.)	18	8,3
Šopasti (P. caesp.)	20	9,3
Vzpenjalni ali lijane (P. scand.)	3	1,4
Nanofanerofiti (NP)	9	4,2
HAMEFITI (Chamaephyta)	**28**	**13,0**
Grmičasti (Ch. suffr.)	19	8,8
Plazeči (Ch. rept.)	2	0,9
Sukulentni (C. succ.)	1	0,5
Sadežni (Ch. frut.)	3	1,4
Mahovni (B. Ch.)	3	1,4
HEMIKRIPTOFITI (Hemicriptophyta)	**100**	**46,3**
Steblasti (H. scap.)	70	32,4
Rozetni (H. ros.)	11	5,1
Šopasti (H. caesp.)	12	5,5
Plazeči (H. rept.)	6	2,8
Dvoletni (H. bien.)	1	0,5
GEOFITI (Geophyta)	**33**	**15,2**
s koreniko (G. rhiz)	25	11,5
z gomolji (G. bulb.)	7	3,2
s čebulico (G. rad.)	1	0,5
TEROFITI (Therophyta)	**2**	**0,9**
Steblasti (T. scap.)	2	0,9
NEOPREDELJENA BIOLOŠKA OBLIKA	**3**	**1,4**
SKUPAJ	**216**	**100,0**

cus pubescens. Naštete značilnice zelo dobro ekološko označujejo asociacijo, torej njen termofilno-heliofilni karakter, odprtost sestoja in revnost rastišča, ki mu botrujejo zelo strma in sušna pobočja. Štiri značilnice *Quercus pubescens*, *Peucedanum cervaria*, *Trifolium rubens* in *Mercurialis ovata* uvrščajo (ob sočasnem upoštevanju ekoloških razmer) asociacijo *Querco-Ostryetum* še sinsistematsko v red *Quercetalia pubescentis*, kar potrjujejo tudi številne druge, v združbi prisotne značilnice tega reda.

5.2.2.1 Ekologija značilnic

Ekološko oznako značilnic smo povzeli po Oberdoferju (1979) in jo po potrebi dopolnili na osnovi naših terenskih izkušenj.

Vrsta ***Quercus pubescens* Willd**. raste na suhih in toplih pobočjih, pogosto v grmiščih hrastov, gabrovca in malega jesena. Prednost daje apnenčasti geološki podlagi, dobimo jo na dolomitu in v obmorskem območju na flišu. Kamnita ali ilovnata tla so navadno bogata s hranili in bazami, srednje globoka, z nevtralno blagim humusnim horizontom. Vrsta je heliofilna in korenini globoko. Uvrščamo jo med značilnice reda *Quercetalia pubescentis*.

Vrsto ***Geranium sanguineum* L**. najdemo na robovih ali v suhih grmiščih in gozdovih heliofilnih hrastovih in borovih gozdov na eksponiranih pobočjih. Poraščа poletno topla, suha, slaba, največkrat apnenčasta tla, ki so sicer bogata z bazami, in kjer je rahel, zmerno kisel, blag humus. Tla so lahko na kamnitem grušču ali apnenčastih peskih, tudi ilovnata ali puhlična, včasih globoka. Značilne za vrsto so plazeče korenine. Je toploljubna in svetloljubna (polsečna) vrsta, ki jo uvrščamo med značilnice zveze *Geranion sanguinei*, nekateri avtorji pa zvez *Quercion pubescentis* ali *Berberidion*.

Vrsta ***Peucedanum cervaria* (L.) Lap.** naseljuje grmišča, njihove robove, mejice (žive meje) ter svetloljubne hrastove in borove gozdove. Prednost daje poletno toplim, srednje globokim ilovnatim, puhličnim, s hranili in bazami zmerno bogatim tlem, včasih tudi na apnenčastih peskih. Uvrščamo jo med značilnice zveze *Geranion sanguinei*, nekateri avtorji tudi kot značilnico zveze *Quercion pubescentis* ali celo zveze *Mesobromion*.

Vrsta ***Trifolium rubens* L**. je pogosta v grmiščih, mejicah, v suholjubnih vrzelastih hrastovih (tudi borovih) gozdovih in na njihovih robovih. Preferira topla, suha, plitva do globoka, ilovnata ali puhlična, z bazami bogata tla, na katerih je blag, rahel humus. Je svetloljubna do polsenčna vrsta, ki globoko korenini. Uvrščamo jo med značilnice zveze *Quercion pubescentis*.

Vrsta ***Aster amellus* L.** uspeva v toploljubnih grmiščih in gozdovih ali na njihovih robovih, pogosta je ob mejah svetloljubnih borovih gozdov ali na suhih pašnikih. Poraščа poletno topla, zmerno suha, srednje globoka do globoka, največkrat z apnencem bogata tla z nevtralnim, blagim, rahlim humusom. Je značilnica razreda *Festuco-Brometea*, nekateri avtorji jo uvrščajo tudi med značilnice zveze *Geranion sanguinei*. Prištevamo jo med svetloljubne do polsenčne vrste.

Vrsta ***Mercurialis ovata* Sternb. & Hoppe** se pojavlja v hrastovih, hrastovo-borovih, toploljubnih bukovih gozdovih in toploljubnih grmiščih na zmerno suhih, kamnitih, ilovnato-meljastih, bolj ali manj s hranili ali bazami bogatih tleh z rahlim, blagim humusom. Je pol-

Tabela 2: Horološke skupine v asociaciji Querco-Ostryetum

GEOELEMENTI	VSI GEOELEMENTI		TOPLOLJUBNI		HLADNOLJUBNI	
	št.	v %	št.	v %	št.	v %
Evromediteranski	15	6,9	15	6,9		
Mediteransko-montanski	23	10,7	23	10,7		
Mediteransko-atlantski	3	1,4	3	1,4		
Mediteransko-pontski	5	2,3	5	2,3		
Pontski	22	10,2	22	10,2		
Jugovzhodnoevropski	9	4,2	9	4,2		
Južnoilirski	4	1,8	4	1,8		
Severnoilirski	4	1,8	4	1,8		
Evropski	49	22,7			49	22,7
Evroazijski	30	13,9			30	13,9
Evrosibirski	23	10,7			23	10,7
Paleotemperatni	9	4,2			9	4,2
Cirkumborealni	7	3,2			7	3,2
Kozmopoliti	2	0,9			2	0,9
Alpski	2	0,9			2	0,9
Alpsko-karpatski	2	0,9			2	0,9
Vzhodnoalpski	1	0,5			1	0,5
Neopredeljene vrste	6	2,8				
SKUPAJ	**216**	**100,0**	**85**	**39,3**	**125**	**57,9**

senčna vrsta. Evropski avtorji jo uvrščajo med značilnice zveze *Quercion pubescentis*. Tomažič (1940) jo ima za značilnico zveze *Fraxino orni-Ostryion* na območju jugovzhodnoalpsko-dinarskega prostora. Tomažičeva umestitev je po našem mnenju pravilna.

Vrsta ***Inula hirta*** **L**. raste v svetloljubnih hrastovih in borovih ter drugih topoloIjubnih vrzelastih gozdovih, v grmiščih in na robovih gozdov in grmišč. Tla njenih rastišč so po navadi zmerno poletno toplo suha, globoka, nevtralna, apnenčasta, ilovnata ali glinasta z rahlim humusom. Na območju (sub-)mediterana raste tudi na flišu. Zanjo so značilne plazeče korenine. Je polsenčna do svetloljubna rastlina. Uvrščamo jo med značilnice zveze *Geranion sanguinei*, nekateri avtorji pa kot značilnico reda *Quercetalia pubescentis* ali celo zveze *Festucion valesiacae*.

Iz gornje analize ekoloških oznak značilnic za asociacijo *Querco-Ostryetum* vidimo, da so si ekološko zelo podobne oziroma sorodne. Vse poseljujejo rastišča topoloIjubnih gozdov in grmišč ali vrzelastih gozdov, večinoma hrastovih in borovih gozdov na karbonatnih kamninah. V toplejših (mediteranskih) območjih rastejo tudi na drugih kamninah, npr. pri nas na flišu. Tla so navadno kamnita, gruščnata, peščena, puhlična, ilovnata, suha, nevtralne reakcije z blagim, rahlim humusom. Večinoma so svetloljubne do polsenčne vrste. Sintaksonomsko so uvrščene večinoma v skupino značilnic zveze *Quercion pubescentis* oziroma reda *Quercetalia pubescentis* ali negozdnih sinsistematskih enot, ki so ekološko skladne z redom *Quercetalia pubescentis*.

Lektotip asociacije je popis 11 iz I. Horvatove fitocenološke tabele 1 (I. Horvat 1938, križaljka br. 1).

5.2.2.2 Značilna kombinacija in sinsistematska uvrstitev asociacije

Naredili smo dve primerjavi značilne kombinacije vrst (Tabela 4), in sicer na osnovi naše analitične Fitocenološke tabele 1 ter sintezne Fitocenološke tabele 2 z upoštevanjem še tabele I. Horvata (stolpca 1 in 2). Prva in druga analiza kažeta na prevlado vrst razreda *Querco-Fagetea* nad drugimi sinsistematskimi enotami. Če razčlenimo razred *Querco-Fagetea* na nižje sinsistematske enote, vidimo, da vrste reda *Quercetalia pubescentis* absolutno prevladujejo nad vrstami drugih sinsistematskih enot. Precejšnja je zastopanost vrst iz reda *Prunetalia*. Vrste reda *Fagetalia* so v analizi značilne kombinacije vrst podrejene, kar morda ni najbolj razvidno v analitični Fitocenološki tabeli 1, je pa razvidno v sintezni Fitocenološki tabeli 2. Nekoliko izstopajo vrste redov *Trifolio-Geranietea* in *Festuco-Brometea*. Izbrana značilna kombinacija vrst potrjuje sinsistematsko opredelitev in ekološko oznako asociacije *Querco-Ostryetum,* kar je razvidno iz analitične in sintezne fitocenološke tabele. Asociacija *Querco-Ostryetum* je pravilno uvrščena v red *Quercetalia pubescentis* Br.-Bl. (1931) 1932 in v ilirsko zvezo *Fraxino orni-Ostryion* Tomažič 1940. Uvrstitev asociacije *Querco-Ostryetum* v Tomažičevo ilirsko zvezo *Fraxino orni-Ostryion* utemeljujemo tudi z njenim fitogeografskim položajem v ilirski florni provinci, ki je podprta s prisotnostjo nekaterih jugovzhodnoevropsko-ilirskih vrst, navedenih v Fitocenoloških tabelah 1 in 2 ter v poglavju 5.2.1.4 Fitocenološke skupine (str. 151).

Sinsistematska delitev v analitični (Fitocenološka tabela 1) in sintezni tabeli (Fitocenološka tabela 2; stolp-

Tabela 3: Fitocenološke skupine v asociaciji Querco-Ostryetum

FITOCENOLOŠKE	QUERCO-OSTRYETUM		QUERCO-FAGETEA	
SKUPINE	št.	%	št.	%
Querco-Fagetea s. lat.	104*	48,1*		
Quercetalia pubescentis			40	18,5
Prunetalia			11	5,1
Aremonio-Fagion			6	2,8
Fagetalia sylvaticae			22	10,2
Quercetalia roboris-petraeae			4	1,8
Querco-Fagetea s. str.			21	9,7
Erico-Pinetea	19	8,8		
Vaccinio-Piceetea	5	2,3		
Betulo-Adenostyletea (=Mulgedio-Aconitetea)	2	0,9		
Scorzoneretalia villosae	7	3,2		
Trifolio-Geranietea	17	7,9		
Nardo-Callunetea	2	0,9		
Seslerietea	5	2,3		
Festuco-Brometea	25	11,6		
Sedo-Scleranthetea	6	2,8		
Molinio-Arrhenatheretea	14	6,5		
Asplenietea trichomanis	1	0,5		
Ostale vrste	9	4,2		
SKUPAJ	216	100,0	104*	48,1*

ca 1 in 2) ter značilna kombinacija vrst ne potrjujejo opredelitve asociacije I. Horvata *Querco-Ostryetum* v zvezo *Ostryo-Carpinion orientalis* Ht. (1954) 1958. Iz te zveze je slabo zastopana le vrsta *Asparagus tenuifolius*. Pri višji sinsistematski uvrstitvi asociacije *Querco-Ostryetum* smo upoštevali zvezo *Fraxino orni-Ostryion* Tomažič (1940), ki združuje kontinentalne termofilne listopadne združbe in je po Tomažiču pravilno uvrščena v red *Quercetalia pubescentis*. I. Horvat (1954, 1958) je Tomažičevo zvezo *Fraxino orni-Ostryion* nepravilno združil v svojo zvezo *Orneto-Ericion* Ht. 1958 (=*Fraxino orni-Pinion nigrae-sylvestris* /Ht. 1953/ Zupančič 2007),

Tabela 4: Značilna kombinacija vrst v asociaciji Querco-Ostryetum

Zveza – red – razred	**Vrste v fitocen. tabeli 1**	**Vrste v fitocen. tabeli 2**
FRAXINO ORNI-OSTRYION	*Fraxinus ornus*	*Fraxinus ornus*
	Ostrya carpinifolia	*Ostrya carpinifolia*
	*Mercurialis ovata **	*Mercurialis ovata**
QUERCION ROBORIS-PETRAEAE		*Trifolium rubens**
		Buglossoides purpurocaerulea
		Tamus communis
QUERCETALIA PUBESCENTIS	*Melittis melissophyllum*	*Melittis melissophyllum*
	Sorbus aria II	*Sorbus aria II*
	Peucedanum oreoselinum	*Peucedanum oreoselinum*
	*Quercus pubescens**	*Quercus pubescens**
	Rhamnus catharticus	*Rhamnus catharticus*
	Viola hirta	*Viola hirta*
	Dictamnus albus	*Dictamnus albus*
	Polygonatum odoratum	*Polygonatum odoratum*
		Tanacetum corymbosum
		*Peucedanum cervaria**
		Lathyrus niger
		Campanula persicifolia
		Sorbus torminalis II
PRUNETALIA SPINOSAE	*Viburnum lantana*	*Viburnum lantana*
	Crataegus monogyna	*Crataegus monogyna*
	Cornus mas	*Cornus mas*
		Cornus sanguinea
		Juniperus communis
		Berberis vulgaris
CARPINION		*Pyrus pyraster II*
AREMONIO-FAGION	*Cyclamen purpurascens*	*Cyclamen purpurascens*
FAGETALIA SYLVATICAE	*Primula vulgaris*	*Primula vulgaris*
		Symphytum tuberosum
QUERCETALIA ROBORIS-PETRAEAE		*Galium lucidum*
ERICO-PINETEA	*Buphthalmum salicifolium*	*Buphthalmum salicifolium*
	Chamaecytisus hirsutus	*Chamaecytisus hirsutus*
	Genista januensis	*Genista januensis*
TRIFOLIO-GERANIETEA	*Vincetoxicum hirundinaria*	*Vincetoxicum hirundinaria*
	Anthericum ramosum	*Anthericum ramosum*
	*Geranium sanguineum**	*Geranium sanguineum**
	Dorycnium germanicum	*Dorycnium germanicum*
		Calamintha clinopodium
SESLERIETEA	*Sesleria albicans*	*Sesleria albicans*
FESTUCO-BROMETEA	*Teucrium chamaedrys*	*Teucrium chamaedrys*
	Carex flacca	*Carex flacca*
	Brachypodium rupestris	*Brachypodium rupestris*
	Euphorbia cyparissias	*Euphorbia cyparissias*
	*Aster amellus**	*Aster amellus**
		Hypochoeris maculata
		Silene italica
MOLINIO-ARRHENATHERETEA		*Serratula tinctoria*
		Veronica chamaedrys
		Dactylis glomerata
OSTALA VRSTA		*Rosa sp.*
** Značilnice asociacije Querco-Ostryetum*		

ki vključuje borove gozdove dinarskega območja (Zupančič 2007). V Sloveniji in na Hrvaškem so na območju razširjenosti asociacije *Querco-Ostryetum* prisotne štiri vrste zahodnoevropske zveze *Quercion pubescentis* Br.-Bl. 1931, ki pa tudi ne zadoščajo za opredelitev asociacije v to zvezo.

Vrzelasti sklop sestoja, heliofilnost in termofilnost asociacije *Querco-Ostryetum* potrjujejo izbor v značilno kombinacijo vrst tudi nekaterih značilnic iz razredov *Trifolio-Geranietea* in *Festuco-Brometea*, ki sta skladna z redom *Quercetalia pubescentis*.

Značilna kombinacija vrst potrjuje ustreznost izbire značilnic asociacije *Querco-Ostryetum*, saj je od sedmih prisotnih kar šest značilnic asociacije v značilni kombinaciji.

5.2.3 TIPOLOŠKA ČLENITEV ASOCIACIJE

Asociacija *Querco-Ostryetum* se zaradi ekoloških razmer in antropozoogenih vplivov deli vsaj na tri subasociacije: – *genistetosum januensis*, – *cotonoasteretosum tomentosae* in –*chamaecytisetosum purpureae*. Vprašanje je četrta subasociacija – *quercetosum petraeae*, ki jo je I. Horvat (1958, 1959) povzdignil v rang samostojne asociacije *Lathyro nigrae-Quercetum petraeae* Ht. (1938) 1958 in bo predmet razprave v poglavju 5.2.5. Vse subasociacije so glede zastopanosti vrst posameznih sinsistematskih vrst bolj ali manj uravnotežene. Nikjer izrazito ne izstopajo vrste teh ali onih sinsistematskih enot, zabeleženih v Fitocenološki tabeli 1.

5.2.3.1 Subasociacija *Querco-Ostryetum genistetosum januensis* subass. nova

Subasociacija *Querco-Ostryetum genistetosum januensis* subass. nova je najbolj razširjena. Najpogosteje se pojavlja na strmih toplih pobočjih Zasavja in Posavja. Lahko bi jo opredelili kot tipično oziroma osrednjo subasociacijo, kjer so relativno najugodnejše ekološke razmere, vendar so tudi te razmeroma slabe. Izbrane razlikovalnice *Genista januensis* Vis., *Clematis recta* L., *Allium pulchellum* G. Don, *Campanula persicifolia* L., *Scabiosa triandra* L. (=*S. gramuntia* L.) in *Dianthus monspessulanus* L. dobro označujejo rastišče, saj uspevajo v toploljubnih grmiščih in gozdovih, v presvetljenih, vrzelastih gozdovih in grmiščih ali ob robovih gozdov in grmišč. Te razlikovalnice poraščajo poletno topla kamnita ali peščena bolj ali manj s hranili in apnencem bogata tla z rahlim humusom. Vse so toploljubne, svetloljubne ali polsenčne vrste (Oberdorfer 1979). Kljub njihovi različni sinsistematski pripadnosti se zaradi termofilnosti ali heliofilnosti rade pojavljajo v združbah, ki pripadajo redu *Quercetalia pubescentis* ali razredom *Trifolio-Geranietea, Sedo-Scleranthetea, Festuco-Brometea* ipd. **Holotip subasociacije je popis 1 v Fitocenološki tabeli 1.**

5.2.3.2 Subasociacija *Querco-Ostryetum cotonoasteretosum tomentosae* subass. nova

Subasociacija *Querco-Ostryetum cotonoasteretosum tomentosae* subass. nova poraščа najtoplejše izpostavljene lege na plitvih tleh. Večinoma je to grmišče, zelo redko nizki gozd. Razlikovalnici *Cotoneaster tomentosus* Lindl. in *Inula conyza* L. sta kazalki teh ekoloških razmer. Večinoma se pojavljata v grmičevju ali na robovih gozdov ali v vrzelastih svetloljubnih in toploljubnih hrastovih in borovih gozdovih. Prednost dajeta poletno toplim, kamnitim ali peščenim, z apnencem, hranili in bazami bogatim tlem z blagim, nevtralnim humusom na izpostavljenih južnih legah. Sta toploljubni in svetloljubni vrsti. Vrsta *Cotoneaster tomentosus* je značilnica za zvezo *Fraxino orni-Pinion nigrae-sylvestris*, ki se pogosto pojavlja v združbah zvez *Quercion pubescentis* ali *Berberidion*. Vrsta *Inula conyza* je značilna za red *Quercetalia pubescentis*, najdemo jo tudi v združbah razreda *Trifolio-Geranietea*, redov *Prunetalia* in *Erico-Pinetalia* (Oberdorfer 1979). **Holotip subasociacije je popis 18 v Fitocenološki tabeli 1.**

5.2.3.3 Subasociacija *Querco-Ostryetum chamaecytisetosum purpureae* subass. nova

Subasociacija *Querco-Ostryetum chamaecytisetosum purpureae* subass. nova je nekoliko obubožana z rastlinskimi vrstami. V nekaterih primerih se pojavlja več vrst reda *Prunetalia*, kar kaže na degradacijske pojave že tako skromnega rastišča. Za razlikovalnici smo izbrali vrsti *Juniperus communis* L. in *Chamaecytisus purpureus* Scop., ki kažeta na degradacijski proces v tej fitocenozi. Vrsto *Juniperus communis* pogosto srečujemo na degradiranih sončnih, suhih traviščih, kjer je ekstenzivna paša in se pojavlja zmerno zakisanje humusa. V preučevanih sestojih ne moremo govoriti o paši, vendar je zaznaven verjetno občasni antropozoogeni vpliv na tem izredno labilnem toploljubnem rastišču. Zanimivo je, da so v bližini pašne površine (Boč, Slivnica). Sklepamo, da je fitocenoza sekundarna na rastišču toploljubnega bukovega gozda. Na degradacijske pojave nas opozarja tudi vrsta *Chamaecytisus purpureus*, ki se z večjo pokrovnostjo pojavlja samo tukaj. Razlikovalnici preferirata sončna, suha travišča in presvetljene gozdo-

ve, poraščata tudi kamnišča, skale ali celo stene. Tla so zmerno suha, včasih tudi lahko sveža, peščena, z zmerno kislim humusom. Vrsti sta svetloljubni in znanilki sekundarnih grmišč in degradiranih rastišč.

5.2.4 GEOGRAFSKA VARIANTA ASOCIACIJE

Asociacija *Querco-Ostryetum* se v Sloveniji nekoliko razlikuje od prvič opisane asociacije na Hrvaškem. Razlike so predvsem v stalnosti in srednji pokrovni vrednosti njenih značilnic. Če govorimo o hrvaški varianti, je ta optimalna, slovenska varianta pa je z značilnicami revnejša. Razlog za skromno pojavljanje značilnic v Sloveniji je v njenem skrajnem severozahodnem arealu. V Sloveniji je že razlika v srednji pokrovni vrednosti dominantne značilnice drevesne vrste *Quercus pubescens,* ki je na hrvaškem dvainpolkrat večja. Podobno je z vrsto *Geranium sanguineum*. Slabše sta v Sloveniji zastopani tudi značilnici *Peucedanum cervaria* in *Trifolium rubens*, tako po stalnosti kot po srednji pokrovni vrednosti, zlasti slednja, saj dosežeta stalnost med 40 in 60 % oziroma med 20 in 40 %. Večjo stalnost in srednjo pokrovno vrednost ima v Sloveniji značilnica *Mercurialis ovata*. Dvainpolkrat večjo pokrovno vrednost ima pri nas značilnica *Inula hirta*. Razlike so tudi v stalnosti in srednji pokrovni vrednosti v diagnostično pomembnem redu *Quercetalia pubescentis* s. lat., kamor uvrščamo asociacijo *Querco-Ostryetum*, kjer prednjači hrvaška varianta. Podobno je z vrstami reda *Prunetalia*, ki so sestavni ekološki del asociacije. Slovenska varianta je bogatejša s fagetalnimi in pinetalnimi vrstami, kar nakazuje določeno sekundarnost asociacije na bukovih rastiščih in pionirski značaj glede pojavljanja več pinetalnih vrst. Zanemarljivo ni niti skromno pojavljanje vrst razreda *Seslerietea*, kar kaže na manjši vpliv bližnjih Alp.

Naštete razlike med slovensko in hrvaško fitocenozo niso zadovoljiv razlog za postavitev dveh geografskih variant. Pokazala pa se je možnost določitve geografske variante za hrvaško asociacijo z drevesno vrsto *Acer obtusatum* kot fitogeografsko razlikovalnico. Vrsta *Acer obtusatom* L. je centralno-vzhodnoilirsko-dinarska vrsta. V Slovenijo sega le v najožjem jugovzhodnem pasu v Kolpski dolini (Poljanska dolina v Beli krajini in na Kočevskem), tu in tam jo dobimo tudi v našem submediteranu. Glede na njeno optimalno razširjenost na Hrvaškem jo lahko štejemo za dobro fitogeografsko razlikovalnico. **Geografska varianta *Querco-Ostryetum* var. geogr. *Acer obtusatum* var. geogr. nova** nam predstavlja optimalno obliko fitocenoze. **Holotip geografske variante je popis 1 iz I. Horvatove (1938, križaljka br. 1) fitocenološke tabele 1.**

5.2.5 PRIMERJAVA Z ASOCIACIJO LATHYRO-QUERCETUM HT. (1938) 1958 (=SERRATULO-QUERCETUM) IN SINSISTEMATSKA PROBLEMATIKA

5.2.5.1 Ekološke razmere

Za primerjavo smo vzeli pet analitičnih fitocenoloških tabel avtorjev I. Horvata (1938, I. Horvat et al. 1974), Cimperška (2008) in Zupančiča s sodelavci (in situ) asociacij *Querco-Ostryetum* in *Lathyro-Quercetum*, ki so predstavljene v sintezni Fitocenološki tabeli 2 v stolpcih 1–5. Fitocenoze v I. Horvatovih in naših tabelah (Zupančič s sodelavci) (Fitocenološka tabela 2, stolpci 1–4) so floristično večinoma izenačene, zato smo jih obravnavali skupno, tako za asociacijo *Querco-Ostryetum* (Fitocenološka tabela 2, stolpca 1 in 2) kot za asociacijo *Lathyro-Quercetum* (Fitocenološka tabela 2, stolpca 3 in 4) in jih nato medsebojno primerjali. Cimperškova fitocenološka tabela asociacije *Lathyro-Quercetum* (Fitocenološka tabela 2, stolpec 5) je floristično bogatejša od tabele I. Horvata in naše, zato smo jo obravnavali posebej. V asociaciji *Lathyro-Quercetum* je v tabelah I. Horvata in Zupančiča s sodelavci skupaj 176 rastlinskih vrst, v Cimperškovi tabeli pa je zabeleženih 224 vrst, to je 48 rastlinskih vrst več kot v obeh prej omenjenih tabelah. Razlaga za tolikšno razliko je v načinu določitve popisne ploskve. I. Horvat in Zupančič s sodelavci so popisovali fitocenozo sensu stricto, torej so se strogo omejevali na bolj ali manj optimalno obliko asociacije *Lathyro-Quercetum*. Zupančič s sodelavci se je strogo držal določil metode, ki priporoča standardno ploskev 400 m^2. I. Horvat se je večinoma držal te norme oziroma je površino nekajkrat zmanjšal v prid zajetja optimalne oblike fitocenoze. Cimperšek je povečal popisne ploskve do 800 m^2 (le v enem primeru 450 m^2) in tako zajemal asociacijo zelo široko – sensu lato. V njegovih popisih so zajete inicialne oblike asociacije ali celo prehodi iz okolne vegetacije. Zato smo primerjave med asociacijami *Querco-Ostryetum* in *Lathyro-Quercetum* v Cimperškovem primeru primerjali ločeno. Rezultati primerjave s Cimperškovo tabelo so ugodnejši za odločitev o samostojni asociaciji *Lathyro-Quercetum*.

V petdesetih letih prejšnjega stoletja je I. Horvat razmišljal, da subasociacijo *Querco-Ostryetum quercetosum petraeae* Ht. 1938 povzdigne v rang samostojne asociacije *Lathyro nigrae-Quercetum petraeae* Ht. (1938) 1958 zaradi dominantnosti gradna (*Quercus petraea*) ter edafskih in reliefnih razlik. V primerjavi z asociacijo *Querco-Ostryetum*, ki uspeva na plitvih sprsteninastih tleh (mull rendzini), porašča asociacija *Lathyro-Quercetum* globlja, zmerno zakisana, nekoliko bolj sveža tla – rjave rendzine. Pojavljanje teh tal omogoča reliefno obli-

kovanje rastišča, ki je zaščiteno pred močnejšim osončenjem in v nekaterih primerih tudi položnejše. To rastišče omogoča večjo vrstno zastopanost mezofilnim in onemogoča rast občutljivejšim termofilnim vrstam (I. Horvat 1938, I. Horvat et al. 1974, M. Wraber 1960). Cimperšek (2008) navaja za asociacijo *Lathyro-Quercetum* naslednje: »Na masivnem apnencu, na apnenem konglomeratu in dolomitiziranem apnencu se razvijajo s hranili in z bazami nasičena, različno globoka, neredko žepasta, pokarbonatna tla.« Naše izkušnje potrjujejo nekatere zgornje ugotovitve, predvsem edafsko-reliefne. Pobočja so lahko položnejša ali strma, strma z vdolbinami, manj izpostavljena toplim legam (severozahodnim, zahodnim, jugovzhodnim) in so zato tla nekoliko globlja – rjave rendzine.

Zaradi navedenih ekoloških razmer je nekaj razlik v rastlinstvu in posledično v vegetaciji. Bolj termofilne vrste so v asociaciji *Lathyro-Quercetum* redkejše, nekatere pa se sploh ne pojavljajo. Podobno je tudi s heliofilnimi vrstami. Nekaj več je mezofilnih vrst. Gledano iz vegetacijskega vidika, je manj vrst iz redov *Quercetalia pubescentis* in *Scorzoneretalia villosae* ter razredov *Erico-Pinetea*, *Trifolio-Geranietea*, *Festuco-Brometea*, *Sedo-Scleranthetea* in *Molinio-Arrhenatheretea*. Komaj kaj več je vrst iz redov *Fagetalia*, v tem sklopu je največ vrst zveze *Carpinion* s. lat. in razreda *Vaccinio-Piceetea*. Reprezentančna je razlika v značilnicah asociacije *Querco-Ostryetum*, ki so v asociaciji *Lathyro-Quercetum* komaj zaznavne. Očitna je razlika v prisotnosti drevesne vrste *Quercus pubescens*, ki je ni v asociaciji *Lathyro-Quercetum* ali je le zelo redka (slučajna), zato smo jo upravičeno uvrstili med značilnice asociacije *Querco-Ostryetum*. To analizo potrjuje primerjava fitocenoloških skupin v asociacijah *Querco-Ostryetum* (I. Horvat 1938 in Zupančič et al. in situ) in *Lathyro-Quercetum* (I. Horvat 1938 in Zupančič et al. in situ ter Cimperšek 2008).

Poleg primerjave fitocenoloških skupin (Tabela 5) nam kaže na zmerno mezofilnost asociacije *Lathyro-Quercetum* tudi analiza horoloških skupin z manjšo udeležbo termofilnih geoelementov, ki jih je le 31,8 % oziroma v Cimperškovi (2008, Tabela 1) tabeli 29,8 %, v asociaciji *Querco-Ostryetum* 39,3 % (glej Tabelo 2). Predvsem je manj evromediteranskih (5,7 % oz. 4,9 %) in mediteransko-montanskih (6,8 % oz. 6,7 %) ter več hladnoljubnih evropskih (25 % oz. 29 %) in cirkumborealnih (5,1 % oz. 7,1 %) geoelementov (Primerjaj Tabelo 2.).

Biološki spekter asociacije *Lathyro-Quercetum* se bolj približuje fitocenozam zmernega pasu oziroma normalni coni. 26 % oziroma 21 % fanerofitov kaže na določeno termofilnost asociacije, kar je značilno za toplejše pasove (mediteransko, pustinjsko, tropsko cono). Razlika med asociacijama *Querco-Ostryetum* in *Lathyro-Quercetum* je tudi v biološkem spektru, ki kaže na relativno ugodnejše ekološke razmere za asociacijo *Lathyro-Quercetum* (Tabela 6).

Asociacija *Querco-Ostryetum* ima inicialni, pionirski, degradacijski značaj z bolj odprtim vrzelastim grmičasto-drevesnim sklepom, tla so plitve rendzine, protorendzine, kjer uspevajo termofilno-heliofilne vrste, manj občutljive za vodni režim zlasti v poletnem obdobju, zelo izpostavljene osončenju, skratka vegetacija je termofilna in se približuje podobnim fitocenozam submediterana/mediterana. V drevesno-grmovni plasti dominira puhavec – *Quercus pubescens*. Asociacija *Lathyro-Quercetum* je ekološko relativno stabilnejša, zmerno termofilna, obogatena z mezofilnejšo floro na ugodnejših, globljih, včasih zmerno zakisanih rjavih rendzinah. Drevesno-grmovna plast je strnjena. Izredno termofilne vrste so redke ali jih celo ni. V drevesno-grmovni plasti dominira mezofilnejši graden – *Quercus petraea*.

Vprašanje je, ali so te ekološke, floristične, vegetacijske razlike dovolj prepričljive za utemeljitev samostojne asociacije *Lathyro-Quercetum* ali pa zadoščajo le za opredelitev dobro izražene subasociacije *Querco-Ostryetum quercetosum petraeae*, kot je prvotno predvideval I. Horvat leta 1938.

Pri primerjavi asociacij smo si poleg ekoloških, floristič nih in vegetacijskih analiz pomagali še z izračunom Sørensonovega indeksa podobnosti fitocenoz. Primerjava med asociacijama *Querco-Ostryetum* in *Lathyro-Quercetum* (I. Horvat in Zupančič s sodelavci: Fitocenološka tabela 2, stolpci 1, 2, 3 in 4) je pokazala indeks σ 77, kar kaže na podobnost med fitocenozama. Pri drugi primerjavi (I. Horvat in Zupančič s sodelavci in Cimperšek: Fitocenološka tabela 2, stolpci 1, 2 in 5) pa je indeks σ 53, kar pa nakazuje različnost fitocenoz. Zadnji indeks je ugodnejši za uveljavljanje samostojne asociacije. Vendar smo skeptični glede Cimperškove metode popisovanja fitocenoze (op. prevelike površine popisne ploskve), saj indeks podobnosti ni realen. Ne glede na gornja izračunana indeksa podobnosti fitocenoz sprejemamo mnenje I. Horvata o opredelitvi samostojne asociacije *Lathyro-Quercetum*, kar utemeljujemo z naslednjo ugotovitvijo. Fitocenozi se nekoliko razlikujeta glede na ekološke razmere in sestoje gradita dve diagnostično pomembni različni drevesni vrsti, in sicer toploljubna vrsta *Quercus pubescens* v asociaciji *Querco-Ostryetum* in mezofilna vrsta *Quercus petraea* v asociaciji *Lathyro-Quercetum*.

5.2.5.2 Značilnice asociacije *Lathyro-Quercetum* (=*Serratulo-Quercetum*)

Značilnice asociacije *Lathyro-Quercetum* so bolj ali manj relativne, zlasti primerjalno nasproti asociacijama

Tabela 5: Primerjava fitocenoloških skupin asociacij Querco-Ostryetum in Lathyro-Quercetum

FITOCENOLOŠKE SKUPINE	QUERCO-OSTRYETUM	LATHYRO-QUERCETUM	
	Ht. + Zup	Ht. + Zup	Cimperšek
	%	%	%
Querco-Fagetea	**48,1**	**59,1**	**58,9**
Vaccinio-Piceetea	2,3	**4,0**	**4,9**
Erico-Pinetea	**8,8**	7,4	5,8
Scorzoneretalia villosae	**3,2**	1,8	1,4
Seslerietea	**2,3**	1,1	0,9
Festuco-Brometea	**11,6**	7,4	6,7
Sedo-Scleranthetea	**2,8**	1,1	0,9
Molinio-Arrhenatheretea	**6,5**	5,1	4,9

Querco-Ostryetum in *Asplenio-Quercetum*. Njihova diagnostična vrednost se zrcali v visoki srednji pokrovni vrednosti in sorazmerno višji stopnji navzočnosti, kot jih značilnice asociacije *Lathyro-Quercetum* dosegajo v asociacijah *Querco-Ostryetum* in *Asplenio-Quercetum* (Fitocenološka tabela 2, stolpci 1, 2, 3, 4, 5 in 6). Za relativne značilnice smo izbrali vrste *Quercus petraea*, *Serratula tinctoria, Lathyrus niger* in *Tamus communis*.

Cimperšek (2008) je na osnovi primerjave med asociacijama *Lathyro-Quercetum* in *Asplenio-Quercetum* izbral naslednje razlikovalnice za asociacijo *Lathyro-Quercetum*: *Melica uniflora, Melittis melisophyllum, Cornus mas, Cyclamen purpurascens, Ostrya carpinifolia, Bromopsis ramosa* subsp. *benekenii, Peucedanum austriacum* in *Buglossoides purpurocaerulea*. Res je, da se asociaciji lokalno, na območju Obsotelja in Kozjanskega, z navedenimi vrstami razlikujeta, vendar le-te nimajo nobene teže v širšem konceptu celinskih termofilnih fitocenoz z gabrovcem ali hrasti, te vrste so v njih splošno razširjene, kot je razvidno iz sintezne Fitocenološke tabele 2.

Na kratko naj opišemo ekološke razmere, v katerih uspevajo značilnice asociacije *Lathyro-Quercetum* (=*Serratulo-Quercetum*) po Oberdorferju (1979) in na lastnih izkušnjah.

Vrsta ***Quercus petraea* (Mattuschka) Liebl**. raste v hrastovih gozdovih gorskega in gričevnatega sveta, na suhih do svežih tleh, revnih z bazami, redkeje tudi na bogatejših, srednje globokih, neustaljenih kamnitih ali ilovnatih tleh. Drevo globoko korenini. Je značilnica razreda *Querco-Fagetea*, prisotna je v združbah zvez *Quercion roboris-petraeae* in *Luzulo-Fagion*.

Vrsta ***Serratula tinctoria* L.** uspeva v svetloljubnih listnatih gozdovih na menjajočih se svežih do suhih, s hranili in bazami zmerno bogatih, zmerno kislih, srednje globokih tleh s prhninastim humusom. Dobimo jo na karbonatnih in nekarbonatnih kamninah. Rastlina globoko korenini, je toploljubna, svetloljubna do polsenčna vrsta. Značilna je za red *Molinietalia*, dobimo jo v združbah reda *Quercetalia pubescentis* in zveze *Carpinion* s. lat.

Vrsta ***Lathyrus niger* (L.) Bernh**. raste v hrastovih ali mešanih hrastovo-borovih gozdovih, na gozdnih robovih in grmiščih, na zmerno suhih, včasih osiromašenih, sicer pa z bazami bogatih, zmerno apnenčastih, srednje globokih ilovnatih ali meljastih tleh z nevtralnim do zmerno kislim humusom. Ljubi poletno topla rastišča, sicer pa je polsenčna vrsta. Je značilnica za red *Quercetalia pubescentis*, uspeva pa tudi v združbah zvez *Carpinion* s. lat. in *Geranion*.

Vrsta ***Tamus communis* L**. uspeva v mejicah (živih mejah), grmičevju, na obrobju gozdov in v presvetljenih gozdovih, na svežih, s hranili in bazami bogatih kamnitih in ilovnatih svežih tleh, z rahlim, blagim humusom. Uvrščamo jo v toploljubne vrste in je kazalka hranljivih tal. Je značilnica zveze *Quercion pubescentis-petraeae*, najdemo jo v združbah redov *Prunetalia* in *Fagetalia*.

Značilnice so ekološko sorodne oziroma podobne in nakazujejo rastišča, kjer so sveža, globlja, vendar kamnita tla, včasih zmerno kisla, bolj ali manj bogata s hranili in bazami. Vse so toploljubne, svetloljubne do polsenčne vrste, ki globoko koreninijo.

Lektotip asociacije je popis 16 iz I. Horvatove (1938, križaljka br. 1) fitocenološke tabele 1, oziroma naš popis 28 iz Fitocenološke tabele 1.

Postavitev samostojne asociacije I. Horvata (1958) s poimenovanjem *Lathyro nigrae-Quercetum petraeae* Ht. (1938) 1958 je po mnenju Poldinija (1988) vprašljiva oziroma je uporabljeno ime neveljavno, t.i. invalidno ime (nom. inval.). Ime asociacije *Lathyro nigrae-Quercetum petraeae* naj bi bilo ustrezno veljavno ime za Richardovo asociacijo na kisli podlagi, utemeljeno leta 1961 v Švici. Menimo, da ima I. Horvat (1958) prednost pri poimenovanju asociacije pred Richardom. Ime asociacije je v obeh primerih slabo izbrano, saj se vrsta *Lathyrus niger* pojavlja v več fitocenozah, tako v termofilnih karbonatnih kot v mezofilnih nekarbonatnih asociacijah. Upoštevati moramo tudi dejstvo, da obe opisani fitocenozi, Richardova (1961) in I. Horvatova (1958), pripadata različnim višjim sinsistematskim enotam v rangu reda. Zaradi nastale zmede (homonimov) v poimenovanju obeh fitocenoz zato, ne glede na prednost

Tabela 6: Biološki spekter asociacij Querco-Ostryetum in Lathyro-Quercetum

	Zmerni pas	Querco-Ostryetum	Lathyro-Quercetum	
	Normalna cona		Ht. & Zup. et al.	Cimperšek
Biološka oblika	Št. vrst	Št. vrst	Št. vrst	Št. vrst
I. Fanerofiti (Phanerophyta)	7	23	26	21
II. Hamefiti (Chamaephyta)	3	13	10	9
III. Hemikriptofiti (Hemicryptophyta)	50	47	43	50
IV. Geofiti (Geophyta)	22	15	19	17
V. Terofiti (Therophyta)	15	1	1	2
VI. Neopredeljena biološka obl.	-	1	1	1

poimenovanja asociacije *Lathyro-Quercetum* Ht. (1938) 1958, predlagamo novo ime, ki je ekološko ustreznejše in utemeljeno z medsebojno primerjavo podobnih fitocenoz.

***Serratulo tinctoriae-Quercetum petraeae* (Ht.) ex Zupančič & Žagar nom. nov. lektotip asociacije je popis 16 iz I. Horvatove (1938, križaljka br. 1) fitocenološke tabele 1, oziroma naš popis 28 iz Fitocenološke tabele 1 (Zupančič & Žagar). Sinonim je *Lathyro nigrae-Quercetum petraeae* Ht. (1938) 1958 nom. inv.**

5.2.5.3 Geografska varianta

Tako kot smo predvideli geografsko varianto za asociacijo *Querco-Ostryetum,* se le-ta pojavlja tudi v sklopu asociacije *Serratulo-Quercetum* (=*Lathyro-Quercetum*). Gre za isto fitogeografsko razlikovalnico *Acer obtusatum* L. Za hrvaško območje predvidevamo geografsko varianto ***Serratulo-Quercetum* var. geogr. *Acer obtusatum* var. geogr. nova,** ki ni tako izrazito poudarjena kot pri asociaciji *Querco-Ostryetum*. Predstavlja optimalno obliko fitocenoze, ki se razlikuje od asociacije v Sloveniji. Na našem območju je asociacija *Serratulo-Quercetum* (=*Lathyro-Quercetum*) še nekoliko mezofilnejša, bogatejša s fagetalnimi, piceetalnimi in pinetalnimi vrstami. **Holotip geografske variante je popis 12 iz I. Horvatove (1938, križaljka br. 1) fitocenološke tabele 1.**

5.2.5.4 Vprašanje sinsistematske stabilnosti asociacije *Serratulo-Quercetum* (=*Lathyro-Quercetum* nom. inv.)

Asociacijo *Serratulo-Quercetum* (=*Lathyro-Quercetum*) uvrščamo v zvezo *Fraxino-Ostryion*, red *Quercetalia pubescentis* in razred *Querco-Fagetea*. Obe asociaciji *Querco-Ostryetum* in *Serratulo-Quercetum* (=*Lathyro-Quercetum*) pripadata istim višjim sinsistematskim rangom, kar je razumljivo glede na prvo uvrstitev subasociacije *Querco-Ostryetum quercetosum petraeae*. Ni razloga za drugačno sinsistematsko uvrstitev, predvsem zaradi zelo podobne floristične vsebine obeh asociacij. Floristično sta si asociaciji z majhnimi razlikami precej podobni. Značilnice asociacije *Serratulo-Quercetum* (=*Lathyro-Quercetum*) so relativne in zastopane v obeh asociacijah, vendar se razlikujejo po pojavljanju in udeležbi v posamezni asociaciji. Relativne značilnice asociacije *Serratulo-Quercetum* (=*Lathyro-Quercetum*) in precejšnja floristična podobnost z asociacijo *Querco-Ostryetum* povzročajo, da asociacija *Serratulo-Quercetum* (=*Lathyro-Quercetum*) nima velike sinsistematske stabilnosti kot samostojna asociacija. Večji poudarek je na ekoloških razmerah, ki se v nekaterih segmentih razlikujejo. Z nadaljnjimi raziskavami in še z večjim številom fitocenoloških popisov na širšem območju je mogoče potrditi samostojnost asociacije ali pa jo ovreči in jo ponovno uvrstiti kot subasociacijo *Querco-Ostryetum quercetosum petraeae,* kot je bilo predlagano leta 1938.

5.2.6 FLORISTIČNA IN EKOLOŠKA RAZLIČNOST PODOBNIH ASOCIACIJ

Za boljše razumevanje celinskih termofilnih asociacij z dominatnima vrstama *Ostrya carpinifolia* in *Quercus petraea*, zlasti pa asociacije *Querco-Ostryetum*, smo nekatere asociacije, ki so po našem mnenju bolj ali manj floristično in ekološko podobne, medsebojno primerjali. Izbrali smo sedem asociacij z območja ilirske florne province predalpskega in preddinarskega, deloma iz obrobja predpanonskega sveta. Natančneje smo že v poglavju 5.2.5 obdelali primerjavo med asociacijama *Querco-Ostryetum* in *Serratulo-Quercetum* (=*Lathyro-Quercetum* nom. inv.). Predmet primerjave v tem poglavju so asociacije *Erico-Ostryetum*, *Cytisantho-Ostryetum*, *Ostryo-Fraxinetum orni*, *Rhododendro-Ostryetum* in *Asplenio-Quercetum*.

5.2.6.1 *Erico carneae-Ostryetum* Ht. 1958

Asociacijo *Erico-Ostryetum* je I. Horvat v petdesetih letih dvajsetega stoletja izpeljal iz subasociacije *Querco-Ostryetum ericetosum* Ht. 1950. Združba je floristično

zelo obubožana (okoli 80 vrst). Zeliščno plast obvladuje vrsta *Erica carnea* z degradacijskimi elementi, kot so *Pteridium aquilinum*, *Carex alba in Leontodon incanus*. V drevesno-grmovni plasti dominira *Ostrya carpinifolia* s kodominantno jugovzhodnoevropsko-ilirsko vrsto *Acer obtusatum*, včasih se v večjem številu pojavlja *Fagus sylvatica*. Poleg naštetih vrst se asociacija *Erico-Ostryetum* razlikuje od asociacije *Querco-Ostryetum* po manjši zastopanosti drevesne vrste *Quercus pubescens* in vrst iz redov *Quercetalia pubescentis* in *Fagetalia sylvaticae* ter razredov *Trifolio-Geranietea*, *Nardo-Callunetea*, *Festuco-Brometea*, *Sedo-Scleranthetea* in *Molinio-Arrhenatheretea*; vzrok za to je v gostoti ruše spomladanske rese (*Erica carnea*). Zanimiva je precejšnja prisotnost vrste *Hepatica nobilis*. Tla so precej humozna, kar je posledica goste naseljenosti vrste *Erica carnea*. Humus je bolj ali manj zakisan in svež. Po mnenju M. Wraberja (1960) je fitocenoza antropogeno pogojena, kar potrjujejo tudi raziskave Accetta (ustno). S to ugotovitvijo se tudi mi strinjamo. Nahajališča asociacije *Erico-Ostryetum* v Sloveniji so v preddinarskem in predalpskem območju. Podobnost med asociacijama *Querco-Ostryetum* in *Erico-Ostryetum* po Sørensenu je 42, kar kaže na majhno podobnost med asociacijama in precejšnjo samostojnost asociacije *Erico-Ostryetum*.

Ob primerjavi asociacij so se izločile naslednje vrste kot izključne značilnice, ki jih ni v nobeni drugi primerjani fitocenozi (Fitocenološka tabela 2): *Helleborus multifidus* Vis., *Acer monspessulanum* L., *Cotoneaster nebrodensis* in *Sesleria juncifolia* Wulf. ex Suffr. Naštete značilnice poraščajo suha, kamnita in topla pobočja ter vrzelaste, presvetljene sestoje. Poleg značilnic so diagnostično pomembne še vrste *Pteridium aquilinum* (L.) Kuhn, *Carex alba* L. in *Leontodon incanus* (L.) Schrank, ki uspevajo v podobnih ekoloških razmerah kot prej imenovane značilnice, ki so hkrati znanilke degradacijskih procesov.

5.2.6.2 *Cytisantho-Ostryetum* M. Wraber 1961

Alpsko-predalpska grmiščna vegetacija *Cytisantho-Ostryetum* naseljuje strma apnenčasto-dolomitna, ekstremno topla, skalnata ali grohasta pobočja, na rendzinah (protorendzinah do rjavih rendzin), včasih na zelo plitvih rjavih tleh. Ponekod so močni denudacijski procesi. Ta bazifilno-nevtrofilna združba, ki uspeva v naših jugovzhodnih Alpah v nadmorskih višinah od 600 do 1000 m nad morjem, je floristično srednje bogata (okoli 140 vrst), vendar revnejša od asociacije *Querco-Ostryetum* (216 vrst). Predvsem je obubožana s termofilnimi vrstami reda *Quercetalia pubescentis* in tudi s fagetalnimi vrstami, bogatejša pa je z vrstami razreda *Seslerietea*, *Festuco-Brometea* in *Sedo-Scleranthetea*. V grmovno-drevesni plasti povsem dominira vrsta *Ostrya carpinifolia*. Podobnost med asociacijama *Querco-Ostryetum* in *Cytisantho-Ostryetum* po Sørensonu je 56, kar potrjuje upravičeno samostojnost asociacije. V alpsko-predalpskem območju jugovzhodnih Alp se pojavlja sorodna asociacija *Ostryo-Fraxinetum orni*, zato smo primerjali asociacijo *Cytisantho-Ostryetum* tudi z njo in ugotovili s Sørensonovim indeksom podobnosti (σ = 44) majhno podobnost med njima in njuno upravičeno samostojnost. Fitocenološka tabela 2 nazorno prikazuje različnost asociacij.

M. Wraber (1961) je izbral dve značilnici za asociacijo *Cytisantho-Ostryetum*, to sta *Cotinus coggygria* in *Allium pulchellum*. Obe sta relativni značilnici, ker se pojavljata še v drugih podobnih ali sorodnih celinskih termofilnih grmiščih, kjer dominira vrsta *Ostrya carpinifolia*. Naš predlog je, da od značilnic, ki jih navaja M. Wraber, obdržimo le vrsto *Allium pulchellum* G. Don. Vrsta *Allium pulchellum* je sicer v določeni meri prisotna v asociaciji *Querco-Ostryetum* in je ena izmed razlikovalnic subasociacije *Querco-Ostryetum genistetosum januensis*, kar kaže na določeno medsebojno sorodnost fitocenoz. Poleg vrste *Allium pulchellum* so značilnice še *Genista radiata* (L.) Scop., *Betonica alopecuros* L, *Dianthus sternbergii* Siber in *Iris pallida* Lam. subsp. *cengialti* (Ambrosi) Foster (=*I. cengialti* Ambrosi f. *vochinensis* Paulin), ki ekološko, fitogeografsko in floristično označujejo asociacijo. Za razlikovalnico asociacije pa predlagamo vrsto *Anemone trifolia* L., ki v fitocenozi še z nekaterimi drugimi vrstami kaže na »ilirskost« (»ilirikoidnost«) fitocenoze (severno obrobje ilirske florne province).

5.2.6.3 *Ostryo-Fraxinetum orni* Aichinger 1933

V prejšnjem poglavju 5.2.6.2 smo primerjali jugovzhodnoalpsko asociacijo *Ostryo-Fraxinetum orni* s podobno oziroma sorodno asociacijo *Cytisantho-Ostryetum* v predgorju Julijskih Alp. Kljub očitni različnosti pa so v obeh imenovanih fitocenozah zelo razširjene vrste *Amelanchier ovalis*, *Cotoneaster tomentosa* in *Calamagrostis varia*, ki kažejo na njuno inicialnost in hkrati različnost z asociacijo *Querco-Ostryetum*. Asociacija *Ostryo-Fraxinetum orni* je med obravnavanimi celinskimi termofilnimi grmišči ali nizkimi gozdovi floristično najrevnejša (okoli 70 vrst). Primerjava z asociacijo *Querco-Ostryetum* kaže na precejšnjo osiromašenost vrst iz redov *Quercetalia pubescentis* in *Fagetalia* ter razredov *Trifolio-Geranietea, Festuco-Brometea* in *Molinio-Arrhenatheretea*. Manj je tudi vrst iz reda *Prunetalia* in razreda *Erico-Pinetea*. Podobnost med njima je zelo majh-

na, Sørensenov indeks je 34, kar izključuje misel I. Horvata (1938), da je asociacija *Ostryo-Fraxinetum orni* del asociacije *Querco-Ostryetum* oziroma njena inicialna subasociacija. Predvsem pa v asociaciji *Ostryo-Fraxinetum orni* ni hrastov. Razlika je tudi horološke oziroma fitogeografske in nekoliko ekološke narave. Naseljuje strma skalnata apnenčasto-dolomitna pobočja v legah, kjer ni ekstremnih temperaturnih nihanj, zlasti spomladi, in gradi termofilne otoke sredi mezofilne fagetalne vegetacije v montanskem pasu. Večinoma ali skoraj vedno je to grmišče. V Sloveniji je njena vzhodna meja razširjenosti, kjer se noriška florna provinca srečuje z ilirsko.

5.2.6.4 *Asplenio adianti-nigri-Quercetum* Ž. Košir ex Cimperšek 2008

Na obrobju predpanonskega sveta je Cimperšek (2008) korektno in s tabelarnim gradivom potrdil asociacijo *Asplenio adianti-nigri-Quercetum petraeae*, ki jo je Ž. Košir začasno (provizorično) predvidel, toda ne znanstveno dokazal. Cimperšek (2008) je v razpravi poleg novo opisane asociacije *Asplenio-Quercetum* predstavil še asociacijo I. Horvata *Serratulo-Quercetum* (=*Lathyro-Quercetum*), ki je tudi predmet naše razprave. Med njima je naredil ekološke, biološke, floristično-geografske in sociološke primerjave. Kljub očitni različnosti obravnavanih asociacij nas je zanimala primerjava podobnosti po Sørensenu med asociacijami *Querco-Ostryetum*, *Serratulo-Quercetum* (=*Lathyro-Quercetum*) in *Asplenio-Quercetum*, vedoč za precejšnje edafske razlike, saj asociacija *Asplenio-Quercetum* uspeva na nekarbonatnih kamninah in zmerno kislih do nevtralnih tleh. Na osnovi Cimperškovih (2008) fitocenoloških tabel (Preglednica 2 in 3) se je izkazalo, da je Sørensenov indeks 67, kar pomeni nekaj podobnosti med asociacijama *Serratulo-Quercetum* (=*Lathyro-Quercetum*) in *Asplenio-Quercetum*. Vendar smo mnenja, da sta asociaciji samostojni in potrjujemo Cimperškovo odločitev na osnovi zgoraj omenjenih ekoloških in floristčnih analiz. Pri primerjanju asociacij *Querco-Ostryetum* in *Asplenio-Quercetum* pa je Sørensenov indeks podobnosti nizek (σ = 44), kar smo tudi pričakovali.

5.2.6.5 *Rhododendro hirsuti-Ostryetum* Franz 1991

Asociacija *Rhododendro-Ostryetum* ni primerljiva z asociacijo *Querco-Ostryetum* in ne z drugimi podobnimi ali sorodnimi termofilnimi celinskimi asociacijami z dominatnima vrstama *Ostrya carpinifolia* in *Quercus petraea*. V sintezni Fitocenološki tabeli 2 smo jo upoštevali bolj zaradi njenega zanimivega pojavljanja v Karavankah pri nas in v Avstriji (Franz 2002) ter na Bovškem (Dakskobler 2004), okolici Trebuše (Dakskobler 2003) in povodju Prešnice pri Borovnici (Accetto 2008). To je inicialna ali celo primarna združba na apnenčasti ali dolomitni podlagi (groblji), s plitvimi tlemi, revnimi s humusom. Porašča hladnejše lege od montanskega do subalpinskega pasu, kjer je manj ekstremnih temperaturnih nihanj. Floristično je asociacija izredno skromna, večina vrst je iz razredov *Vaccinio-Piceetea* in *Erico-Pinetea*. Od termofilnejših vrst so prisotne *Ostrya carpinifolia*, *Fraxinus ornus*, *Sorbus aria* in *Amalenchier ovalis*. Willner & Grabherr (2007) sta s sodelovanjem avtorja Franza njegovo asociacijo *Rhododendro hirsuti-Ostryetum* vključila v asociacijo *Erico-Ostryetum* Ht. 1959 kot subasociacijo *Erico-Ostryetum rhododendretosum hirsuti*.

5.3 ZAKLJUČKI

Idejo o dveh samostojnih celinskih termofilnih asociacijah z vrsto *Ostrya carpinifolia* na ekstremnih rastiščih predpanonskega (preddinarskega) območja zahodne Hrvaške je I. Horvat (1950, 1954, 1958, 1959) dobil s prvim pregledom gozdnih združb Jugoslavije in nato njeno potrditev ob sintezni študiji o sinsistematskih odnosih termofilnih hrastovih in borovih gozdov jugovzhodne Evrope. Enovito asociacijo *Querco-Ostryetum* Ht. 1938 z dvema subasociacijama je razdelil v dve asociaciji, in sicer v prvotno *Querco-Ostryetum* (*Q.-O. typicum*) in novo *Lathyro-Quercetum* (*Q.-O. quercetosum petraeae*). Njun obstoj je pojasnil z različnostjo floristčnih in ekoloških razmer v posamezni asociaciji. Po letih 1958–1959 smo sprejeli tezo I. Horvata o dveh samostojnih asociacijah. Pozneje se je pojavil dvom o možnosti obstoja asociacije *Lathyro-Quercetum*. Poldini (1988) dvomi o samostojnosti asociacije *Lathyro-Quercetum* in misli, da med asociacijama *Lathyro-Quercetum* in *Querco-Ostryetum* ni bistvenih floristčnih razlik in da asociacija *Lathyro-Quercetum* nima svojih značilnih niti razlikovalnih vrst ter da je ime asociacije bilo že prej uporabljeno za drugo asociacijo. Predlagal je, da se asociacija *Lathyro-Quercetum* ponovno spremeni v subasociacijo *Querco-Ostryetum quercetosum petraeae*, kot je to storil I. Horvat leta 1938.

Da je ime asociacije *Lathyro-Quercetum* zavajajoče, je opozoril Th. Müller (v Oberdorfer 1992) in predlagal začasno ime *Genista sagitalis – Quercus petraea*. Podobno je tudi Ž. Košir (1994) opozoril na podvajanje imena asociacije. Problema o poimenovanju asociacije *Lathyro-Quercetum* se je lotil tudi Cimperšek (2008) in pristal na poimenovanju, ki ga je I. Horvat predlagal leta

1958, to je *Lathyro nigrae-Quercetum petraeae* (1938) Ht. 1958.

Glavna naloga naše razprave je potrditi pojavljanje asociacije *Querco-Ostryetum* Ht. 1938 v Sloveniji, ugotoviti morebitne razlike in končno razrešiti problem njenih značilnic glede na podobne ali sorodne celinske termofilne združbe z dominatnima vrstama *Ostrya carpinifolia* in *Quercus petraea*. Splošna ugotovitev je, da je asociacija *Querco-Ostryetum* v Sloveniji nekoliko mezofilnejša in bolj inicialna od reprezentančno opisane na Hrvaškem. Zato smo predlagali, da hrvaško fitocenozo tudi fitogeografsko opredelimo s centralno-vzhodnoilirsko-dinarsko (jugovzhodnoevropsko-ilirsko) vrsto *Acer obtusatum*, ki predstavlja standardno obliko fitocenoze. Sicer se hrvaška in slovenska fitocenoza v signifikantnih vrstah bistveno ne razlikujeta v vrstah reda *Quercetalia pubescentis*, kamor asociacijo uvrščamo, kot tudi ne v vrstah reda *Prunetalia* in razreda *Trifolio-Geranietea*, ki ekološko dopolnjujeta oznako termofilne celinske združbe. Podobnost hrvaške in slovenske fitocenoze po Sørensenu (σ = 61) kaže na njuno podobnost in hkrati upravičenost postavitve geografske variante.

Primerjava sedmih podobnih oziroma sorodnih celinskih termofilnih asociacij tipa *Ostrya carpinifolia* oziroma *Quercus petraea* nam je omogočila tehtno izbiro značilnic ne le asociacije *Querco-Ostryetum*, temveč tudi relativnih značilnic asociacije *Serratulo tinctoriae-Quercetum petraeae* (= *Lathyro nigrae-Quercetum petraeae*) ter korekture in dopolnitve značilnic asociacij *Erico-Ostryetum*, *Cytisantho-Ostryetum*, *Ostryo-Fraxinetum orni* in *Rhododendro-Ostryetum*.

V tej razpravi nismo mogli neprizadeto mimo asociacije *Lathyro-Quercetum*. Naša dokončna odločitev je, da nekoliko drugačne ekološke razmere asociacije *Lathyro-Quercetum* vplivajo na njeno floristično sestavo, če ne toliko na raznovrstnost flore, pa predvsem na različnost njenega pojavljanja, to je na različnosti prezence in pokrovnosti in da smo tako zadovoljivo rešili problem značilnic asociacije. **Da bi se izognili zmešnjavi poimenovanja asociacije, predlagamo sintaksonomsko in hkrati ekološko ustreznejše ime asociacije *Serratulo tinctoriae-Quercetum petraeae*. Mislimo, da vračanje asociacije nazaj v podrejen položaj subasociacije *Querco-Ostryetum quercetosum petraeae* ni smiselno.**

Uporaba numerične Sørensenove metode podobnosti je relativna. Še večjo relativnost kaže prag stopnje, ki naj bi odločal, kdaj sta si združbi podobni in ju moramo imeti za enotno fitocenozo oziroma sta pod pragom stopnje in ju imamo za samostojni. Morda so metode, npr. metoda hierarhičnega kopičenja ali metoda, ki temelji na minimalnem porastu vsote kvadratov ostanka, ali metoda glavnih koordinat, kaj bolj natančne, vendar so še vedno relativne. Pomembna je sposobnost raziskovalca, da zna in situ diagnosticirati in določiti kakšen sinsistematski rang dosega neka fitocenoza. Empirična ocena fitocenološkega popisa, uporabljena za eksaktne matematično-numerične metode, je še vedno relativna. Ne glede na matematično-numerične metode smo z našimi dolgoletnimi izkušnjami prišli do zaključka, da se v naravi pojavljata dve samostojni asociaciji *Querco pubescentis-Ostryetum carpinifoliae* in *Serratulo tinctoriae-Quercetum petraeae* (=*Lathyro nigrae-Quercetum petraeae*).

Fitocenološka tabela 2 nam nazorno kaže uvrstitev posameznih asociacij v višje sinsistematske enote. Asociacije *Querco-Ostryetum*, *Serratulo-Quercetum* (=*Lathyro-Quercetum*), *Erico-Ostryetum, Cytisantho-Ostryetum, Ostryo-Fraxinetum orni* in *Asplenio-Quercetum* uvrščamo v ilirsko zvezo celinskih termofilnih združb *Fraxino orni-Ostryion* Tomažič 1940. Zveza *Fraxino orni-Ostryion* pa pripada redu *Quercetalia pubescentis* Br.-Bl. (1931) 1932, ki zajema širši obseg fitocenoz hladnejšega mediterana (kjer je prisotna še listopadna dendroflora), submediterana in termofilnih celinskih fitocenoz. Asociacija *Asplenio-Quercetum* je nekoliko obubožana glede vrst zveze *Fraxino orni-Ostryion* in reda *Quercetalia pubescentis*, vendar jo zaenkrat ne moremo drugače uvrstiti kot v ti dve sinsistematski enoti.

Najtežje je uvrstiti asociacijo *Rhododendro-Ostryetum* v višje sinsistematske enote. Avtor asociacije Franz (2002) jo je po našem mnenju pravilno uvrstil v zvezo *Erico-Pinion mugo* Leibungut 1948 nom. inv. Vprašljiva je nadaljnja uvrstitev v red in razred. Franz (2002) jo je po mnenju Wallnöferjeve (v Mucina et al. 1993) uvrstil v red *Erico-Pinetalia* Ht. 1959 in razred *Erico-Pinetea* Ht. 1959. Zupančič (2007) pa je mnenja, da spada zveza *Erico-Pinion mugo* v red *Vaccinio-Piceetalia* (Pawlowski 1928) Br.-Bl. v Br.-Bl. et al. 1939 em. K. Lund 1967 in razred *Vaccinio-Piceetea* Br.-Bl. v Br.-Bl. et al. 1939 em. Zupančič (1976) 1980. Držali se bomo slednje uvrstitve.

V novejšem času sta Willner & Grabherr (2007) za območje Avstrije drugače razlagala pojavljanje kontinentalnih grmišč/gozdov tipa *Ostryetum* s. lat. Kot vodilno/nosilno sta uvedla asociacijo *Erico-Ostryetum* Ht. 1959 in vanjo vključila asociacije *Ostryo-Fraxinetum orni* Aichinger 1933, *Cytisantho-Ostryetum* M. Wraber 1961 in *Rhododendro hirsuti-Ostryetum* Franz 1991, zadnjo kot subasociacijo *Erico-Ostryetum rhododendretosum hirsuti*.

Strinjamo se z mnenjem M. Wraberja (1960) in Accetta (ustno), da je asociacija *Erico-Ostryetum* antropogeno povzročena z mnogimi degradacijskimi, florističnimi in edafskimi elementi. Zaradi njene sindinamike ni primerna za vodilno fitocenozo. Pri tem moramo upoštevati, da imajo asociacije *Ostryo-Fraxinetum orni*, *Cytisatho-Ostryetum* in *Rhododendro hirsuti-Ostryetum*

vsaka svojo specifično sindinamiko, precejšnjo sintaksonomsko stabilnost in se zato medsebojno razlikujejo, (Glej Fitocenološko tabelo 2).

Na koncu lahko ugotovimo, da je Slovenija bogata s celinskimi termofilnimi asociacijami, kar še povečuje njeno bogato biotsko raznolikost flore in vegetacije.

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Avtor fotografij: V. Žagar

Figure 4: Association Querco-Ostryetum on the slopes of Kozica by Rimske Toplice
Slika 4: Asociacija Querco-Ostryetum na pobočju Kozice pri Rimskih Toplicah.

Figure 5: Association Querco-Ostryetum in the vicinity of Trbovlje in Zasavje
Slika 5: Asociacija Querco-Ostryetum v okolici Trbovelj v Zasavju.

Figure 6: Recognisable scrub structure of the association Querco-Ostryetum (Dol by Predgrad in the Kolpa valley)
Slika 6: Prepoznavna grmiščnata struktura asociacije Querco-Ostryetum (Dol pri Predgradu v Kolpski dolini).

Figure 7: View of a stand of the association Querco-Ostryetum (Kamnik in the Savinja valley)
Slika 7: Pogled v sestoj asociacije Querco-Ostryetum (Kamnik v Savinjski dolini).

PHYTOCOENOLOGICAL TABLE (Fitocenološka tabela)1: QUERCO-OSTRYETUM Ht.1938

Sinsistematical characteristic (Sinsistematska pripadnost)																																	
Number of relevé (Zaporedna številka popisa)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Working No of relevé (Delovna številka popisa)		32/83	21/82	25/82	28/83	35/82	13/84	22/81	24/81	19/81	31/83	37/82	26/82	15/84	36/82	49/77	50/77	51/77	101/76	102/76	103/76	104/76	205/62	210/62	1/69	211/62	204/62	22/69	7/65	5/65	17/69		
Date (Datum)		2.8.83	28.7.82	29.7.82	4.8.83	30.7.82	14.8.84	16.8.81	14.8.81	15.8.81	5.8.83	30.7.82	29.7.82	11.7.84	28.7.82	18.8.77	18.8.77	18.8.77	21.9.76	21.9.76	21.9.76	21.9.76	7.10.62	20.10.62	5.7.69	20.10.62	7.10.62	6.11.69	7.10.65	6.10.65	31.10.69		
Altitude in m (Nadmorska višina v m)		580	450	490	480	450	510	720	330	460	630	480	350	550	430	500	540	600	600	600	620	630	620	620	680	620	640	540	670	750	650		
Aspect (Nebesna lega)		S	S	SW	SW	S	SSW	S	S	S	SW	S	SW	SSW	W	SW	S	S	SW	SW	SE	SE	S	SSW	S-W	SE	S	W	WNW	SE	SW		
Slope in degrees (Nagib v stopinjah)		50	40	35	30	30	30	50	35	50	45	40	35	30-35	35	35	35	30-35	35-40	30	25-30	45	40	35	20	30	40	15-20	30	20	20		
Bedrock (Geološka podlaga)		lime	dolo, lime	dolo, lime	dolo	lime	dolo, lime	dolo, lime	dolo	dolo, lime	lime	dolo	dolo	dolo, lime	dolo, lime	dolo	dolo	dolo	dolo	dolo	dolo	dolo	dolo	dolo	dolo	dolo	dolo	lime	dolo	lime	lime		
Stoniness in % (Kamnitost v %)		30	10	20	0	30	0	10	0	10	20	0	0	5	20	0	0	0	0	0	0	0	10	0	0	0	0	30	0	60	60		
Cover (Pokrovnost) %:																																	
Tree layer (drevesna plast)	Ib	30	0	0	30	60	60	30	10	30	30	70	0	40	70	20	20	40	0	90	20	0	0	80-90	10	90	90	90	80-90	0	70		
Shrub layer (grmovna plast)	II	70	90	60	70	40	70	60	60	60	60	60	60	70	70	100	100	70	70	50	90	100	80	30	80	40	50	40	60	70-80	50		
Herb layer (zeliščna plast)	III	100	100	100	90	90	100	90	100	90	100	100	90	100	60	90	90	90	100	80	100	100	100	90-100	90	90	100	80	50	50	20		
Moss layer (mahovna plast)	IV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	40		
Relevé (Velikost popisne ploskve) m^2		400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400		
Province (Pokrajina)		Kranjska	Štajerska	Štajerska	Štajerska	Štajerska	Kranjska	Štajerska	Štajerska	Kranjska	Kranjska	Štajerska	Štajerska	Kranjska	Štajerska	Kranjska	Štajerska	Štajerska	Štajerska	Štajerska	Štajerska	Štajerska	Štajerska	Štajerska	Kranjska	Štajerska	Štajerska	Kranjska	Kranjska	Kranjska	Kranjska		
Location (Kraj popisov)		Šentlambert	Zasavje	nad Orešjem	Bizeljsko	Pri gradu Bizelj	Zidani most	Zasavje	Senovo Lasiše	Posavje	Borovnica	Notranj sko	Radeče	Zasavje	Binkoštni vrh	Rimske Toplice	dolina Savinje	Šentlambert	Zasavje	Kozje Brdič	Kozjansko	Sv. Gore Zagaj	Posotelje	Iški vintgar	Okolica Ljubljane	Senovo Armeško	Posavje	Šmarno-gorska Grmada	Okolica Ljubljane	Boč	Podravinje	Boč	Podravinje	Boč	Podravinje	Boč	Podravinje	Boč	Podravinje	Slivnica	Notranjsko	Boč	Podravinje	Boč	Podravinje	Mala gora	Kočevsko	Slivnica	Notranjska	Mali Javornik	Kranjska	Mala gora	Kočevsko
Association (Asociacija)		QUERCO- OSTRYETUM CARPINIFOLIAE																															
Subassociation (Subasociacija)		GENISTETOSUM JANUENSIS																COTONOASTERETOSUM TOMENTOSAE					CHAMAECYTISETOSUM PURPUREUS						LATHYRO-QUERCETUM PETRAEAE					

Presence (Prezenca)

Protected species list (Seznam zavarovanih vrst; Skoberne 2007)

Red List categories (Kategorije vrst rdečega seznama; UL RS 82/2002)

Remarkable species (Znamenita vrsta; Wraber T. 1990)

CHARACTERISTIC SPECIES OF THE ASSOCIATION (Značilnice za asociacijo) QUERCO-OSTRYETUM Ht. 1938 corr. Zupančič & Žagar

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
Q_2	Quercus pubescens	I	2.1	-	-	1.1	1.1	1.1	2.2	1.1	2.2	2.2	2.1	-	1.1	2.2	2.1	2.3	2.1	-	1.1	1.2	-	-	2.1	-	3.2	2.2	.	.	.	.	19	26	. . .
		II	+.2	3.1	3.3	1.1	+.2	+.2	2.2	2.2	1.1	1.2	1.2	2.3	1.1	1.2	+	+	+	1.2	+	2.2	2.2	1.2	-	+.2	+	+	.	.	.	.	25		. . .
Q_2	Peucedanum cervaria	III	+.2	.	+.2	.	+	.	1.2	+.2	.	1.1	+.2	.	+	.	+.2	+		+	+	+	.	.	.	.	.	.	.	.	1.1	.	14		. . .
Q_2	Lathyrus niger		1.2	.	+.2	.	+.2	.	+.2	1.1	1.1	.	1.2	+.2	.	+.2	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	12	. . .
Q_1	Buglossoides purpurocaerulea		1.2	+		+.2	1.1	1.1	.	+.2	.	2.2	.	1.2	.	1.2	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	10	. . .
Q_1	Trifolium rubens		+	.	+.2	+.2	.	.	.	.	.	+	+.2	.	.	+.2	.	.	.		.	.	.	.	.	.	.	.	.	.	+	.	7	. . .
Q_1	Tamus communis		.	+.2	+	.	.	.	.	.	+.2	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	5	. . .

CHARACTERISTIC SPECIES OF THE SUBASSOCIATION (Značilnice za subasociacijo) QUERCO-OSTRYETUM GENISTETOSUM JANUENSIS subass. nova

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
EP	Genista januensis	III	+.2	1.1	+.2	+.2	+.2	+	+	+	+	1.1	1.1	1.1	+	.	+	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.	17	. . .
Q_2	Clematis recta	II	1.1	+.2	+	1.1	.	.	+	1.1	+.2	+	+.2	+	.	.	.	1.2	+	.	.	.	.	.	.	.	.	.	.	1.1	.	.	13	. . .
SS	Allium pulchellum	III	1.1	+	+	+	+	+	+	+	.	.	.	.	.	+	1.1	+	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	12	. . .
OC	Dianthus monspessulanus		1.1	+.2	+	.	+	.	.	.	+.2	+.2	+.2	+.2	.		+	.	+	.	.	.	.	.	.	.	.	.	+	+	.	12	. . .
Q_2	Campanula persicifolia		+	+	.	+	+	+	.	.	+	+	.	.	.	+.2	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	11	. . .
FB	Scabiosa triandra (=S. gramuntia)		+	.	1.1	+.2	1.1	.	1.1	+	1.1	.	1.1	1.1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	. . .

CHARACTERISTIC SPECIES OF THE SUBASSOCIATION (Značilnice za subasociacijo) QUERCO-OSTRYETUM COTONEASTERETOSUM TOMENTOSAE subass. nova

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
EP	Cotoneaster tomentosus	II	.	.	.	.	.	.	+.2	.	.	.	.	.	.	.	+	.	+	2.3	1.1	2.2	3.3	.	.	.	.	.	.	.	.	.	7	. . .
Q_2	Inula conyza	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	+.2	+.2	1.2	+	+.2	.	.	.	.	.	.	.	.	.	.	6	. . .

CHARACTERISTIC SPECIES OF THE SUBASSOCIATION (Značilnice za subasociacijo) QUERCO-OSTRYETUM CHAMAECYTISETOSUM PURPUREUS subass. nova

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
P	Juniperus communis	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	$+^0$	+	+	+	.	.	.	6	. . .
EP	Chamaecytisus purpureus	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	1.2	.	+	1.2	.	.	.	.	4	. . •

CHARACTERISTIC SPECIES OF THE ASSOCIATION (Značilnice za asociacijo) LATHYRO-QUERCETUM Ht. (1938) 1950

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
F_3	Quercus petraea	I	2.1	-	-	1.2	2.3	+	.	-	.	1.1	2.2	-	1.2	3.2	.	.	.	.	-	-	-	.	.	.	.	.	2.1	2.1	-	3.1	11	19	. . .
		II	-	1.1	1.1	-	2.2	-	.	+	.	1.1	2.3	1.1	-	+	.	.	.	.	+	+	2.2	.	.	.	.	.	-	+	1.1	+	14		. . .
Q_2	Lathyrus niger	III	1.2	.	+.2	.	+.2	.	+.2	1.1	1.1	.	1.2	+.2	.	+.2	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	12	. . .
MA	Serratula tinctoria		.	+	.	+	.	.	.	.	+.2	.	+.2	.	1.1	1.1	+.2	+	.	.	.	.	.	.	.	.	.	.	.	.	1.1	1.1	+	11	. . .
Q_1	Tamus communis		.	+.2	+	.	.	.	.	.	+.2	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	5	. . .

OO FRAXINO ORNI-OSTRYION CARPINIFOLIAE Tomažič 1940

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
	Fraxinus ornus	I	-	-	-	2.2	-	2.2	-	-	+.2	1.1	2.1	-	2.2	-	+	-	1.2	-	2.3	-	-	-	3.2	-	2.2	3.2	2.2	2.1	-	2.2	15	30	. . .
		II	1.2	1.2	1.1	2.2	1.2	1.2	2.2	1.1	1.2	2.2	2.2	1.1	2.2	2.2	3.3	3.3	3.3	2.3	1.1	2.2	3.3	3.2	2.2	3.3	2.2	1.1	2.2	2.2	2.2	-	29		. . .
	Ostrya carpinifolia	I	3.2	-	-	2.2	2.2	2.3	2.2	-	1.1	2.2	3.2	-	-	2.2	+	+.2	1.2	-	2.3	-	-	-	3.2	-	2.2	3.3	4.2	1.1	-	.	18	29	. . .
		II	2.2	2.3	2.2	2.3	3.2	2.2	3.2	1.2	2.3	2.2	+.2	1.1	3.2	1.1	2.3	1.2	2.2	2.3	+	1.2	1.1	2.2	1.2	1.3	-	1.1	+	1.2	2.2	.	28		. . .
	Mercurialis ovata	III	1.1	1.1	1.1	1.1	1.1	+	+	1.1	1.1	.	1.1	1.1	1.1	+.2	1.1	1.1	1.1	+.2	1.1	+.2	+	1.1	1.2	.	1.1	+	.	.	.	.		24	. . .
		I	-	-	-	-	1.1	-	.	1.1	1.2	.	-	-	.	1.2	.	.	.	.	.	.	.	.	.	.	-	-	-	1.2	+	-	.	6		. . .
	Quercus cerris	II	1.1	1.1	1.2	1.1	-	+	.	2.1	+	.	1.1	1.2	.	1.2	.	.	.	.	.	.	.	.	.	.	-	+	+	+	+	+	.	15	17	. . .
		III	-	-	-	-	-	-	.	-	-	.	-	-	.	-	.	.	.	.	.	.	.	.	.	+	-	-	-	-	-	.	1		. . .

	Cotinus coggygria	II	2.2	.	.	1.2	.	1.2	+.2	1.2	3.2	.	.	.	2.3	.	.	.	.	1.2	.	+	1.2	.	.	.	.	.	.	.	.	.		10	.	.	.
	Euonymus verrucosa		.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+.2	.	.	.	.	.	.	+	.	1.1	+	.		6	.	.	.
	Pulmonaria angustifolia	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.		1	.	.	.
Q_1	QUERCION PUBESCENTI-PETRAEAE Br.-Bl. 1931																																							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30									
	Valeriana officinalis	III	+.2	.	.	+	+.2	.	1.1	.	1.1	+.2	+	.	.	.	+.2	1.1	1.1	.	+	.	.	.	+	.	+	+	.	.	+	+		16	.	.	.
	Buglossoides purpurocaerulea		1.2	+		+.2	1.1	1.1	.	+.2	.	2.2	.	1.2	.	1.2	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.		10	.	.	.
	Trifolium rubens		+	.	+.2	+.2	.	.	.	.	.	+	+.2	.	.	+.2	.	.	.		.	.	.	.	.	.	.	.	.	.	+	.		7	.	.	.
	Tamus communis		.	+.2	+	.	.	.	.	.	+.2	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.		5	.	.	.
Q_2	QUERCETALIA PUBESCENTIS Br.-Bl. (1931) 1932 s. lat.																																							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30									
	Melittis melissophyllum	III	1.1	1.1	1.1	1.1	+.2	1.1	1.1	+.2	+.2	1.1	1.1	1.1	1.1	1.1	+	1.1	1.1	+	1.1	1.1	+	+	1.1	1.1	1.1	+	+	+	+	+		30	.	.	.
	Sorbus aria	I	1.2	-	-	2.2	-	2.3	-	-	-	-	-	-	-	-	-	+	.	-	1.2	+	-	-	2.2	.	1.1	1.2	.	+	-	1.1	11	27	.	.	.
		II	1.2	1.2	1.2	2.3	1.2	3.2	1.2	1.1	1.2	1.2	2.2	2.2	3.2	1.2	1.2	1.2	.	+.2	+	2.2	1.2	1.2	1.1	.	+	2.2	.	1.2	2.2	+	27		.	.	.
	Peucedanum oreoselinum	III	1.1	1.1	+.2	1.1	+.2	1.1	.	+	+.2	+.2	+.2	1.1	1.2	+	+.2	+	+	1.1	+	1.1	1.1	+	+	+	+	+	+	.	.	+		27	.	.	.
	Quercus pubescens	I	2.1	-	-	1.1	1.1	1.1	2.2	1.1	2.2	2.2	2.1	-	1.1	2.2	2.1	2.3	2.1	-	1.1	1.2	-	-	2.1	-	3.2	2.2	.	.	.	.	19	26	.	.	.
		II	+.2	3.1	3.3	1.1	+.2	+.2	2.2	2.2	1.1	1.2	1.2	2.3	1.1	1.2	+	+	+	1.2	+	2.2	2.2	1.2	-	+.2	+	+	.	.	.	.	25		.	.	.
	Rhamnus catharticus		+	+	.	+.2	+	+	+	1.1	+	+	.	+.2	.	.	+	+	.	+	+	+	.	+	+	+	+	+	+	+	+	.		23	.	.	.
	Viola hirta	III	+	+	+	+.2	.	.	+	+	+	+	+	+.2	.	+	+.2	+	+	.	.	+	+	.	+	.	+	.	.	+	+	.		20	.	.	.
	Dictamnus albus		.	+	+	+	.	.	1.1	+	+	.	.	.	+.2	.	1.1	1.2	1.1	+.2	+.2	1.1	1.1	1.1	1.1	.	1.1	1.1	.	.	.	.		18	.	.	.
	Polygonatum odoratum		+.2	+	+.2	+	+	.	+	+	+	.	+.2	1.1	1.1	.	+	+	+	1.1	.	+	+.2	.	.	.	.	.	.	.	+	.		18	.	.	.
	Tanacetum corymbosum		+.2	1.1	.	.	1.1	.	.	+	+	+	1.1	+	+	1.1	.	.	.	+	+	1.2	.	.	1.1	.	.	+	.	.	1.2	.		16	.	.	.
	Peucedanum cervaria		+.2	.	+.2	.	+	1.1	1.2	+.2	.	1.1	+.2	.	+	.	+.2	+		+	+	+	.	.	.	.	.	.	.	.	1.1	.		15	.	.	.
	Clematis recta	II	1.1	+.2	+	1.1	.	.	+	1.1	+.2	+	+.2	+	.	.	.	1.2	+	.	.	.	.	.	.	.	.	.	.	1.1	.	.		13	.	.	.
	Lathyrus niger	III	1.2	.	+.2	.	+.2	.	+.2	1.1	1.1	.	1.2	+.2	.	+.2	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.		12	.	.	.
	Sorbus torminalis	I	.	.	.	-	-	.	.	-	-	-	-	-	.	-	.	.	.	.	.	.	.	.	-	.	.	1.1	+	.	.	.	2	11	.	.	.
		II	.	.	.	1.1	+	.	.	+	+.2	1.2	+	+	.	1.1	.	.	.	.	.	.	.	.	+	.	.	+	-	.	.	.	10		.	.	.
	Campanula persicifolia	III	+	+	.	+	+	+	.	.	+	+	.	.	.	+.2	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.		11	.	.	.
	Hypericum montanum		+	+	.	+	.	+	+	+	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.		11	.	.	.
	Teucrium montanum		.	.	.	+	.	+	.	+	.	.	.	.	1.2	.	.	.	.	+.2	.	.	+.2	.	.	.	.	+	.	.	.	.		7	.	.	.
	Inula conyza		.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	+.2	+.2	1.2	+	+.2	.	.	.	.	.	.	.	.	.	.		6	.	.	.
OC	Asparagus tenuifolius		+	.	.	+	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	+	+.2	.		6	.	.	.
	Epipactis atrorubens		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	+	+	+	.	.	.	.	.		6	H	.	.
	Camptothecium lutescens	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.3	1.3	1.3	3.4		4	.	.	.
	Cephalanthera longifolia	III	.	.	.	.	+	.	.	.	.	.	+.2	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.		4	H	.	.
	Quercus streimii (Q. pubescen-	I	.	.	-	.	1.2	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	2	3	.	.	.
	sXQ. petraea)	II	.	.	+	.	1.2	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	.	.	.	2		.	.	.
	Peucedanum austriacum	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	+	.		3	.	.	.
	Satureja montana subsp. variegata		.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.		2	.	.	.
	Arabis turrita		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.		1	.	.	.
	Aristolochia lutea (=A. pallida)		.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		1	.	.	.
	Laserpitium latifolium		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.		1	.	.	.
	Paeonia officinalis		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.		1	H	.	.
	Prunus mahaleb	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.		1	.	.	.

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
P	PRUNETALIA SPINOSAE R. Tx. 1952 s. lat.																																			
B	Viburnum lantana	II	+	1.2	2.2	1.2	1.2	2.3	.	2.2	1.1	2.2	2.3	2.2	+.2	2.1	+	+.2	+.2	+	2.2	+.2	1.2	2.1	1.2	1.2	2.2	2.2	1.1	+	+	1.1	29	.	.	.
	Crataegus monogyna		1.1	+	+	.	+	1.1	1.1	+	+.2	1.1	1.2	1.1	.	2.2	+	.	.	+	.	.	.	.	.	+	+	.	.	+	.	+	+	19	.	.	.
	Cornus mas		.	1.1	1.2	.	1.1	1.1	1.1	1.2	1.2	.	1.1	+.2	.	1.2	1.2	+	+.2	.	.	.	.	.	.	+	+	.	1.2	.	1.2	.	1.2	18	.	.	.
	Cornus sanguinea		.	+.2	.	+	+	.	.	1.2	+	.	+	.	.	1.2	+	.	+	.	+.2	+	.	.	.	+	.	.	+	1.2	+	1.1	16	.	.	.
	Ligustrum vulgare		.	+	.	+.2	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	1.1	.	+	2.2	.	.	2.2	8	.	.	.
B	Berberis vulgaris		.	.	.	+	.	1.1	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	1.1	.	.	+	.	.	+	8	.	.	.
	Juniperus communis		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	$+^0$	+	+	+	.	.	.	6	.	.	.
RU	Fragaria moschata (=F. elatior)	III	+	.	.	.	+.2	.	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.
	Rosa canina	II	.	.	+	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	4	.	.	.
	Prunus spinosa		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	3	.	.	.
C	CARPINION Issler 1931 em. Oberdorfer 1957 s. lat.																																			
	Rosa arvensis	II	+	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	1.1	+	+	+	+	12	.	.	.
	Lonicera caprifolium		+	+	+	.	+	+	.	.	.	.	.	.	.	+.2	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	9	.	.	.
	Acer campestre		.	.	.	.	+	.	.	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	6	.	.	.
	Carpinus betulus		.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1.2	+.2	+	5	.	.	.
	Cruciata glabra	III	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	+	.	+	5	.	.	.
	Prunus avium	II	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	3	.	.	.
F_1	AREMONIO-FAGION (Ht. 1938) Török, Podani & Borhidi 1989																																			
	Cyclamen purpurascens	III	.	+	+	+	+	.	.	+	+	+	+	+	.	+	+	+	+	+	+	+	+	+	.	+	+	+	1.1	1.1	+	1.2	25	O^0	.	.
	Knautia drymeia subsp. drymeia		+	.	+	+	+	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	1.1	+	.	+	.	.	.	.	9	.	.	.
	Helleborus niger subsp. niger		.	.	.	+.2	.	+	+	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	1.1	.	.	8	O^0	.	.
	Aremonia agrimonoides		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	4	.	.	.
	Hacquetia epipactis		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	.	.	+	1.1	.	.	3	.	.	•
	Omphalodes verna		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	1.1	3	.	.	.
	Anemone trifolia		.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.
	Epimedium alpinum		.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
	Rhamnus fallax	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.
F_2	FAGETALIA SYLVATICAE Pawl. 1928																																			
	Primula vulgaris	III	+	+	+	+	+	.	.	.	+	+	+	.	.	+	+.2	.	+	.	+	+	.	.	+	+	+	+	.	+	.	.	18	.	.	.
	Digitalis grandiflora		+	.	.	.	+.2	+	.	.	+	1.1	+.2	.	.	.	+	+	+	+	.	.	+	.	+	.	.	+	.	.	.	+	.	14	.	.	.
	Salvia glutinosa		+	.	.	+	+	.	.	+	.	+	.	.	.	+	+	.	.	.	+	.	.	.	+	$+^0$	.	.	+	+	+	.	13	.	.	.
	Fagus sylvatica	I	.	.	.	.	+	-	.	.	.	1.1	.	.	.	-	.	.	.	.	-	+	.	.	1.1	.	+	+	.	1.1	.	+	8	11	.	.	.
		II	.	.	.	.	+	$+^0$	.	.	.	1.1	.	.	.	+	.	.	.	.	+	-	.	.	+	.	-	+	.	-	.	+	8		.	.	.
	Campanula trachelium	III	+	+	.	.	+	+	+	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	11	.	.	.
	Melampyrum nemorosum subsp. nemorosum		.	+.2	1.1	.	1.1	.	+	.	+.2	.	+.2	1.1	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	+.2	10	.	.	.
	Asarum europaeum		.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	1.2	+	.	6	.	.	.
	Galium laevigatum		.	.	.	+	+.2	.	.	.	.	+.2	.	.	.	.	.	.	+	.	+.2	.	.	.	.	.	.	+	.	.	.	.	6	.	.	.
	Acer platanoides	II	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	6	.	.	.
	Epipactis helleborine	III	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	+	6	H	.	.
	Neottia nidus-avis		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	+	.	+	+	.	.	6	H	.	.

	Cephalanthera rubra		.	.	.	.	.	.	1.1	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+		5	H	V	.
	Cephalanthera damasonium		.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	1.1	.	.	.	.		4	H	V	.
	Euphorbia amygdaloides		.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1.1	.	+	.		4	.	.	.
	Mercurialis perennis		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	+	+	+		4	.	.	.
	Acer pseudoplatanus	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	.	.	.	+	.		4	.	.	.
	Lathyrus vernus	III	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.		4	.	.	.
	Stachys sylvatica		.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.		4	.	.	.
	Melica nutans		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.	.	.	.	+	+		3	.	.	.
	Daphne mezereum	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	+	.	.		3	.	.	.
	Euphorbia dulcis	III	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.		3	.	.	.
	Mycelis muralis		.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+		3	.	.	.
RP	QUERCETALIA ROBORIS-PETRAEAE R.-Tx. (1931) 1937 s. lat.																																						
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30								
RP_1	Galium lucidum	III	.	.	.	1.1	.	+.2	.	+	.	.	.	.	.	1.1	1.1	1.2	1.2	.	1.2	+.2	1.1	.	+	1.2	1.1	1.1	1.1	+	+	+		18	.	.	.
	Lembotropis nigricans		.	.	.	.	.	+	1.1	1.1	1.2	+	.	.	+	.	+	+.2	+	.	.	.	+	.	.	.	.	.	.	.	.	.		10	.	.	.
	Festuca heterophylla		.	+	.	+	.	.	.	.	.	.	+	.	.	+	.	1.2	2.2	.	.	.	.	.	+	+.2	.	.	.	.	+	.		9	.	.	.
	Pteridium aquilinum		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	$+^0$	.	+	.	.	+	.		4	.	.	.
F_3	QUERCO-FAGETEA Br.-Bl. & Vlieger in Vlieger 1937																																						
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30								
	Quercus petraea	I	2.1	-	-	1.2	2.3	+	.	-	.	1.1	2.2	-	1.2	3.2	.	.	.	.	-	-	-	.	.	.	.	.	2.1	2.1	-	3.1	11	19	.	.	.
		II	-	1.1	1.1	-	2.2	-	.	+	.	1.1	2.3	1.1	-	+	.	.	.	.	+	+	2.2	.	.	.	.	.	-	+	1.1	+	14		.	.	.
	Convallaria majalis	III	.	+.2	.	.	1.1	.	.	.	.	.	1.1	1.1	.	1.1	.	.	.	+	.	+	.	.	.	.	.	+	.	+	1.1	+		11	.	.	.
	Lonicera xylosteum	II	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	+	+	+	.		7	.	.	.
	Hepatica nobilis	III	.	.	.	.	.	.	.	.	+.2	+	.	.	.	+	.	+	+	.	.	.	.	.	.	1.1	.	.	.	.	.	.		6	.	.	.
	Clematis vitalba	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	+	.	.	.	+	.	+	+		6	.	.	.
	Carex digitata	III	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	+.2	1.2	+.2	+		5	.	.	.
	Tilia cordata	I	-	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	2.2	1	4	.	.	.
		II	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	-	3		.	.	.
A_1	Thalictrum aquilegiifolium	III	.	.	.	.	.	.	.	+	.	.	.	.	1.1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.		4	.	.	.
	Ctenidium molluscum	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.3	1.3	.	2.3		3	.	.	.
	Corylus avellana	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.3	.	.	.	1.2	+	.		3	.	.	.
EP	ERICO-PINETEA Ht. 1959 s. lat.																																						
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30								
	Buphthalmum salicifolium	III	1.1	1.1	1.2	+.2	1.2	1.1	1.1	+.2	+.2	2.2	1.2	1.1	2.2	+	1.1	+	+.2	+.2	+	+	.	1.1	1.1	+.2	+	1.1	+	+	+	+		29	.	.	.
EP_2	Chamaecytisus hirsutus		+.2	+.2	.	+	+.2	.	+.2	.	.	+.2	+.2	1.1	.	.	1.1	1.2	+.2	+.2	+	+	+	.	.	+.2	.	+	.	+	+	.		19	.	.	.
EP_2	Polygala chamaebuxus		.	.	.	+.2	.	+	+.2	+	.	+.2	.	.	1.2	.	+.2	1.2	+.2	2.2	.	2.2	.	1.1	+	.	1.2	1.2	.	.	1.2	+.2		17	.	.	.
HP	Genista januensis		+.2	1.1	+.2	+.2	+.2	+	+	+	+	1.1	1.1	1.1	+	.	+	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.		17	.	.	.
EP_2	Erica carnea		.	.	.	1.2	.	2.3	1.2	3.4	.	.	.	1.2	1.2	.	.	.	.	2.2	+.2	3.4	2.2	1.3	4.4	.	4.4	5.5	.	+.2	.	.		15	.	.	.
FP	Amelanchier ovalis	II	1.1	1.1	1.1	+.2	.	2.2	1.2	.	+.2	1.1	1.2	.	2.2	.	.	.	.	.	.	.	.	2.2	+	.	2.2	1.1	.	.	.	.		14	.	.	.
EP_2	Carex alba	III	+	+.2	+	+.2	.	+.2	.	.	1.2	+.2	1.2	+.2	.	.	+.2	.	.	.	.	.	.	1.2	1.4	.	.	.	.	.	.	+		14	.	.	.
HP	Rhamnus saxatilis	II	.	.	.	1.2	.	+.2	.	1.1	.	.	.	.	1.2	.	.	.	+.3	+	+	+	+.2	+	+	.	.	+	.	.	.	.		12	.	.	.
	Dianthus monspessulanus	III	1.1	+.2	+	.	.	+	.	.	.	+.2	+.2	+.2	+.2	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.		12	*	.	.
HP	Iris graminea		+	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	+.2	+	.	1.1	+	.	.	+	+	+	+	.	.	.	.		10	H	.	.
FP	Cotoneaster tomentosus	II	.	.	.	.	.	.	+.2	.	.	.	.	.	.	.	+	.	+	2.3	1.1	2.2	3.3	.	.	.	.	.	.	.	.	.		7	.	.	.
	Calamagrostis varia	III	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	+.3	.	.	.	2.3	.	2.2	.	1.2	.	.	1.2	2.2	.		7	.	.	.

	Laserpitium siler		.	+	.	.	.	.	.	+.2	.	.	+	.	.	.	1.3	.	+.2	+.2	.	.	.	.	.	.	.	.	.	+	.	.	7	.	.	.
	Chamaecytisus purpureus		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	1.2	.	+	1.2	.	.	.	.	4	.	.	•
FP	Daphne cneorum	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.2	+	.	1.2	+	.	.	.	.	.	.	.	.	.	4	.	o	.
	Cirsium erisithales	III	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.
HP	Genista radiata		.	.	.	.	.	.	+.2	.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.
	Pinus sylvestris	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	+	.	.	1	2	.	.	.
		II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	-	.	.	1		.	.	.

VP$_3$ VACCINIO-PICEETEA Br.-Bl. in Br.-Bl. Et al. 1939 em. Zupančič (1976) 2000 s. lat.

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
	Solidago virgaurea	III	.	.	+	+	+	.	.	+	.	+	+.2	+.2	.	+	+	.	.	.	.	.	.	.	+	.	+	+	+	+	1.1	+	16	.	.	.
	Hypnum cupressiforme	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+.2	+.3	.	.	+.3	4	.	.	.
	Scapania nemorea		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.3	.	.	+.3	2	.	.	.
	Laserpitium peucedanoides	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.1	.	.	.	+	.	.	.	.	2	.	.	.
	Grimmia pulvinata	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.3	+	2	.	.	.
VP$_1$	Hieracium sylvaticum	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	2	.	.	.
	Abies alba	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	$+^0$	$+^0$	2	.	.	.

SC SCORZONERETALIA VILLOSAE H-i & Ht. em H-i 1973 s. lat.

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
	Helianthemum ovatum	III	+.2	.	+.2	.	.	+	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	.	.	.
HM	Cirsium pannonicum		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	+	.	.	.	+	+	.	5	.	.	.
	Centaurea triumfettii		1.2	.	+	+	.	.	.	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.
	Satureja montana subsp. variegata		.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.	3	.	.	.
SV$_1$	Betonica serotina		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	2	.	.	.

TG TRIFOLIO-GERANIETEA SANGUINEI Th. Müller 1961 s. lat.

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
GE	Vincetoxicum hirundinaria	III	1.1	+.2	.	+	1.1	1.1	1.1	+	1.1	2.1	+.2	1.1	2.1	1.1	+	+.2	+.2	+	+	.	+	1.1	+	+	+	+	.	+	+	.	26	.	.	.
GE	Anthericum ramosum		1.1	1.1	2.2	+.2	1.2	1.1	1.1	1.1	1.1	.	+.2	1.1	+.2	1.1	2.2	+	1.1	1.1	+	+	+	+	+	.	1.1	.	.	.	.	.	23	.	.	.
GE	Geranium sanguineum		+	1.1	1.1	1.1	+.2	1.1	1.1	.	1.1	.	1.1	1.2	1.1	+.2	+	+.2	+.2	+.2	.	+	+	+	+	.	+	.	.	+	+	.	23	.	.	.
OR	Dorycnium germanicum		+.2	1.2	1.1	1.1	.	1.2	+.2	+.2	1.2	+.2	.	1.1	2.1	.	+	+	+.2	+.2	.	+	+.2	+	.	+.2	+	.	.	.	.	.	20	.	.	.
OR	Origanum vulgare		+.2	+	+	+	.	+	.	.	+	.	+.2	+.2	+	.	+	+	.	.	+	.	+	.	+	.	+	.	.	.	+	+	17	.	.	.
GE	Inula hirta		1.1	1.2	.	1.1	.	1.1	1.1	1.1	1.2	.	+.2	1.1	2.1	.	.	.	.	.	.	.	.	.	.	+	+	+	1.1	.	.	.	.	14	.	.	.
OR	Calamintha clinopodium		+	.	.	.	.	.	+	+	.	.	.	.	.	.	+	1.1	+.2	.	.	.	.	.	.	.	+.2	.	+	+	+	+	+	12	.	.	.
GE	Thalictrum minus		.	.	.	+	.	+	.	.	+	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	+	+	.	.	+	.	.	9	.	.	.
OR	Sedum maximum		1.1	+	.	.	+.2	.	+	.	.	1.1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	*	.	.
	Centaurea fritschii		.	+	+.2	+	.	.	+	.	.	.	.	1.1	.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	6	.	.	.
GE	Coronilla coronata		.	+	+.2	.	.	+.2	.	.	+	.	.	.	.	.	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.
TM	Trifolium medium		.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.
OR	Coronilla varia		.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	+.2	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.

NC NARDO-CALLUNETEA Prsg. 1949 s. lat.

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
	Chamaecytisus supinus	III	+.2	+.2	1.2	+	+.2	.	.	.	1.2	+	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	9	.	.	.
G	Genista germanica		.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	+	.	3	.	.	.

S_3	SESLERIETEA Br.-Bl. 1948 em. Oberd. 1978 s. lat.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
S_2	Sesleria albicans	III	+.2	.	+.2	+.2	.	.	.	1.2	1.2	.	.	+.2	+.2	.	+.2	.	.	2.2	.	1.2	2.2	3.3	+.2	+.2	+.2	1.2	.	.	.	.	16	.	.	.
S_2	Globularia cordifolia		.	.	+	+.2	.	.	.	.	.	.	.	.	+.2	.	.	.	.	+.2	.	.	+.2	1.2	.	.	.	.	+.3	.	.	.	.	7	.	.	.
S_2	Globularia nudicaulis		.	.	.	.	.	.	+.2	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.
S_2	Helianthemum grandiflorum		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	2	.	.	.
S_2	Lilium bulbiferum		.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2	*	.	.
FB	FESTUCO-BROMETEA Br.-Bl. & R. Tx. 1943 s. lat.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
B_2	Teucrium chamaedrys	III	1.1	+.2	+	+.2	1.1	1.1	+.2	1.1	1.1	1.1	+.2	+.2	1.1	.	+.2	+.2	1.1	+.2	.	.	+.2	.	+	1.1	1.1	+	+	+	+	+	26	.	.	.
MB	Carex flacca		.	2.1	2.2	+.2	1.1	2.2	+.2	+.2	+.2	+.2	1.2	1.1	1.1	1.1	+.2	.	.	1.2	+.2	+.2	+.2	.	+	1.2	.	.	1.2	+	.	1.1	23	.	.	.
	Brachypodium rupestre		2.3	+.2	.	+.2	.	.	1.1	+.2	1.2	2.3	+.2	+.2	1.2	+.2	1.2	2.3	1.2	2.2	1.2	1.2	1.2	.	.	+	.	.	4.4	+	.	2.3	22	.	.	.
	Euphorbia cyparissias		+	+	+	+	+	+	+	+	+	+	.	+	+	+	+	.	.	+	.	.	.	+	.	+	.	+	+	.	.	+	20	.	.	.
X	Carex humilis		+.2	.	.	+.2	.	.	.	.	.	.	.	.	+.2	.	3.3	2.2	2.3	2.2	3.4	1.2	2.2	.	+	3.3	1.2	+	+.2	2.2	+	+	18	.	.	.
	Aster amellus		.	.	.	+	.	1.1	+.2	+	+.2	1.1	+.2	+.2	.	.	+	+	+	1.2	+	.	1.1	+	+	.	.	.	.	.	.	.	16	.	.	.
MB	Euphorbia verrucosa		.	.	.	+	.	.	.	.	.	.	.	+	.	.	+	+.2	+	+	+	+	+	1.1	.	+	+	.	.	.	.	.	12	.	.	.
MB	Scabiosa triandra (=S. gramuntia)		+	.	1.1	+.2	1.1	.	1.1	+	1.1	.	1.1	1.1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	.	.	.
MB	Prunella grandiflora		+.2	.	.	.	.	.	+	+	1.1	.	.	+	+.2	+	.	.	.	.	.	.	.	.	.	+.2	+	.	.	.	.	.	9	.	.	.
	Asperula cynanchica		.	.	.	.	.	.	+	+	+	.	.	+	.	.	+	+.2	+.2	+	.	.	+	.	.	.	.	.	.	.	.	.	9	.	.	.
	Stachys recta		1.1	.	1.1	+	.	.	.	.	.	.	1.1	1.1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	+	8	.	.	.
	Galium verum		1.1	.	.	.	.	.	+.2	.	+.2	1.2	+.2	.	+	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	.	.	.
X	Linum tenuifolium		+.2	.	+.2	+	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.
	Sanguisorba minor		.	+	+	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	5	.	.	.
MB	Silene vulgaris subsp. antelopum (=S. bosniaca)		.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	+	.	.	.	+	.	.	.	.	.	.	5	.	.	.
	Asperula aristata		.	+.2	+.2	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.
B_2	Anthyllis vulneraria		.	+.2	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	3	.	.	.
	Ajuga genevensis		.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.
	Pimpinella saxifraga		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	3	.	.	.
	Aster linosyris		.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.
	Scabiosa columbaria		.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2			
SS	SEDO-SCLERANTHETEA Br.-Bl. 1955 em. Th. Müller 1961 s. lat.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
	Allium pulchellum	III	1.1	+	+	+	+	+	+	+	.	.	.	.	.	+	1.1	+	1.1	.	.	.	.	.	.	.	.	.	.	.	.	.	12	.	.	.
	Thymus serpyllum agg.		.	+.2	+.2	+	.	+.2	+.2	.	.	.	+	+.2	.	.	.	.	.	1.2	.	.	.	.	.	+.2	.	+.2	+	.	.	.	11	.	.	.
	Allium montanum		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.2	.	.	+	+	.	.	+	+	.	.	.	.	5	.	.	.
SFP	Leontodon incanus		.	+.2	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	5	.	.	.
	Jovibarba hirta		+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+.2	.	.	.	.	.	.	.	.	.	3	*	.	.
MA	MOLINIO-ARRHENATHERETEA Tx. 1937 s. lat.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
M_1	Inula salicina	III	1.1	+.2	.	1.1	.	1.1	1.1	+.2	1.1	.	1.1	+.2	2.1	+.2	.	.	.	.	.	.	.	.	1.1	.	1.2	.	1.1	+	2.2	+	17	.	.	.
M_2	Betonica officinalis		.	.	.	+.2	.	+	.	.	.	+	.	.	+	.	+	+	+	.	.	+	.	.	+	+	+	.	+	+	+	+	15	.	.	.
	Centaurea jacea agg. (C. angustifolia)		.	.	+	.	.	.	.	.	1.1	.	1.1	.	1.1	.	+.2	+.2	+	+.2	+.2	.	+	.	.	.	.	.	1.1	.	.	+	12	.	.	.
M2	Serratula tinctoria		.	+	.	+	.	.	.	.	+.2	.	+.2	.	1.1	1.1	+.2	+	.	.	.	.	.	.	.	.	.	.	.	1.1	1.1	+	11	.	.	.
AR	Dactylis glomerata		+	+.2	.	.	.	.	.	.	.	.	+.2	.	.	+	1.2	+.2	+.2	.	.	.	.	.	+	.	+	.	.	.	+	.	10	.	.	.

AR	Lotus corniculatus		.	.	.	+	.	+	+	1.1	.	.	.	+	+	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	9	.	.	.
AR	Galium mollugo		.	1.2	1.2	.	+	.	.	1.2	+.2	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	.	.	.
M_2	Genista tinctoria		.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	+	+	6	.	.	.
PT	Phyteuma ovatum (P. halleri)		.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+.2	+.2	.	.	.	.	.	+	.	.	.	.	.	.	.	4	.	.	.
AS	ASPLENIETEA TRICHOMANIS Br.-Bl. in Meier & Br.-Bl. 1934 corr. Oberd. 1977 s. lat.																																			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
	Asplenium ruta-muraria	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	3	.	.	.
	Asplenium trichomanes		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	3	.	.	.
O	OTHER SPECIES (Ostale vrste)																																			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
ONO	Melandryum album	III	+	+	+.2	+.2	.	.	.	+	.	+	.	+.2	.	.	+.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8	.	.	.
E	Fragaria vesca		.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	+	.	+	.	+	1.1	+	.	+	8	.	.	.
	Scabiosa hladnikiana		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	+	.	.	.	.	4	.	.	•
	Thesium divaricatum		.	+	+.2	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.
M	MOSSES (Mahova)																																			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
	Tortella tortuosa	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+.2	+.2	+.2	.	5	.	.	.
	Neckera crispa		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+.3	+	4	.	.	.

LEGEND (*Legenda*)

Sinsistematical characteristic (*Sinsistematska pripadnost*)

OC Ostryo-Carpinion orientalis Ht. 1954 corr. 1958
A_1 Adenostylion aAlliariae Br.-Bl. 1925
AR Arrhenatheretalia R. Tx. 1931
B Berberidion Br.-Bl. 1950
B_2 Brometalia erecti Br.-Bl. 1936
EA Epilobietea angustifolii R. Tx. & Prsg. 1950
EP_2 Erico-Pinetalia Ht. 1959
FP Fraxino orni-Pinion nigrae-sylvestris Ht. 1953 Zupančič 2007
G Genistion pilosae Duviegnaud 1942
GE Geranion sanguinei R. Tx. in R. Tx. & Th. Müller 1961
HM Hypochaeridion maculatae Horvatić 1973
HP Helleboro nigri-Pinenion (Ht. 1959)
M_1 Molinion caeruleae Koch 1926
M_2 Molinetalia W. Koch 1926
MB Mesobromion erecti Br.-Bl. & Moor 1938 emend. Oberd. 1957
ONO Onopordetalia Br.-Bl. et R. Tx. 1943 ex Klika et Hadač 1944
OR Origanetalia vulgaris T. Müller 1961
PT Polygono-Trisetion Br.-Bl. et R. Tx. ex Marschall 1947
RP_1 Quercion roboris-petraeae R. Tx. 1932
RU Pruno-Rubion fruticosi (R. Tx. 1952) corr. Doing 1962
(Rubo-Prunion spinosae /R. Tx. 1952/ Th. Müller in Oberdorfer et al. 1967)
S_2 Seslerietalia variae Br.-Bl. 1926
SFP Seslerio-Festucion pallescentis Klika 1931 em. Korn. 1974
SV_1 Scorzonerion villosae Horvatić 1973 s. lat.
X Xerobromion Br.-Bl. & Moor 1938 em. Moravec in Holub et al. 1967

Bedrock (*Geološka podlaga*)

a limestone (apnenec)
d dolomite (dolomít)

Protection of nature (*Naravovarstvena kategorija*)

• Remarkable species (*Znamenita vrsta*; Wraber T.1990)
Protected species list (*Seznam zavarovanih vrst*; Skoberne2007)
* Protected species (*Zavarovana vrsta*)
H Measures for preserving a favourable state of the habitat of plant species
(*Ukrepi za ohranjanje ugodnega stanja habitata rastlinske vrste*)
O^0 Plant species with which there is no prohibition for above-ground parts of the plant, except seeds or fruits
(*Rastlinske vrste, pri katerih ni prepovedi za nadzemne dele rastlin, razen semen oziroma plodov*)
Red List categories (*Kategorije vrst rdečega seznama*; UL RS 82/2002)
o Out of danger (*Vrsta zunaj nevarnosti*)
V Vulnerable (*Ranljiva vrsta*)

PHYTOCOENOLOGICAL TABLE (Fitocenološka tabela) 2: OSTRYETUM (CONTINENTALE) S. LAT.

Sinsistematical characteristic (Sinsistematska pripadnost)												
	Number of anal. tab. (Številka analitične tabele)		1	2	3	4	5	6	7	8	9	10	11
	Author of anal. table (Avtor analitične tabele)		Horvat	Zupančič	Horvat	Zupančič	Cimperšek	Cimperšek	Horvat	Wraber	Aichinger	Franz	Richard
	Altitude (Nadmorska višina)		280-540	330-720	245-660	540-750	270-655	270-590		630-990	650-850	800-900	520-780
	Aspect (Nebesna lega)		S-SW-SE	S-SW-SE	S-SW-SE	S-SW-SE	S-SW-SE	S-SW		S-SW-SE	S-SW-SE	N W	S-SW-SE
	Slope in degrees (Nagib v stopinjah)		25-45	20-50	10-35	15-30	25-40	30-40		20-50	20-40	40 5	0-70
	Bedrock (Geološka podlaga)		dol	dol, dol apn	dol	dol, apn	apn, dol apn	peš, and, rož, diab		dol, apn	dol, apn	apn apn	nekarb, karb
	Stonines (Kamnitost)		0	0-30	0	0-60	May-40	0-30		0	0	0 0	0
	Location (Kraj popisov)		MED, SAM, HR ZAG,	ŠTA, NOT, KRAN	MED, HR ZAG	NOT, KOČ	ŠTAJ	ŠTAJ	GOR KOT	BOH	KAR	KOR, KARN	JURA
	State (Država)		Croatia	Slovenia	Croatia	Slovenia	Slovenia	Slovenia	Croatia	Slovenia	Austria	Austria	Switzerland
	Number of relevé (Število popisov)		11	26	5	4	14	13	9	14	10	1 1	14
	QUERCO-OSTRYETUM Ht. 1938												
			1	2	3	4	5	6	7	8	9	10	11
		I	2321 IV	904 IV	2 I	.	127 III	- I	II	.	.	.	.
Q_2	Quercus pubescens	II	888 V	783 V	-	.	-	-	II	.	.	.	.
		III	2 II	-	-	.	-	-	-	.	.	.	.
TG	Geranium sanguineum		391 V	178 V	102 II	2+	1 I	24 I	III	4 II	2 II	.	1 I
Q_2	Peucedanum cervaria		300 V	43 III	4 II	1 1	37 II	1 I	.	.	.	.	1 I
Q_1	Trifolium rubens		275 V	2 II	102 II	1+	- I	2 I	.	.	.	.	1 II
FB	Aster amellus		51 IV	82 IV	.	.	- I	.	.	39 II	.	.	.
OO	Mercurialis ovata		138 III	330 V	2 I	.	.	.	II	.	.	.	.
TG	Inula hirta		94 III	242 III	.	.	.	.	.	1 I	.	.	.
	DIFERENTIAL SPECIES OF GEOGRAPHICAL VARIANT (Razlikovalnica geografske variante)												
Q_2	Acer obtusatum	I	160 II	.	100 I	.	.	.	IV	.	.	.	.
		II	3 III	.	-	.	.	.	III	.	.	.	.
	SERRATULO TINCTORIAE-QUERCETUM PETRAEAE (Ht.) ex Zupančič & Žagar nom. nov. (LATHYRO NIGRAE-QUERCETUM PETRAEAE Ht. /1938/ 1950)												
			1	2	3	4	5	6	7	8	9	10	11
		I	842 III	404 II	5250 V	32-3	3357 V	2423 V	I	1 I	.	.	7321 V
F_3	Quercus petraea	II	4 III	200 III	952 IV	3+-1	36 II	82 V	II	-	.	.	113 V
		III	2 II	-	6 III	-	-	-	-	-	.	.	112 IV
MA	Serratula tinctoria		480 V	41 II	3002 V	3+-1	75 V	6 IV	.	.	.	.	.
Q_2	Lathyrus niger	III	254 IV	79 II	1152 V	2+	134 V	46 V	.	.	.	.	645 V
Q_1	Tamus communis		205 IV	15 I	552 V	1+	4 IV	- I	.	.	.	.	- I
	ASPLENIO ADIANTI-NIGRI-QUERCETUM PETRAEAE Košir ex Cimperšek 2008												
	Characteristic species (Značilnice)		1	2	3	4	5	6	7	8	9	10	11
SS	Festuca pallens		.	.	.	.	.	44 IV	.	.	.	.	.
FB	Hieracium bauhinii (=H. praealtum)	III	5 III	.	.	.	.	7 IV	.	.	.	.	.
RP_2	Asplenium adiantum-nigrum		.	.	.	.	.	5 IV	.	.	.	.	.

	Diferential species (Razlikovalnice)		1	2	3	4	5	6	7	8	9	10	11
VP_3	Calluna vulgaris		.	.	.	.	.	353 V	.	.	.	.	38 II
VP_3	Luzula luzuloides (=L. albida)		.	.	.	.	1 II	198 V	.	.	.	.	431 III
VP_3	Avenella flexuosa		.	.	.	.	45 V	.	.	.	.	.	.
MA	Genista tinctoria		47 II	2 I	100 I	2+	36 I	6 V	I	.	.	.	.
NC	Genista germanica		.	1 I	.	1+	- II	42 IV	.	.	.	.	.
	ERICO-OSTRYETUM Ht. 1956												
			1	2	3	4	5	6	7	8	9	10	11
Q_2	Helleborus multifidus	III	.	.	.	.	.	.	II	.	.	.	.
OC	Acer monspessulanum	II	.	.	.	.	.	.	I	.	.	.	.
Q_2	Cotoneaster nebrodensis		.	.	.	.	.	.	I	.	.	.	.
S	Sesleria juncifolia	III	.	.	.	.	.	.	I	.	.	.	.
	CYTISANTHO-OSTRYETUM M. Wraber 1961												
			1	2	3	4	5	6	7	8	9	10	11
EP_3	Genista radiata	III	.	1 I	.	.	.	.	.	966 V	.	.	.
SS	Allium pulchellum		.	61 II	.	.	.	.	.	36 V	.	.	.
S	Betonica alopecuros		.	.	.	.	.	.	.	254 IV	.	.	.
S	Dianthus sternbergii		.	.	.	.	.	.	.	41 IV	.	.	.
SS	Iris pallida subsp. cengialti (I. cengialti f. vochinensis)		.	.	.	.	.	.	.	72 II	.	.	.
	DIFERENTIAL SPECIES OF GEOGRAPHICAL VARIANT (Razlikovalnica geografske variante)												
F_1	Anemone trifolia	III	.	1 I	.	.	.	.	.	41 IV	.	.	.
	OSTRYO-FRAXINETUM ORNI Aichinger 1933												
			1	2	3	4	5	6	7	8	9	10	11
TG	Campanula spicata	III	.	.	.	.	.	.	.	.	55 IV	.	.
EP_3	Pinus sylvestris	I	.	- I	.	1+	.	.	.	.	277 III	.	1003 IV
		II	.	- I	.	-	.	.	.	.	1 I	.	- II
TG	Peucedanum rablense	III	.	.	.	.	.	.	.	.	201 III	.	.
EP_3	Pinus nigra	I	.	.	.	.	.	.	.	.	3 II	.	.
		II	.	.	.	.	.	.	.	.	1 I	.	.
	RHODODENDRO HIRSUTI-OSTRYETUM Franz 1991												
			1	2	3	4	5	6	7	8	9	10	11
VP	Rhododendron hirsutum	II	.	.	.	.	.	.	.	.	.	3 2	.
AS	Paederota lutea	III	.	.	.	.	.	.	.	.	.	+ .	.
VP	Pinus mugo	II	.	.	.	.	.	.	.	.	.	. 1	.
VP	Rhodothamnus chamaecistus	III	.	.	.	.	.	.	.	.	.	. 1	.
	DIFERENTIAL SPECIES OF (Razlikovalnice za) LATHYRO-QUERCETUM Richard 1961												
			1	2	3	4	5	6	7	8	9	10	11
RP_2	Festuca heterophylla	III	50 III	89 II	550 III	1+	112 V	445 IV	.	.	.	.	1322 V
MA	Anthoxanthum odoratum		.	.	.	.	.	.	.	.	.	.	911 V
RP_2	Melampyrum pratense		.	.	.	.	13 IV	141 IV	.	.	.	.	521 V
MA	Betonica officinalis		1 I	4 III	4 II	4+	1 I	.	.	.	.	.	218 V
VP_3	Polytrichum formosum		.	.	.	.	.	1 I	.	.	.	.	202 V

RP_2	Teucrium scorodonia	III	.	.	.	.	.	.	.	.	.	.	148 V
RP_2	Veronica officinalis		.	.	.	.	.	.	.	.	.	.	79 V
EP	Scleropodium purum		.	.	.	.	.	.	.	.	.	.	146 IV
FB	Chamaespartium sagittale (=Genista sagittalis)		.	.	.	.	- I	.	.	.	.	.	39 III
VP_3	Vaccinium myrtillus		.	.	.	.	.	42 III	.	.	.	.	394 II
VP_3	Pleurozium schreberi		.	.	.	.	.	.	.	.	.	. +	3 II
OO	FRAXINO ORNI-OSTRYION CARPINIFOLIAE Tomažič 1940												
			1	2	3	4	5	6	7	8	9	10	11
	Ostrya carpinifolia	Ia	549 IV	1155 IV	204 IV	2 1-4	76 IV	.	III	-	1503 V	4 2	.
		Ib	-	-	-	-	-	.	V	5179 V	2 II	1 -	.
		II	664 V	1347 V	4 II	3+-2	-	.	-	234 III	-	- -	.
		III	-	-	-	-	-	.	-	-	-	1 -	.
	Quercus cerris	I	503 III	77 I	1106 V	2+-1	751 IV	697 V	I	.	.	.	.
		II	49 III	203 III	-	3+	-	-	I	.	.	.	.
		III	1 I	1 I	4 II	-	-	-	-	.	.	.	.
	Mercurialis ovata		138 III	330 V	2 I	.	.	.	II	.	.	.	.
	Fraxinus ornus	I	94 III	732 III	754 III	4 2	112 IV	2 I	III	-	1526 V	+ .	.
		IIa	1229 V	1731 V	1000 V	4 2	363 V	637 V	V	1590 V	225 II	- .	.
		IIb	2 II	-	-	-	-	-	-	626 III	-	- .	.
	Cotinus coggygria	II	.	376 II	.	.	.	.	II	398 V	.	.	.
	Euonymus verrucosa		.	2 I	.	2+-1	1 I	.	.	37 II	.	.	.
	Pulmonaria angustifolia	III	.	.	.	1+	.	.	.	.	.	.	.
	Viola collina		.	.	.	.	1 I	.	.	.	.	.	.
OC	OSTRYO-CARPINION ORIENTALIS Ht. 1954 em. 1958												
			1	2	3	4	5	6	7	8	9	10	11
	Asparagus tenuifolius	III	.	2 I	.	2+	.	.	.	.	.	.	.
	Coronilla emerus		.	.	.	.	.	.	.	.	.	.	111 IV
	Acer monspessulanum	II	.	.	.	.	.	.	I	.	.	.	.
Q_1	QUERCION PUBESCENTIS-PETRAEAE Br.-Bl. 1932												
			1	2	3	4	5	6	7	8	9	10	11
	Trifolium rubens	III	275 V	2 II	102 II	1+	- I	2 I	.	.	.	.	1 II
	Buglossoides purpurocaerulea		308 IV	165 II	550 III	.	39 IV	.	.	.	.	.	.
	Tamus communis		205 IV	15 I	1152 V	1+	4 IV	- I	.	.	.	.	- I
	Valeriana officinalis		136 II	81 III	.	2+	1 I	.	.	1 I	1 I	.	- I
	Calamintha sylvatica		.	.	.	.	2 III	2 II	.	.	.	.	.
	Valeriana officinalis subsp. collina		.	.	.	.	.	.	III	7 IV	.	.	.
Q_2	QUERCETALIA PUBESCENTIS Br.-Bl. (1931) 1932												
			1	2	3	4	5	6	7	8	9	10	11
	Melittis melissophyllum	III	391 V	349 V	206 V	4+	6 V	1 I	V	114 V	4 III	.	112 IV
	Rhamnus catharticus	II	370 V	7 IV	4 II	3+	3 III	- I	V	4 II	.	.	3 II
	Tanacetum corymbosum	III	321 V	169 III	452 IV	1 1	1 III	.	II	.	.	.	.
	Peucedanum cervaria		300 V	43 III	4 II	1 1	37 II	1 I	.	.	.	.	1 I

	Polygonatum odoratum		99 V	63 IV	8 IV	1+	1 I	.	III	41 V	664 IV	.	5 IV
		I	2321 IV	904 IV	2 I	.	127 III	- I	II	.	.	.	.
	Quercus pubescens	II	888 V	783 V	-	.	-	-	II	.	.	.	.
		III	2 II	-	-	.	-	-	-	.	.	.	.
	Peucedanum oreoselinum		299 IV	179 V	102 II	.	3 III	- I	II	149 V	106 V	.	.
	Lathyrus niger		254 IV	79 II	1152 V	2+	134 V	46 V	.	.	.	.	645 V
	Campanula persicifolia		140 IV	4 III	102 II	.	9 V	7 V	II	.	.	.	3 III
	Viola hirta		6 IV	7 IV	102 II	2+	1 I	- I	.	184 V	.	.	.
	Clematis recta	II	138 III	80 III	2 I	1 1	.	.	III	3 II	51 II	.	.
I_1	Carex hallerana	III	4 III	.	.	.	.	.	.	.	.	.	.
	Orchis purpurea		4 III	.	2 I	.	.	.	.	.	.	.	.
	Acer obtusatum	I	160 II	.	100 I	.	.	.	IV	.	.	.	.
		II	3 III	.	-	.	.	.	III	.	.	.	.
		I	47 II	19 I	4 II	1+	3 III	1 I	-	.	.	.	40 III
	Sorbus torminalis	IIa	459 V	60 II	108 V	1+	5 IV	6 V	II	.	.	.	148 V
		IIb	2 II	-	4 II	-	-	-	-	.	.	.	1 I
	Teucrium montanum	III	22 II	.	.	.	.	.	.	41 IV	.	.	.
	Peucedanum austriacum		3 II	1 I	4 II	1+	3 IV	- I	.	3 II	.	.	.
	Hypericum montanum		3 II	3 II	4 II	2+	- II	2 IV	.	1 I	.	.	.
	Aristolochia lutea		3 II	- I	100 I	.	- I	.	.	.	.	.	.
	Laserpitium latifolium		2 II	.	350 I	1+	.	.	.	3 II	1 I	.	2 II
	Sorbus domestica	II	2 I	.	2 I	.	- I	- I	.	.	.	.	.
	Sorbus aria	I	1 I	280 II	102 II	2+-1	4 IV	-	.	-	247 III	+	. 4 III
		IIa	6 IV	972 V	8 IV	3+-2	2 II	1 I	.	306 IV	51 II	+	. 45 V
		IIb	-	-	-	-	-	-		4 II	-	-	. -
		III	-	-	-	-	-	-	.	-	-	-	. 41 IV
	Quercus streimii (=Q. petraea X Q. pubescens)	I	-	20 I	.	.	.	.	.	.	.	.	.
		II	45 I	20 I	.	.	.	.	.	.	.	.	.
	Dictamnus albus	III	.	195 IV	.	.	.	.	.	.	.	.	.
	Inula conyza		.	21 II	.	.	- I	2 II	.	.	.	.	.
	Epipactis atrorubens		.	2 II	.	.	.	.	I	.	.	.	+ .
	Cephalanthera longifolia		.	1 I	.	1+	2 II	2 III	.	.	.	.	- I
	Camptothecium lutescens	IV	.	.	.	4 1-3	.	.	.	146 IV	.	.	.
	Paeonia officinalis	III	.	.	.	1 1	.	.	.	.	.	.	.
	Arabis turrita		.	.	.	1+	1 I	.	.	1 I	.	.	.
	Prunus mahaleb	II	.	.	.	1+	.	.	.	.	.	.	1 I
	Helleborus multifidus	III	.	.	.	.	.	.	II	.	.	.	.
	Cotoneaster nebrodensis	II	.	.	.	.	.	.	I	.	.	.	.
	Laburnum anagyroides (=Cytisus laburnum)	I	.	.	.	.	1 I	.	.	.	.	.	.
		II	.	.	.	.	36 I	.	.	.	.	.	.
	Limodorum abortivum		.	.	.	.	.	- I	.	.	.	.	.
	Acer opalus	I	.	.	.	.	.	.	.	.	.	.	6 IV
		II	.	.	.	.	.	.	.	.	.	.	203 V
		III	.	.	.	.	.	.	.	.	.	.	77 IV

P PRUNETALIA SPINOSAE R. Tx. 1952

		1	2	3	4	5	6	7	8	9	10	11
Cornus sanguinea	II	414 V	42 III	102 II	4+-1	3 II	2 II	V	.	.	.	37 II
Viburnum lantana		389 V	885 V	204 IV	4+-1	198 II	.	V	3 II	53 III	+ .	44 V
Cornus mas		142 V	213 IV	552 IV	2 1	77 V	.	IV	.	.	.	.
Crataegus monogyna		97 V	186 IV	206 V	3+	43 V	- I	.	1 I	52 II	.	185 V
Juniperus communis		210 IV	2 I	4 II	1+	1 II	2 II	IV	4 III	53 III	.	3 II
Berberis vulgaris		51 IV	40 II	6 III	2+	1 II	.	IV	40 III	4 III	.	1 II
Ligustrum vulgare		185 III	21 II	302 IV	2 2	6 IV	2 II	IV	2 II	3 II	.	184 V
Prunus spinosa		50 III	- I	4 II	2+	.	.	.	.	.	.	3 II
Staphylea pinnata		48 III	.	102 II	.	.	.	.	.	.	.	.
Fragaria moschata (=F. elatior)	III	.	2 I	.	.	.	.	.	.	.	.	.
Rosa canina	II	.	2 I	.	.	.	1 I	.	.	.	.	.
Crataegus sp.		.	.	.	.	.	1 II	IV	.	.	.	.
Crataegus oxyacantha		.	.	.	.	.	.	.	.	.	.	114 V
Sorbus mougeotii		.	.	.	.	.	.	.	.	.	.	5 III

C CARPINION Issler 1931 em. Oberd. 1953 s. lat.

		1	2	3	4	5	6	7	8	9	10	11
Pyrus pyraster	II	52 IV	.	304 V	.	1 III	-	.	.	.	.	6 IV
	III	2 II	.	2 I	.	-	2 II	.	.	.	.	-
Lonicera caprifolium	II	95 III	3 II	310 III	.	.	.	.	.	.	.	.
Cruciata glabra	III	3 III	1 I	4 II	2+	2 II	42 IV	.	.	.	.	.
Prunus avium	II	3 II	1 I	8 IV	1+	- II	1 III	.	.	.	.	4 III
	III	2 II	-	100 I	-	-	-	.	.	.	.	6 IV
Carex montana		160 II	.	350 I	.	36 I	.	.	.	.	.	1556 V
Carpinus betulus	I	-	-	-	-	2 II	2 I		-			-
	II	2 II	1 I	202 III	3+-1	1 I	1 I	.	1 I	.	.	1 I
Helleborus atrorubens	III	2 II	.	2 I	.	.	.	.	.	.	.	.
Malus sylvestris	II	1 II	.	202 III	.	.	.	.	.	.	.	.
Acer campestre	I	1 I	-	102 II	-	-	- I	.	.	.	.	-
	II	50 III	2 I	452 III	1+	6 V	2 I	.	.	.	.	6 IV
	III	-	-	-	-	-	-	.	.	.	.	2 II
Rosa arvensis	II	.	22 II	.	4+	4 IV	41 III	.	.	.	.	149 V
Dactylis polygama	III	.	.	.	.	6 V	42 III	.	.	.	.	1 I
Fragaria moschata (=F. elatior)		.	.	.	.	4 III	2 II	.	.	.	.	.
Viola riviniana		.	.	.	.	1 III	1 I	.	.	.	.	.
Stellaria holostea		.	.	.	.	1 I	.	.	.	.	.	.
Erythronium dens-canis		.	.	.	.	.	.	II	.	.	.	.
Galium aristatum		.	.	.	.	.	.	.	37 II	.	.	.

F_1 AREMONIO-FAGION (Ht. 1938) Török, Podani et Borhidi 1989

		1	2	3	4	5	6	7	8	9	10	11
Cyclamen purpurascens	III	50 III	8 V	2 I	4+-1	5 V	.	IV	79 V	103 III	.	- I
Knautia drymeia subsp. drymeia		5 III	22 II	102 III	.	5 IV	3 III	.	.	.	.	.
Helleborus niger subsp. niger		47 II	3 II	.	1 1	.	.	IV	627 V	.	.	.

Hacquetia epipactis		.	19 I	.	2+-1	.	.	.	.	.	.	.
Anemone trifolia		.	1 I	.	.	.	.	.	41 IV	.	.	.
Epimedium alpinum		.	- I	.	.	.	.	.	.	.	.	.
Aremonia agrimonoides		.	.	.	4+	1 I	.	.	.	53 III	.	.
Omphalodes verna		.	.	.	3+-1	.	.	.	.	.	.	.
Vicia oroboides		.	.	.	.	1 II	1 I	.	.	.	.	.
Helleborus dumetorum		.	.	.	.	- I	.	.	.	.	.	.
Lamium orvala		.	.	.	.	- I	.	.	.	.	.	.
Polystichum setiferum		.	.	.	.	- I	.	.	.	.	.	.
Rhamnus fallax	II	.	.	.	.	.	.	.	37 II	.	.	.

F_2 FAGETALIA SYLVATICAE Pawl. 1928 s. lat.

		1	2	3	4	5	6	7	8	9	10	11
Primula vulgaris	III	211 V	7 IV	4 II	1+	2 III	2 II	II	41 IV	.	.	3 II
Symphytum tuberosum		210 IV	.	106 IV	.	1 I	.	II	.	.	.	.
Melampyrum nemorosum subsp. nemorosum		50 III	60 II	4 II	1+	.	.	.	.	.	.	.
Campanula trachelium		48 III	4 II	6 III	1+	2 IV	1 II	.	1 I	.	.	.
Lathyrus vernus		4 III	1 I	2 I	1+	1 II	- I	.	.	.	.	41 IV
	I	3 II	40 II	-	2+-1	37 II	2 II	III	-	.	.	4 II
Fagus sylvatica	II	4 III	22 II	4 II	1+	1 II	41 III	III	126 II	.	.	166 V
	III	-	-	-	-	-	-	-	-	.	.	1 I
Digitalis grandiflora		3 II	24 III	.	1+	1 II	42 III	.	.	.	r	.
Euphorbia dulcis		2 II	1 I	6 III	.	1 I	1 II	.	.	.	.	76 IV
Cephalanthera rubra		1 I	20 I	.	1+	- I	.	.	1 II	.	.	- I
Cephalanthera damasonium		1 I	20 I	4 II	.	.	.	.	.	.	.	- I
Euphorbia amygdaloides		1 I	1 I	.	2+-1	3 III	39 I	.	3 II	.	.	38 II
Salvia glutinosa		.	4 II	.	3+	1 III	4 III	.	4 II	.	.	.
Acer platanoides	II	.	2 II	.	.	1 II	.	.	.	.	.	.
Galium laevigatum	III	.	2 II	.	.	7 IV	352 V	.	.	.	.	.
Melica nutans		.	19 I	.	.	.	.	.	1 I	1 I	.	395 IV
Epipactis helleborine		.	2 I	.	2+	- II	.	.	3 II	3 II	.	- I
Neottia nidus-avis		.	2 I	.	2+	.	.	.	.	.	.	.
Stachys sylvatica		.	2 I	.	.	.	.	.	.	.	.	.
Acer pseudoplatanus	I	.	-	.	-	-	- I	.	1 I	.	-	.
	II	.	1 I	.	1+	1 II	-	.	-	.	+	.
Asarum europaeum	III	.	1 I	.	3+-1	.	.	.	.	.	.	.
Daphne mezereum	II	.	1 I	.	1+	.	.	.	1 I	.	.	.
Mycelis muralis	III	.	1 I	.	1+	1 I	1 II	.	.	.	.	.
Euonymus latifolia	II	.	.	350 I	.	- I	1 I	.	.	.	.	.
Mercurialis perennis	III	.	.	.	4+-1	.	.	.	128 II	.	.	1 I
Brachypodium sylvaticum		.	.	.	.	76 IV	2 II	.	.	.	.	.
Bromopsis ramosa subsp. benekenii		.	.	.	.	76 IV	- I	.	.	.	.	.
Cardamine bulbifera		.	.	.	.	1 II	1 II	.	.	.	.	.
Galium odoratum		.	.	.	.	- II	.	.	.	.	.	- I
Pulmonaria officinalis		.	.	.	.	- II	.	.	.	.	.	.
Poa nemoralis		.	.	.	.	1 I	1 II	.	.	.	.	75 III
Galeobdolon montanum		.	.	.	.	- I	.	.	.	.	.	- I

	Lilium martagon		.	.	.	.	- I	- I	II	.	.	.	.
	Cardamine impatiens		.	.	.	.	.	2 I	.	.	.	.	.
	Geranium robertianum		.	.	.	.	.	1 I	.	.	.	.	.
	Prenanthes purpurea		.	.	.	.	.	- I	.	.	.	.	146 IV
	Aquilegia nigricans		.	.	.	.	.	.	II	1 I	1 I	.	.
	Viola reichenbachiana		.	.	.	.	.	.	I	73 II	.	.	6 IV
	Gymnocarpium robertianum		.	.	.	.	.	.	.	.	.	+	.
	Eurhynchium striatum	IV	.	.	.	.	.	.	.	.	.	.	4 II
	Phyteuma spicatum	III	.	.	.	.	.	.	.	.	.	.	3 II
	Lonicera alpigena	II	.	.	.	.	.	.	.	.	.	.	1 I
RP_2	QUERCETALIA ROBORIS-PETRAEAE R. Tx. (1931) 1937												
			1	2	3	4	5	6	7	8	9	10	11
	Galium lucidum	III	480 V	194 III	402 V	4+-1	1 II	.	IV	75 III	2 II	.	.
	Lembotropis nigricans		94 III	60 II	.	.	- I	77 II	.	.	4 III	.	.
	Festuca heterophylla		50 III	89 II	550 III	1+	112 V	445 IV	.	.	.	.	1322 V
	Pteridium aquilinum		4 III	1 I	.	1+	1 I	41 III	V	1 I	3 II	.	.
	Melampyrum pratense		.	.	.	.	13 IV	141 IV	.	.	.	.	521 V
	Hieracium sabaudum		.	.	.	.	4 III	5 IV	.	.	.	.	4 III
	Polypodium vulgare		.	.	.	.	1 II	5 IV	.	.	.	.	.
	Glechoma hederacea		.	.	.	.	1 II	1 I	.	.	.	.	.
	Hieracium umbellatum		.	.	.	.	- I	.	.	.	.	.	.
	Asplenium adiantum-nigrum		.	.	.	.	.	5 IV	.	.	.	.	.
	Castanea sativa	I	.	.	.	.	.	4 III	.	.	.	.	.
	Hieracium racemosum	III	.	.	.	.	.	4 III	.	.	.	.	.
	Hieracium laevigatum		.	.	.	.	.	3 III	.	.	.	.	.
	Hieracium vulgatum (=H. lachenalii)		.	.	.	.	.	2 II	.	.	.	.	.
	Frangula alnus	II	.	.	.	.	.	1 I	.	.	.	.	.
	Genista pilosa	III	.	.	.	.	.	1 I	.	.	.	.	.
	Teucrium scorodonia		.	.	.	.	.	.	.	.	.	.	148 V
	Veronica officinalis		.	.	.	.	.	.	.	.	.	.	79 V
	Luzula forsteri		.	.	.	.	.	.	.	.	.	.	38 II
F_3	QUERCO-FAGETEA Br.-Bl. et Vlieger 1937												
			1	2	3	4	5	6	7	8	9	10	11
		I	842 III	404 II	5250 V	32-3	3357 V	2423 V	I	1 I	.	.	7321 V
	Quercus petraea	II	4 III	200 III	952 IV	3+-1	36 II	82 V	II	-	.	.	113 V
		III	2 II	-	6 III	-	-	-	-	-	.	.	112 IV
	Convallaria majalis		208 III	78 II	204 IV	3+-1	1 III	2 III	.	128 II	1 II	.	7 IV
	Corylus avellana	II	5 III	67 I	2 I	2+-1	.	- I	IV	200 IV	.	.	36 I
	Hepatica nobilis	III	92 II	21 II	2 I	.	.	.	IV	38 II	.	.	8 V
	Hedera helix	II	46 II	.	104 III	.	5 V	43 IV	.	.	.	.	364 V
	Clematis vitalba		3 II	1 I	6 III	3+	1 IV	1 II	III	37 II	.	.	.
	Melica uniflora	III	1 I	.	102 II	.	754 V	.	.	.	.	.	198 II
	Listera ovata		1 I	.	4 II	.	.	.	.	.	.	.	.
	Tilia cordata	II	.	20 I	.	1 1	2 III	2 I	.	.	.	.	.
	Lonicera xylosteum		.	2 I	.	3+	1 I	.	I	1 I	2 II	.	79 V

	Carex digitata	III	.	- I	.	4+-1	1 II	.	II	41 IV	1 I	.	110 IV
	Ulmus campestris	II	.	.	2 I	.	.	.	.	.	.	.	.
	Ctenidium molluscum	IV	.	.	.	3 1-2	.	.	.	1 I	.	.	.
	Platanthera bifolia	III	.	.	.	.	1 III	2 III	.	.	.	+	. 10 V
	Tilia platyphyllos	I	.	.	.	.	1 II	-	.	.	.	.	-
		II	.	.	.	.	2 II	- I	.	.	.	.	1 III
	Anemone nemorosa	III	.	.	.	.	1 I	.	II	.	.	.	181 IV
	Campanula latifolia		.	.	.	.	- I	.	.	.	.	.	.
	Lilium carniolicum		.	.	.	.	.	.	.	2 II	1 I	.	.
	Fraxinus excelsior	II	.	.	.	.	.	.	.	.	.	.	3 III
		III	.	.	.	.	.	.	.	.	.	.	37 III
	Ilex aquifolium	II	.	.	.	.	.	.	.	.	.	.	2 II

EP_3 ERICO-PINETEA Ht. 1959 s. lat.

		1	2	3	4	5	6	7	8	9	10	11
Chamaecytisus hirsutus	III	233 V	63 IV	108 V	2+	1 II	218 V	III	3 II	2 II	.	.
Buphthalmum salicifolium		232 V	370 V	100 I	4+	2 III	.	V	114 V	205 V	.	.
Genista januensis		411 III	82 IV	2 I	.	.	.	III	.	.	.	.
Amelanchier ovalis	II	4 III	405 III	.	.	.	1 I	II	239 V	252 IV	1	1 3 II
Erica carnea	III	773 II	1404 III	.	1+	- I	38 I	V	255 IV	1178 IV	3	1 .
Laserpitium siler		2 II	20 II	2 I	1+	1 I	.	.	110 III	.	.	.
Daphne blagayana	II	159 I	.	.	.	.	.	I	.	.	.	.
Carex alba	III	1 I	99 III	1 I	1+	.	.	IV	1 I	.	.	.
Cotoneaster tomentosus	II	1 I	299 II	.	.	.	.	.	8 V	228 III	.	6 IV
Polygala chamaebuxus	III	.	234 III	.	2+-1	.	.	III	271 IV	.	1	. .
Rhamnus saxatilis	II	.	61 III	.	.	2 II	.	.	113 V	2 II	.	.
Iris graminea	III	.	42 II	1 I	.	4 III	.	.	.	.	.	.
Dianthus monspessulanus		.	23 II	.	2+	.	.	.	.	.	.	.
Calamagrostis varia		.	155 I	.	2 1-2	.	.	II	929 V	1251 IV	1	. 715 II
Chamaecytisus purpureus		.	58 I	.	.	.	.	.	1 I	.	.	.
Daphne cneorum	II	.	39 I	.	.	.	.	.	.	.	.	.
Genista radiata		.	1 I	.	.	.	.	.	966 V	.	.	.
Cirsium erisithales	III	.	1 I	.	.	.	.	.	.	.	.	2 .
Pinus sylvestris	I	.	- I	.	1+	.	.	.	.	277 III	.	1003 IV
	II	.	- I	.	-	.	.	.	.	1 I	.	- II
Molinia arundinacea	III	.	.	.	.	.	40 II	I	196 II	.	.	.
Asperula tinctoria		.	.	.	.	.	.	.	.	177 II	.	.
Pinus nigra	I	.	.	.	.	.	.	.	.	3 II	.	.
	II	.	.	.	.	.	.	.	.	1 I	.	.
Scleropodium purum	IV	.	.	.	.	.	.	.	.	.	.	146 IV

VP_3 VACCINIO-PICEETEA Br.-Bl. in Br.-Bl. et al. 1939 em. Zupančič (1976) 2000 s. lat.

		1	2	3	4	5	6	7	8	9	10	11
Solidago virgaurea	III	3 II	5 III	100 I	4+-1	- II	2 III	III	37 II	4 III	.	6 IV
Aposeris foetida		1 I	.	1 I	.	1 I	- I	.	2 II	.	.	.
Laserpitium peucedanoides		.	20 I	.	.	.	.	.	.	1 I	r	. .
Hypnum cupressiforme	IV	.	1 I	.	2+	.	4 III	.	2 II	.	.	184 V

Hieracium sylvaticum	III	.	- I	.	.	1 I	9 V	.	.	.	1	. 1179 V
Scapania nemorea	IV	.	.	.	2+-1	.	.	.	2 II	.	.	.
Grimmia pulvinata		.	.	.	2+	.	.	.	3 II	.	.	.
	I	.	.	.	.	.	.	.	.	.	.	1 I
Abies alba	II	.	.	.	2+0	.	.	.	.	.	.	4 IV
	III	.	.	.	.	.	.	.	.	.	.	1 I
Avenella flexuosa		.	.	.	.	45 V	.	.	.	.	.	.
Luzula luzuloides		.	.	.	.	1 II	198 V	.	.	.	.	431 III
Calamagrostis arundinacea		.	.	.	.	1 I	139 IV	.	.	.	.	.
Rubus hirtus	II	.	.	.	.	1 I	1 II	.	.	.	.	.
Luzula pilosa	III	.	.	.	.	- I	.	.	.	.	.	74 III
Calluna vulgaris		.	.	.	.	.	353 V	.	.	.	.	38 II
Leucobryum glaucum	IV	.	.	.	.	.	43 IV	.	.	.	.	.
Vaccinium myrtillus	III	.	.	.	.	.	42 III	.	.	.	.	394 II
Polytrichum formosum	IV	.	.	.	.	.	1 I	.	.	.	.	202 V
Picea abies	II	.	.	.	.	.	.	I	.	.	.	- I
Laserpitium gaudinii (=L. krapfii=L. marginatum)	III	.	.	.	.	.	.	I	.	.	.	.
Rubus saxatilis	II	.	.	.	.	.	.	.	.	3 II	.	.
Rhododendron hirsutum		.	.	.	.	.	.	.	.	.	3	2 .
Valeriana tripteris	III	.	.	.	.	.	.	.	.	.	2	. .
Pinus mugo	II	.	.	.	.	.	.	.	.	.	.	1 .
Rhodothamnus chamaecistus		.	.	.	.	.	.	.	.	.	.	1 .
Paederota lutea	III	.	.	.	.	.	.	.	.	.	+	. .
Pleurozium schreberi	IV	.	.	.	.	.	.	.	.	.	.	+ 3 II
Veronica urticifolia	III	.	.	.	.	.	.	.	.	.	.	+ .
Atrichum undulatum	IV	.	.	.	.	.	.	.	.	.	.	114 V
Dicranum scoparium		.	.	.	.	.	.	.	.	.	.	271 IV
Rhytidiadelphus triquetrus		.	.	.	.	.	.	.	.	.	.	109 III
Hylocomium splendens		.	.	.	.	.	.	.	.	.	.	5 III
Mnium undulatum		.	.	.	.	.	.	.	.	.	.	1 III
Luzula sylvatica	III	.	.	.	.	.	.	.	.	.	.	36 I
Thuidium tamariscinum	IV	.	.	.	.	.	.	.	.	.	.	1 I

A_3 BETULO-ADENOSTYLETEA Br.-Bl. & R. Tx. 1943 s. lat(=MULGEDIO-ACONITETEA Klika 1944)

		1	2	3	4	5	6	7	8	9	10	11
Thalictrum aquilegiifolium	III	.	20 I	.	1+	.	.	.	1 I	.	.	.
Phyteuma ovatum		.	2 I	.	.	.	.	.	1 I	.	.	.
Tephroseris longifolia (=Senecio ovirensis)		.	.	.	.	1 I	.	.	.	.	.	.
Salix glabra	II	.	.	.	.	.	.	.	.	.	.	1 .
Ribes alpinum		.	.	.	.	.	.	.	.	.	.	4 III

SC_2 SCORZONERETALIA VILLOSAE (H-ić & Ht. 1958) em. H-ić 1973 s. lat.

		1	2	3	4	5	6	7	8	9	10	11
Veronica jacquinii	III	253 III	.	2 I	.	.	.	II	.	.	.	.
Centaurea triumfetti		91 III	39 I	2 I	.	.	.	.	3 II	.	.	.
Cirsium pannonicum		51 III	1 I	4 II	2+	.	.	.	.	.	.	.
Helianthemum ovatum		48 III	2 II	.	.	.	.	.	4 IV	51 II	.	.

	Satureja montana subsp. variegata		.	1 I	.	.	.	.	.	75 III	.	.	.
	Betonica serotina		.	1 I	.	.	.	.	.	.	.	.	.
TG	TRIFOLIO-GERANIETEA Th. Müller 1961												
			1	2	3	4	5	6	7	8	9	10	11
	Geranium sanguineum	III	391 V	178 V	102 II	2+	1 I	24 I	III	4 II	2 II	.	1 I
	Calamintha clinopodium		300 V	22 II	302 IV	4+	2 II	2 II	.	4 II	852 V	.	.
	Anthericum ramosum		255 IV	369 V	2 I	.	1 II	2 II	II	183 V	227 III	.	39 III
	Vincetoxicum hirundinaria		95 IV	294 V	2 I	2+	4 IV	- I	II	414 V	.	.	.
	Dorycnium germanicum		6 IV	188 IV	.	.	.	.	III	6 IV	.	.	.
	Inula hirta		94 III	242 III	.	.	.	.	.	1 I	.	.	.
	Fragaria viridis		48 III	.	262 IV	.	.	2 I	.	.	.	.	.
	Carex michelii		46 II	.	.	.	.	.	.	.	.	.	.
	Coronilla varia		45 I	1 I	100 I	.	.	1 I	.	.	.	.	.
	Sedum maximum		5 III	40 II	104 III	.	3 V	1 II	.	.	.	.	.
	Astragalus glycyphyllos		2 II	.	2 I	.	1 II	1 I	.	.	.	.	.
	Origanum vulgare		1 I	6 III	.	2+	1 II	- I	.	6 IV	.	.	2 II
	Trifolium alpestre		1 I	.	.	.	.	.	.	.	.	.	.
	Centaurea fritschii		.	21 II	.	.	.	.	.	.	.	.	.
	Thalictrum minus		.	3 II	.	1+	.	.	.	8 V	.	.	.
	Coronilla coronata		.	21 I	.	.	.	.	.	.	.	.	.
	Scabiosa columbaria		.	1 I	.	.	.	.	.	.	2 II	.	.
	Trifolium medium		.	1 I	.	.	1 I	1 I	.	1 I	.	.	74 III
	Silene nutans		.	.	.	.	3 II	84 V	.	78 V	.	.	- I
	Dianthus barbatus subsp. barbatus		.	.	.	.	2 II	2 III	.	.	.	.	.
	Achillea distans		.	.	.	.	2 II	.	.	.	.	.	.
	Lychnis viscaria		.	.	.	.	1 I	44 IV	.	.	.	.	.
	Silene nemoralis		.	.	.	.	1 I	.	.	.	.	.	.
	Lathyrus sylvestris		.	.	.	.	1 I	2 I	.	.	.	.	.
	Vicia cassubica		.	.	.	.	- I	1 I	.	.	.	.	.
	Arabis hirsuta		.	.	.	.	.	.	.	3 II	.	.	.
	Thesium bavarum		.	.	.	.	.	.	.	1 I	.	.	.
	Peucedanum rablense		.	.	.	.	.	.	.	.	201 III	.	.
	Hypericum perforatum		.	.	.	.	.	.	.	.	.	.	1 III
	Digitalis lutea		.	.	.	.	.	.	.	.	.	.	36 I
	Molinia caerulea		.	.	.	.	.	.	.	.	.	.	1 I
NC	NARDO-CALLUNETEA Prsg. 1949												
			1	2	3	4	5	6	7	8	9	10	11
	Chamaecytisus supinus	III	.	41 II	.	1+	.	.	.	.	1 I	.	.
	Genista germanica		.	1 I	.	1+	- II	42 IV	.	.	.	.	.
	Festuca ovina		.	.	.	.	1 I	.	.	.	.	.	.
	Dianthus collinus		.	.	.	.	- I	.	.	.	.	.	.
	Carex pilulifera		.	.	.	.	.	1 I	.	.	.	.	.
	Thymus pulegioides (=T. ovatus)		.	.	.	.	.	.	.	.	52 II	.	.
	Festuca ovina subsp. capillata		.	.	.	.	.	.	.	.	.	.	36 II
	Campanula rotundifolia		.	.	.	.	.	.	.	.	.	.	1 II

	Luzula campestris		.	.	.	.	.	.	.	.	.	.	1 II
S_3	SESLERIETEA Br.-Bl. 1948 em. Oberd. 1978 s. lat.												
			1	2	3	4	5	6	7	8	9	10	11
	Sesleria albicans	III	.	321 IV	.	.	.	.	.	111 IV	1225 III	.	271 III
	Globularia cordifolia		.	22 II	.	.	.	.	.	.	.	.	.
	Globularia nudicaulis		.	1 I	.	.	.	.	.	.	.	.	.
	Helianthemum grandiflorum		.	- I	.	1+	.	.	.	1 I	.	.	.
	Lilium bulbiferum		.	- I	.	1+	.	.	.	.	.	.	.
	Globularia meridionalis		.	.	.	.	.	.	I	.	.	.	.
	Sesleria juncifolia		.	.	.	.	.	.	I	.	.	.	.
	Betonica alopecuros (=B. divulsa=B. jacquinii)		.	.	.	.	.	.	.	254 IV	.	.	.
	Carduus defloratus		.	.	.	.	.	.	.	166 IV	.	.	.
	Dianthus sternbergii		.	.	.	.	.	.	.	41 IV	.	.	.
	Campanula thyrsoides		.	.	.	.	.	.	.	6 IV	.	.	.
	Acinos alpinus		.	.	.	.	.	.	.	3 II	.	.	.
FB	FESTUCO-BROMETEA Br.-Bl. et R. Tx. 1943 s. lat.												
			1	2	3	4	5	6	7	8	9	10	11
	Teucrium chamaedrys	III	231 V	197 V	2 I	4+	.	2 II	IV	822 V	678 V	.	2 II
	Carex flacca		708 IV	340 IV	402 V	3+-1	76 IV	4 III	.	1 I	1 I	.	76 IV
	Hypochaeris maculata		141 IV	.	2 I	.	.	.	.	.	.	.	.
	Silene italica agg.		95 IV	.	2 I	.	.	.	II	.	.	.	.
	Aster amellus		51 IV	82 IV	.	.	- I	.	.	39 II	.	.	.
	Euphorbia cyparissias		7 IV	7 IV	.	2+	1 II	2 II	II	6 IV	104 IV	.	.
	Carex humilis		346 III	742 III	.	4+-2	.	.	II	2394 V	902 IV	.	501 III
	Polygala comosa		139 III	.	2 I	.	.	.	.	.	.	.	.
	Stachys recta		5 III	78 II	.	2+	.	.	.	114 V	.	.	.
	Hieracium bauhinii (=H. praealtum)		5 III	.	.	.	.	7 IV	.	.	.	.	.
	Campanula glomerata		46 II	.	.	.	.	.	.	.	.	.	.
	Asperula cynanchica		3 II	3 II	.	.	.	.	III	.	.	.	.
	Orchis militaris		3 II	.	.	.	.	.	.	1 I	1 I	.	.
	Pimpinella saxifraga		1 I	- I	.	2+	.	.	.	.	.	.	.
	Brachypodium rupestre		.	426 IV	.	3+-4	.	.	.	36 III	.	.	.
	Euphorbia verrucosa		.	23 III	.	.	.	.	.	.	.	.	.
	Galium verum		.	175 II	.	.	.	.	.	2 II	4 III	.	.
	Scabiosa triandra (=S. gramuntia)		.	117 II	.	.	.	.	.	4 III	.	.	.
	Prunella grandiflora		.	22 II	.	.	.	.	I	77 IV	.	.	.
	Asperula aristata subsp. longiflora		.	2 I	.	.	.	.	.	5 III	.	.	.
	Linum tenuifolium		.	2 I	.	.	.	.	.	4 II	.	.	.
	Sanguisorba minor		.	2 I	.	.	.	.	.	.	.	.	.
	Silene vulgaris subsp. bosniaca		.	2 I	.	.	.	.	.	.	.	.	.
	Aster linosyris		.	1 I	.	.	.	.	.	.	.	.	.
	Ajuga genevensis		.	1 I	.	.	1 II	.	.	4 II	.	.	.
	Anthyllis vulneraria		.	1 I	.	.	.	.	.	1 I	.	.	.
	Brachypodium pinnatum		.	.	.	.	1 II	138 III	.	.	51 II	.	394 II
	Chamaespartium sagittale (=Genista sagittalis)		.	.	.	.	- I	.	.	.	.	.	39 III

	Leucanthemum praecox		.	.	.	.	- I	.	.	.	.	.	.
	Polygala vulgaris		.	.	.	.	.	2 II	.	.	.	.	.
	Hieracium cymosum		.	.	.	.	.	1 I	.	.	.	.	.
	Helianthemum nummularium subsp. obscurum		.	.	.	.	.	.	II	.	.	.	.
	Galium purpureum		.	.	.	.	.	.	.	611 V	2 II	.	.
	Bromus erectus		.	.	.	.	.	.	.	146 IV	.	.	.
	Linum viscosum		.	.	.	.	.	.	.	4 III	.	.	.
	Peucedanum carvifolia		.	.	.	.	.	.	.	4 III	.	.	.
	Scabiosa lucida subsp. stricta		.	.	.	.	.	.	.	4 III	.	.	.
	Globularia punctata		.	.	.	.	.	.	.	2 II	.	.	.
SS	SEDO-SCLERANTHETEA Br.-Bl. 1955 em. Th. Müller 1961												
			1	2	3	4	5	6	7	8	9	10	11
	Lactuca perennis	III	48 III	.	.	.	.	.	.	.	.	.	.
	Allium montanum		1 I	2 I	1 I	.	.	.	.	.	.	.	.
	Allium pulchellum		.	61 II	.	.	.	.	.	36 V	.	.	.
	Thymus serpyllum		.	23 II	.	1+	.	.	.	.	.	.	.
	Leontodon incanus		.	2 I	.	.	.	.	IV	3 II	51 II	.	.
	Jovibarba hirta		.	1 I	.	.	.	.	.	.	.	.	.
	Centaurea haynaldi subsp. julica		.	.	.	.	.	.	.	4 III	.	.	.
	Iris pallida subsp. cengialti (I. cengialti f. vochinensis)		.	.	.	.	.	.	.	72 II	.	.	.
	Dianthus sylvestris		.	.	.	.	.	.	.	4 II	51 II	.	.
	Sempervivum tectorum (S. schottii)		.	.	.	.	.	.	.	4 II	.	.	.
	Sedum album		.	.	.	.	.	.	.	2 II	.	.	.
	Melica ciliata		.	.	.	.	.	.	.	.	552 III	.	.
MA	MOLINIO-ARRHENATHERETEA R. Tx. 1937 s. lat.												
			1	2	3	4	5	6	7	8	9	10	11
	Serratula tinctoria	III	480 V	41 II	3002 V	3+-1	75 V	6 IV	.	.	.	.	.
	Veronica chamaedrys		97 V	.	2 I	.	3 III	81 IV	.	.	.	.	109 III
	Dactylis glomerata		210 IV	22 II	1100 II	1+	.	.	.	.	.	.	38 II
	Cardaminopsis arenosa		50 III	.	.	.	.	.	.	.	.	.	.
	Hierochloe odorata		48 III	.	.	.	.	.	.	.	.	.	.
	Genista tinctoria		47 II	2 I	100 I	2+	36 I	6 V	I	.	.	.	.
	Lotus corniculatus		3 II	22 II	.	.	.	.	.	7 IV	1 I	.	.
	Centaurea stenolepis		2 II	.	.	.	.	.	.	.	.	.	.
	Betonica officinalis		1 I	4 III	4 II	4+	1 I	.	.	.	.	.	218 V
	Inula salicina		1 I	223 III	100 I	4+-2	.	.	.	.	.	.	.
	Ajuga reptans		1 I	.	4 II	.	.	.	.	.	.	.	3 III
	Centaurea jacea c. f. (subsp. angustifolia)		.	60 II	.	2+-1	1 I	.	I	1 I	.	.	.
	Galium mollugo		.	59 II	.	.	1 I	.	.	4 III	.	.	.
	Campanula patula		.	.	.	.	- I	178 IV	.	.	.	.	.
	Vicia sepium		.	.	.	.	- I	.	.	.	.	.	4 III
	Leucanthemum ircutianum		.	.	.	.	.	2 IV	.	.	.	.	.
	Achillea millefolium		.	.	.	.	.	1 I	.	.	.	.	.
	Galium album		.	.	.	.	.	1 I	.	.	.	.	1 II
	Trifolium pratense		.	.	.	.	.	1 I	.	.	.	.	.

	Selinum carvifolia		.	.	.	.	.	.	.	2 II	.	.	.
	Lathyrus pratensis		.	.	.	.	.	.	.	.	53 III	.	.
	Anthoxanthum odoratum		.	.	.	.	.	.	.	.	.	.	911 V
ART	ARTEMISIETEA VULGARIS Lohmeyer, Preising & R. Tx. in R. Tx. 1950												
			1	2	3	4	5	6	7	8	9	10	11
	Galeopsis pubescens		.	.	.	.	- I	3 III	.	.	.	.	.
	Geum urbanum		.	.	.	.	- I	.	.	.	.	.	.
	Melandryum album		.		.	.	.	3 II	.	.	.	.	.
	Erigeron annuus		.	.	.	.	.	1 II	.	.	.	.	.
	Impatiens parviflora		.	.	.	.	.	1 I	.	.	.	.	.
TH	THLASPIETEA ROTUNDIFOLII Br.-Bl. et al. 1947 s. lat.												
			1	2	3	4	5	6	7	8	9	10	11
	Veronica fruticulosa	III	.	.	.	.	.	.	.	3 II	.	r 1	.
	Campanula cespitosa		.	.	.	.	.	.	.	3 II	.	.	.
AS	ASPLENIETEA TRICHOMANIS Br.-Bl. in Meier & Br.-Bl. 1934 corr. Oberd. 1977 s. lat.												
			1	2	3	4	5	6	7	8	9	10	11
	Asplenium trichomanes	III	.	- I	.	2+	1 II	2 II	.	4 II	.	.	.
	Asplenium ruta-muraria		.	.	.	3+	- I	.	.	6 IV	.	.	.
	Campanula spicata		.	.	.	.	.	.	.	.	55 IV	.	.
	Calamintha nepetoides		.	.	.	.	.	.	.	.	51 II	.	.
	Valeriana saxatilis		.	.	.	.	.	.	.	.	.	+	.
O	OTHER SPECIES (Ostale vrste)												
			1	2	3	4	5	6	7	8	9	10	11
	Rosa sp. div.	II	54 V	.	104 III	.	.	.	V	.	.	.	.
	Hieracium sp.	III	2 II	.	4 II	.	.	.	.	.	.	.	.
	Orchis sp.		2 II	.	2 I	.	.	.	.	.	.	.	.
	Melandrium album		.	3 II	.	.	.	.	.	.	.	.	.
	Fragaria vesca		.	2 I	.	3+-1	- I	- I	.	2 II	1 I	.	254 V
	Scabiosa hladnikiana		.	1 I	.	.	.	.	.	.	.	.	.
	Thesium divaricatum		.	1 I	.	.	.	.	.	.	.	.	.
	Carex mucronata		.	.	.	.	36 I	.	.	.	.	.	.
	Cardaminopsis arenosa		.	.	.	.	1 I	.	.	.	.	.	.
	Myosotis arvensis		.	.	.	.	1 I	.	.	.	.	.	.
	Sisymbrium altissimum		.	.	.	.	.	1 I	.	.	.	.	.
	Asplenium septentrionale		.	.	.	.	.	- I	.	.	.	.	.
	Sorbus aucuparia	II	.	.	.	.	.	.	II	.	.	.	1 I
	Thymus sp.	III	.	.	.	.	.	.	II	.	.	.	.
	Peucedanum verticillare (=Angelica verticillaris)		.	.	.	.	.	.	.	.	51 II	.	.
	Potentilla verna		.	.	.	.	.	.	.	.	2 II	.	.
	Verbascum austriacum		.	.	.	.	.	.	.	.	2 II	.	.
	Potentilla sterilis		.	.	.	.	.	.	.	.	.	.	74 II
	Rubus sp.	II	.	.	.	.	.	.	.	.	.	.	4 II
	Rosa spinosissima		.	.	.	.	.	.	.	.	.	.	3 II

ML	MOSSES AND LICHENS (Mahovi in lišaji)											
			1	2	3	4	5	6	7	8	9	10	11
	Tortella tortuosa	IV	.	1 I	.	3+	.	.	.	44 V	.	.	3 II
	Neckera crispa		.	- I	.	3+	.	.	.	1 I	.	.	1 I
	Polytrichum juniperinum		.	.	.	.	.	351 V	.	.	.	.	.
	Cladonia sp.		.	.	.	.	.	214 III	.	.	.	.	.
	Dicranella heteromalla		.	.	.	.	.	39 I	.	.	.	.	.
	Fissidens taxifolius		.	.	.	.	.	.	.	3 II	.	.	4 III
	Brachythecium geheebii		.	.	.	.	.	.	.	3 II	.	.	.
	Mnium orthorrhynchium		.	.	.	.	.	.	.	3 II	.	.	.
	Cladonia pyxidata		.	.	.	.	.	.	.	1 I	.	.	2 II
	Thuidium delicatulum		.	.	.	.	.	.	.	1 I	.	.	.
	Rhytidium rugosum		.	.	.	.	.	.	.	.	.	.	71 I
	Brachythecium rutabulum		.	.	.	.	.	.	.	.	.	.	1 I
	Cladonia furcata		.	.	.	.	.	.	.	.	.	.	1 I

LEGEND (Legenda)

Analytical tables (Analitične tabele)

1 - Querco-Ostryetum Ht. 1938 var. geogr. Acer obtusatum var. geogr. nova
2 - Querco-Ostryetum Ht. 1938
3 - Serratulo-Quercetum petraeae var. geogr. Acer obtusatum Ht. ex Zupančič & Žagar (Lathyro nigrae-Quercetum petraeae Ht. 1938 var. geogr. Acer obtusatum)
4 - Serratulo-Quercetum petraeae Ht. ex Zupančič & Žagar (Lathyro nigrae-Quercetum petraeae Ht. 1938)
5 - Serratulo-Quercetum petraeae Ht. ex Zupančič & Žagar (Lathyro nigrae-Quercetum petraeae Ht. 1938)
6 - Asplenio adianti-nigri-Quercetum petraeae Ž. Košir ex Cimperšek 2008
7 - Erico carneae-Ostryetum Ht. 1956
8 - Cytisantho-Ostryetum M. Wraber 1961
9 - Ostryo carpinifoliae-Fraxinetum orni Aichinger 1933
10 - Rhododendro hirsuti-Ostryetum Franz 1991
11 - Lathyro nigrae-Quercetum petraeae Richard 1961

Location and province (Kraj popisa in pokrajina)

BOH - Bohinj
GOR KOT - Gorski kotar (Croatia)
HR ZAG - Hrvatsko Zagorje (Croatia)
JURA - Jura (Switzerland)
KAR - Karavanke (Austria)
KARN - Karnijske Alpe (Austria)
KOČ - Kočevsko
KOR - Koroška (Austria)
KRAN - Kranjska
MED - Medvednica (Croatia)
NOT - Notranjska
SAM - Samoborsko gorje (Croatia)
ŠTAJ - Štajerska

Bedrock (Geološka podlaga)

and - andesite (andezit)
apn - limestone (apnenec)
diab - diabase (diabaz)
dol - dolomite (dolomit)
dol apn - dolomitized limestone (dolomitiziran apnenec)
karb - carbonate (karbonatne kamnine)
nekarb - non-carbonate (nekarbonatne kamnine)
peš - sandstone (peščenjak)
rož - chart (roženec)