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NOBLE HARDWOOD FORESTS OF THE ALTIMONTANE BELT (*LAMIO ORVALAE–ACERETUM PSEUDOPLATANI* P. KOŠIR ET MARINČEK 1999) IN SLOVENIA (WESTERN PART OF THE ILLYRIAN FLORAL PROVINCE)

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The article treats of the association *Lamio orvalae–Aceretum* P. Košir et Marinček 1999, which was found in the altimontane belt of the Dinaric region (Mt. Snežnik, the Trnovski gozd plateau), and in the altimontane and montane belt of the Pre-Alpine region of Slovenia (Mt. Blegoš, Kamniška Bistrica valley). The association was classified into the alliance of Illyrian noble hardwood forests *Fraxino–Acerion* Fukarek 1969. The stands of the association are in the synoptic table compared with other Illyrian maple associations and related Central European maple associations of the alliance *Tilio–Acerion* Klika 1955.

Key words: noble hardwood forests, synsystematics, forest vegetation, *Lamio orvalae–Aceretum*, altimontane belt, *Fraxino–Acerion*, Illyrian floral province, Slovenia

Košir, P.: Šume plemenitih listača altimontanskog pojasa (*Lamio orvalae–Aceretum pseudoplatani* P. Košir et Marinček 1999) u Sloveniji (zapadni dio ilirske florne provincije). Nat. Croat., Vol. 14, No. 2., 59–86, Zagreb, 2005.

U radu je obrađena asocijacija *Lamio orvalae–Aceretum* P. Košir et Marinček 1999. Sastojine asocijacije pronađene su u altimontanskom pojasu dinarskog (Snežnik, Trnovski gozd), i u altimontanskom te montanskom pojasu predalpskog područja Slovenije (Blegoš, Kamniška Bistrica). Asocijacija je uvrštena u svezu ilirskih šuma plemenitih listača *Fraxino–Acerion* Fukarek 1969. Sastojine asocijacije su u sinoptičkoj tablici uspoređivane s ostalim ilirskim asocijacijama javora i sa sličnim srednjoeuropskim šumama javora sveze *Tilio–Acerion* Klika 1955.

Ključne riječi: šume plemenitih listača, sinsistematika, šumska vegetacija, *Lamio orvalae–Aceretum*, altimontanski pojas, *Fraxino–Acerion*, Ilirska florna provincija, Slovenija

INTRODUCTION

Noble hardwood forests are intrazonal forests that grow on small sites with specific soil conditions. They occur on slopes, the foot of the slopes, in sinkholes, gorges and hollows with colluvial, skeletal and primarily unstable soil, which allows noble hardwoods to replace otherwise competitively stronger tree species on such sites, above all the beech (CLOT, 1990).

Noble hardwood forests of the altimontane and subalpine belt have already been thoroughly studied in Central Europe (CLOT, 1990; MÜLLER, 1992; WALLNÖFER *et al.,* 1993). For the most part, they are classified into the association *Ulmo–Aceretum* Issler 1925, and rarely also in the association *Sorbo ariae–Aceretum* Moor 1952 (MÜLLER, 1992), which in comparison with the previously mentioned association occurs on warmer aspects and is characterized by many heliophilous species. Both associations are classified within the Central European alliance of noble hardwood forests *Tilio–Acerion* Klika 1955.

However, noble hardwood forests of the altimontane belt in the area of the Illyrian floral province have not been thoroughly studied. Compared to beech forests, noble hardwood forests cover a much smaller proportion of forests and have therefore been neglected within the research of beech forest stands in Slovenia, as well as in other parts of the Illyrian floral province. Lately, however, they too became the subject of intensive research, especially in Slovenia (MARINČEK, 1990, 1995; ACCETTO, 1991; ZUPANČIČ, 1996; ZUPANČIČ & ŽAGAR, 1999; DAKSKOBLER, 1999; P. KOŠIR & MARINČEK, 1999; P. KOŠIR, 2000, 2002, 2004). So far, these studies have been focused above all on the montane and submontane belt.

With regard to the synsystematic classification of noble hardwood forests in the region of the Illyrian floral province many different views exist. The latest research (P. KOŠIR, 2004) showed that the noble hardwood forests of the Illyrian floral province can be classified into an independent alliance *Fraxino–Acerion* Fukarek 1969 within the order *Fagetalia sylvaticae*. The results of the latest research (P. KOŠIR, 2004) are also considered in this article.

HORVAT (1938) was the first to mention the stands of noble hardwoods in the region of the Illyrian floral province at higher altitudes (altimontane and subalpine belt) on Velika Kapela and on Lička Plješevica, where they occur within the subalpine beech forests. Together with the stands at lower altitudes, he classified them as *Aceri–Fraxinetum croaticum*. In his later work on the highland vegetation of western Croatia HORVAT (1962) also mentions the association *Aceri–Ulmetum* Beger 1922 (apart from the above-mentioned association which occurs within subalpine beech forests) on the northern slope of Risnjak, but without mentioning the altitude. In the region of Lika the stands at altitudes between 1100 and 1230 m are also mentioned by PELCER *et al.* (1977), as *Aceri–Ulmetum* prov. In Slovenia, noble hardwood forests at various altitudes (from 800 to 1350 m) on Mt. Snežnik, Javornik and the Trnovski gozd plateau were presented as the association *Aceri–Ulmetum* by Piskernik in his graduation thesis (PISKERNIK, 1954). TREGUBOV (1957) also mentions the association *Ulmo–Aceretum* Issler 1925 within forests on Mt. Snežnik up to the altitude of 1100 m. M. WRABER (1953) describes the association *Aceri–Ulmetum* on

Pohorje and the high karst region, and mentions the subassociation *A.–U. adenostyletosum* as an altitudinal form of this association. Later (M. WRABER, 1960) he incorporated the forests in the pre-Alpine, Alpine and Dinaric regions on carbonate soils, from the lowlands to the highest altitudes, into the association *Aceri–Fraxinetum illyricum*, separately from the association *Sorbo aucupariae–Aceretum* on the silicate Pohorje region. In Bosnia and Herzegovina, the noble hardwood forests of the altimontane and subalpine belt were mentioned and described by Fukarek & STEFANOVIĆ (1958) and FUKAREK (1970) as *Aceri–Fraxinetum* from the region of the Peručica virgin forest, and as *Ulmo–Aceretum* (FUKAREK, 1964) from the region of Igman.

The association *Lamio orvalae–Aceretum* was described by P. KOŠIR & MARINČEK (1999) in the region of Kamniška Bistrica as an Illyrian association of the montane belt of the pre-Alpine region of Slovenia and was presented with one relevé. However, our research into noble hardwood forests of the altimontane belt in the Dinaric and pre-Alpine region showed that the stands are similar, as they are connected by the species of altimontane and subalpine tall herbs and shrubs of the order *Adenostyletalia*. Therefore, we include the stands located in the altimontane belt of the Dinaric and pre-Alpine region of Slovenia and described in this study in this association.

In this article, the association *Lamio orvalae–Aceretum*, into which the forest stands of noble hardwoods in the altimontane belt are classified, will be analysed and presented in an analytic table. Ecological conditions will be described by means of soil profiles. A comparative table of Illyrian maple forests (alliance *Fraxino–Acerion*) and Central European maple forests (alliance *Tilio–Acerion*) will determine their synsystematic classification as well.

METHODS

The relevés were made applying the standard Central European method (BRAUN-BLANQUET, 1964).

The collected vegetation relevés were organised together with relevé material already published from the territory of the Illyrian floral province, and also some relevé material of similar vegetation from Central Europe in the TURBOVEG database (HENNEKENS & SCHAMINÉE, 2001). To process and analyse the phytosociological relevés and their syntaxonomic classification we used the principal coordinate analysis ordination method (PcoA) from the computer package SYN-TAX 2000 (PODANI, 2001). The dissimilarity coefficient was the similarity ratio.

When processing the vegetation relevés we used also the JUICE 6.1.10 (TICHÝ, 2001) computer program to arrange the large phytosociological tables. When determining the diagnostic species we applied the measure of fidelity, which has become a frequently used method (CHYTRÝ *et al.*, 2002). The coefficient ϕ was used in the JUICE (TICHÝ, 2001) program as it allows a comparison of species fidelity in datasets of different size. The species with the highest fidelity values were treated as diagnostic.

The description of the association includes the chorological spectrum. The classification of species (with the exception of mosses, which were not considered here) into a certain chorological group follows POLDINI (1991) and partly PIGNATTI (1982).

Species which occur only once and with a small cover value were excluded from the table and are mentioned in the Appendix.

The names of vascular plants follow the *Liste der Gefässpflanzen Mitteleuropas* (EHRENDORFER, 1973), except for the genera *Stellaria* and *Helleborus* (MARTINČIČ *et al.*, 1999) and ferns (KRAMER, 1984). For the names of mosses we used the *Seznam listnatih mahov (Bryopsida) Slovenije* (MARTINČIČ, 2003).

The newly described syntaxa were named according to the *Code of phytosociological nomenclature* (WEBER *et al.*, 2000). The Code does not treat the syntaxa of the ranks such as geographical race, variant and subvariant, which means that there are no current rules for their denomination.

The association was subdivided into lower syntaxonomical units applying the principle of the multidimensional division of vegetation units (W. & A. MATUSZKIEWICZ, 1981).

The soil conditions were studied with the representative soil profiles.

The soil profiles were described by Tomaž Prus, M.Sc., and the chemical analyses were conducted in the laboratories of the Pedology and Environment Protection Centre of the Biotechnical Faculty in Ljubljana.

RESULTS AND DISCUSSION

Study area and general ecological conditions

The association thrives in the altimontane belt of the pre-Alpine and Dinaric region of Slovenia and descends to the montane belt in the cold pre-Alpine region. The relevés were made in the region of Snežnik, the Trnovski gozd plateau, Blegoš and Kamniška Bistrica. In the pre-Alpine region the association covers the slopes of alluvial fans and colluvial ditches (concavities), but in the Dinaric region it grows mostly at the bottom, the foot, or slopes of sinkholes, where the soil is deeper and unstable; however, it covers other colluvial slopes as well. In the pre-Alpine region, the association *Lamio orvalae–Aceretum* occurs intrazonally in the distribution area of the altimontane beech forests of the association *Ranunculo platanifolii–Fagetum* Marinček et al. 1993 var. geogr. *Hepatica nobilis* Marinček 1998, and of *R.–F.* var. geogr. *Calamintha grandiflora* Marinček 1998 in the Dinaric region. In the pre-Alpine region it appears also in the distribution area of the pre-Alpine beech forest *Lamium orvalae–Fagetum* (I. Horvat 1938) Borhidi 1963 var. geogr. *Dentaria pentaphyllos* Marinček 1981.

The study area lies in the climatic region of the lower montane part of western Slovenia (OGRIN, 1996). The montane region in western Slovenia has a sub-Mediterranean rainfall regime and receives between 1600 and 3000 mm of rainfall yearly. Characteristic of the sub-Mediterranean rainfall regime is a primary rainfall peak in autumn and a secondary at the end of spring, whereas the primary rainfall mini-

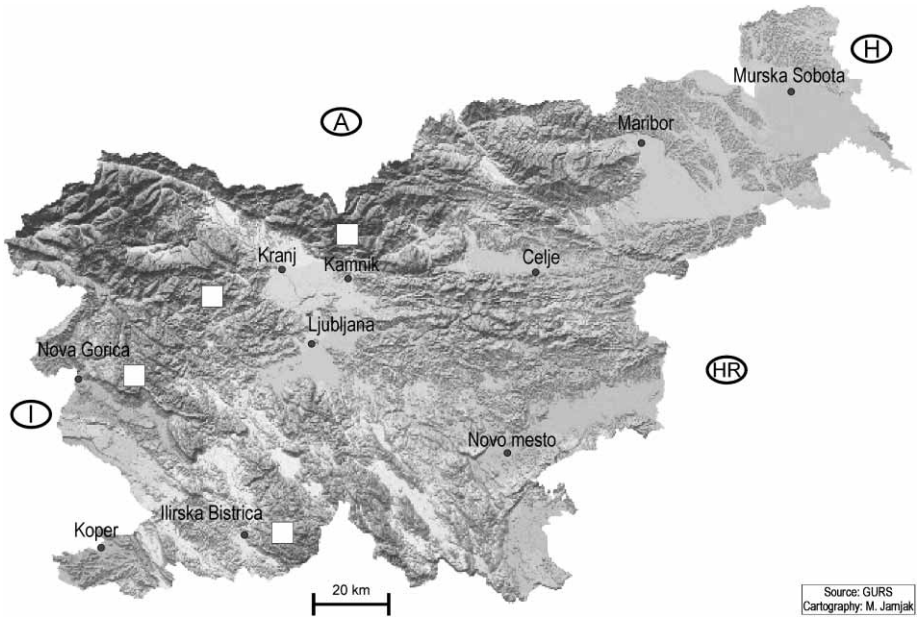

Fig. 1. Study area of the association *Lamio orvalae–Aceretum* in Slovenia.

mum is at the end of winter and secondary in July and August. Mean temperature of the coldest month is below –3 °C, and of the warmest month above 10 °C.

The stands of the association *Lamio orvalae–Aceretum* thrive on various aspects, above all on cold, northern and eastern aspects; only rarely do the stands appear on southward or westward slopes. The association occurs mainly at altitudes between 1000 and 1300 metres, and in the cold pre-Alpine/Alpine region even lower, down to altitudes between 750 and 960 metres. It covers moderately steep slopes of 5 to 25°, rarely also up to 35°.

The range of stoniness is large, from 0 to 80 %. Sites with 5–10 % surface stoniness prevail (these are mostly the sites with hillside scree), but there are also many extremely stony sites (40% to 80 % stoniness) with larger rocks.

The community grows exclusively on calcareous bedrock. Triassic and Jurassic limestone and dolomite prevail (SLOVENIJA – Geološka karta, 1993).

The association occurs mainly on weakly developed soil. The prevailing soil is rendzina on hillside scree and limestone, but also colluvial-delluvial soil occurs. Due to lower temperatures at higher altitudes the soil is less deep and more weakly developed than in the stands of noble hardwoods at lower altitudes. Less favourable temperatures are also the reason why decomposition of organic matter is slower, which is reflected in slightly higher C/N proportion values in the soil profiles of the studied stands (profiles 1 to 5) when compared to the values in the soil profiles of the stands of noble hardwoods at lower altitudes in the same region (see *Omphalodo–Aceretum*; P. KOŠIR, 2000).

Structure and floristic composition

For the most part, the upper tree layer covers 60 to 90 % of the surface and the lower up to 40 %. *Acer pseudoplatanus* dominates the tree layer, while within the subassociation *L.–A. fraxinetosum Fraxinus excelsior* prevails in the tree layer. Also occurring are *Fagus sylvatica*, *Ulmus glabra* and *Picea abies*, very rarely also *Abies alba*.

The larger part of the shrub layer is only poorly developed and covers between 5 to 10 % of the surface, and rarely up to 20 % or even 30 to 40 % as well. Only *Sambucus nigra* and *Rhamnus fallax* occur more frequently, whereas the shrub layer consists mainly of the above-mentioned tree species, among which *Fagus sylvatica* and *Acer pseudoplatanus* are the most common.

The herb layer is well developed and most often covers between 80 and 100 % of the surface. The species of the alliance *Fraxino–Acerion* are well represented. The highest frequency and coverage among them have *Urtica dioica*, *Adoxa moschatellina*, *Geranium robertianum*, *Actaea spicata*, *Lamium orvala*, *Polystichum aculeatum* and *Lunaria rediviva*. The species of the order *Fagetalia sylvaticae* occur in the largest numbers, and the highest frequency and coverage among them are found in *Dryopteris filix-mas*, *Dentaria bulbifera*, *Paris quadrifolia*, *Lamiastrum flavidum*, *Mycelis muralis*, *Galium odoratum* and *Symphytum tuberosum*. Also common are the species of the order *Adenostyletalia* G. et J. Br.-Bl. 1931, which include the differential species of the association. The most common species of the order *Adenostyletalia* is *Senecio fuchsii*, which also stands out for its high cover values. Other frequently occurring species are *Athyrium filix–femina*, *Veratrum album*, *Saxifraga rotundifolia*, *Myosotis sylvatica*, *Polygonatum verticillatum* and *Silene dioica*. Other syntaxa are not so well represented. Among the species of the alliance *Aremonio–Fagion* (I. Horvat 1938) Török et al. 1989, *Dentaria enneaphyllos* and *Cardamine trifolia* occur the most frequently and abundantly. In the class *Querco–Fagetea* Br.-Bl. et Vlieg. in Vlieg. 1937 only *Anemone nemorosa* appears with a high frequency, the same as *Stellaria nemorum* and *Chrysosplenium alternifolium* within the alliance *Alno–Ulmion* Br.-Bl. et Tx. 1943, and *Oxalis acetosella* within the class *Vaccinio–Piceetea* Br.-Bl. in Br.-Bl. et al. 1939.

The moss layer is developed in accordance with the very diverse stoniness of the sites of this association. It covers between 0 and 60 % of the ground surface and is limited to larger stable stones and rocks, while hillside scree remains mainly uncovered with mosses. The most common species and those with the highest cover values are *Ctenidium molluscum*, *Brachythecium rutabulum*, *Hypnum cupressiforme* and *Brachythecium populeum*.

Fig. 2 shows the species composition of the community regarding its syntaxonomical classification into individual syntaxa. The largest number of the species is of the order *Fagetalia sylvaticae* (21 %), followed by the moss species (20 %) and the species of the alliance *Fraxino–Acerion* (12 %). Also to be mentioned are the species of the altimontane and subalpine tall herbs and shrubs of the order *Adenostyletalia*, which are relatively well represented with 9 % and indicate the growth of the community in the altimontane belt. Other syntaxa are more poorly represented.

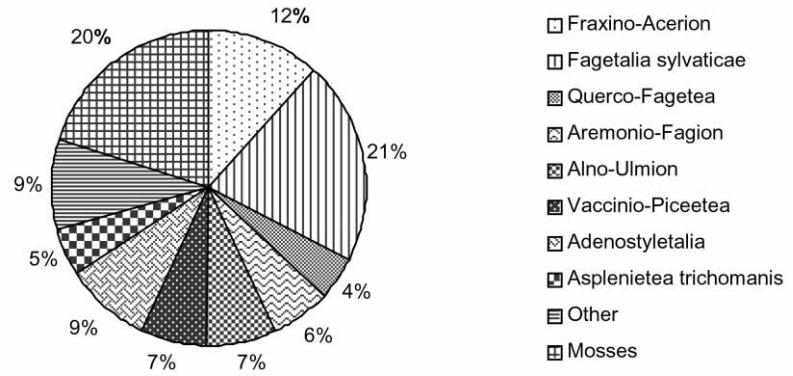

Fig. 2. Syntaxonomical spectrum of the association *Lamio orvalae–Aceretum*

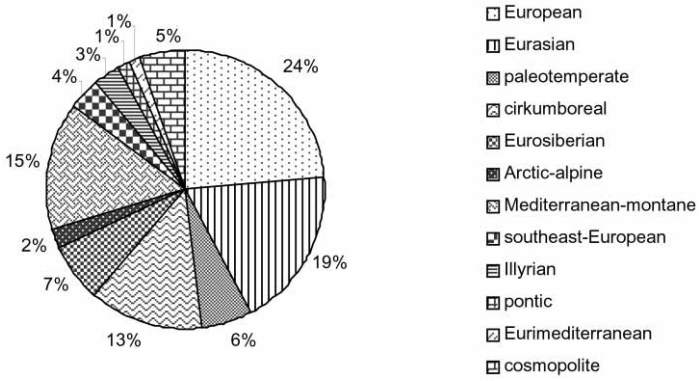

Fig. 3. Geoelemental spectrum of the association *Lamio orvalae–Aceretum*

Regarding the origin of floral elements, the community composition is as presented in Fig. 3. The association described is dominated by the European floral element (24 %), followed by Eurasian (19 %), Mediterranean-montane (15 %) and the circumboreal (13 %) floral element. Other floral elements are not so well represented. The presence of the already mentioned Mediterranean-montane species (15 %), southeast-European (4 %) and Illyrian (3 %) species distinguishes the studied community from related Central European communities.

Differential species of the association

As associations of noble hardwood forests are often without character species or even without specific differential species, CLOT (1990) establishes associations of Central European maple forests on the basis of a combination of ecological groups of species. WALLNÖFER *et al*. (1993) also described the associations of the Central European alliance of noble hardwood forests *Tilio–Acerion* in Austria based on such

a diagnostic combination of species where a group of character species is often missing. This article, too, determines a new association which is floristically sufficiently different from the related maple communities above all on the basis of differential species.

Differential species of the association are: *Stellaria nemorum*, *Saxifraga rotundifolia*, *Polygonatum verticillatum* and *Ranunculus platanifolius*. The species that are at the same time differential for the variant *L.–A. typicum* var. *Adenostyles alliariae* are also included among the differential species of the association: *Adenostyles alliariae*, *Polystichum lonchitis*, *Cicerbita alpina* and *Adenostyles glabra*. All of them, with the exception of *Stellaria nemorum,* belong to the order *Adenostyletalia* and therefore characterize the association as a community of noble hardwoods of the altimontane belt.

At the same time, these species are also the differential species of altimontane beech forests, with the reservation that *Adenostyles alliariae* does not occur within them with such high cover values as within the noble hardwood forests of the same altitudinal belt. Unlike *Adenostyles glabra* (which is more common in beech forests) this species occurs on deeper soil. It grows on wet soils rich in nutrients and bases (OBERDORFER, 1994). Its occurrence is also mentioned within the association *Ulmo–Aceretum* in Central Europe (CLOT, 1990; OBERDORFER, 1994).

As its ecological optimum is in forests on stony rubble and rock crevices (OBERDORFER, 1994), *Polystichum lonchitis* is classified among the species of the class *Asplenietea trichomanis*. However, considering its growth at higher altitudes it could also be classified among the species of the order *Adenostyletalia*. It is a character species of the Illyrian subalpine beech forests *Polysticho lonchitis–Fagetum* (I. Horvat 1938) Marinček in Poldini et Nardini 1993 (MARINČEK, 1980,1996).

In Central Europe, *Stellaria nemorum* is classified among the species of the alliance *Alno–Ulmion* (OBERDORFER, 1994; WALLNÖFER *et al*., 1993), but in the region of the Illyrian floral province the species has also another ecological meaning. This species, widely distributed in Europe, is less common in Slovenia. Within the Illyrian floral province, where the species *Stellaria montana* is more common, it is confined above all to the altimontane and subalpine belt, and at lower altitudes (montane and submontane belt) it can hardly be found at all (DAKSKOBLER *et al*., 1999).

POLDINI (1991) classifies *Saxifraga rotundifolia*, *Adenostyles alliariae*, *A. glabra* and *Cicerbita alpina* among the species of the Mediterranean-montane floral element, and *Stellaria nemorum* and *Ranunculus platanifolius* among European species. *Polygonatum verticilatum* is treated as a Eurasian species and *Polystichum lonchitis* as a circumboreal species.

The association *Omphalodo–Aceretum* P. Košir and Marinček 1999, which grows in the montane belt of the Dinaric region, is also effectively differentiated from the association *Lamio orvalae–Aceretum* by *Veratrum album*, *Myosotis sylvatica* and *Silene dioica*. All these species, however, frequently occur in some other associations of noble hardwood forests and were therefore not included in the group of differential species of the association *Lamio orvalae–Aceretum*.

Subdivision of the community into lower synsystematic units

We distinguish two geographical races within the association:

– *L.–A.* var. geogr. *Dentaria pentaphyllos* in the pre-Alpine region and in the western part of the Dinaric region (the Trnovski gozd plateau) and

– *L.–A.* var. geogr. *Calamintha grandiflora* in the central part of the Dinaric region of Slovenia (Snežnik).

The differential species of the geographical race *L.–A.* var. geogr. *Dentaria pentaphyllos* is *Dentaria pentaphyllos*, whose easternmost distribution borderline is in western Slovenia. The stands of the geographical race *L.–A.* var. geogr. *Calamintha grandiflora* are differentiated by the Illyrian species *Calamintha grandiflora* and *Geranium nodosum*, which are characteristic above all of the Dinaric region.

The association was ecologically subdivided into two subassociations:

– *L.–A. fraxinetosum* subass. nova hoc loco and

– *L.–A. typicum* subass. nova hoc loco

Subassociation ***L.–A. fraxinetosum*** **subass. nova hoc loco (Tab. 6/1–7)** comprises the most initial stands of this association. They occur on colluvial-delluvial soil on limestone hillside scree. The stands of this subassociation cover alluvial fans and were found in the pre-Alpine region of Slovenia, in the area of Kamniška Bistrica. Within the association they cover sites at the lowest altitudes (750–960 m). Compared to the stands of the subassociation *L.–A. typicum*, the tree layer includes not only the species *Acer pseudoplatanus*, but also *Fraxinus excelsior*, which in most stands dominates even the species *Acer pseudoplatanus*.

The differential species of the subassociation are *Fraxinus excelsior*, *Salvia glutinosa*, *Eupathorium cannabinum*, *Rhamnus fallax*, *Hypericum hirsutum*, *Arabis turitta*, *Arctium lappa* and *Laburnum alpinum*. They indicate the initial character of the subassociation as they are forest clearing species of the class *Epilobietea angustifolii* (*Salvia glutinosa*, *Eupathorium cannabinum*, *Hypericum hirsutum*, *Laburnum alpinum*). They are also relatively heliophilous species, thus indicating high canopy openness of the stands (*Arabis turitta*, *Rhamnus fallax* and *Arctium lappa*). *Fraxinus excelsior* is considered a pioneer species (OBERDORFER, 1994), but also indicates the growth of the stands at lower altitudes.

Holotype of the subassociation *Lamio orvalae–Aceretum fraxinetosum excelsioris* is relevé No. 1 in Tab. 6 hoc loco.

Subassociation ***L.–A. typicum*** **subass. nova hoc loco (Tab. 6/8–32)** is the central form of the association in terms of ecology, as well as floristically. The prevailing soil type in this subassociation is rendzina.

Two variants were distinguished within the subassociation: var. *Lunaria rediviva* and var. *Adenostyles alliariae*.

Stands of the variant with *Lunaria rediviva* were located in the region of the Trnovski gozd plateau and Mt. Blegoš (one relevé). The Trnovski gozd plateau lies in a warmer climatic region (sub-Mediterranean impact), so the temperature conditions are more favourable. In the only stand on Mt. Blegoš (the pre-Alpine region),

Tab. 1. Soil profile description (Profile 1)

Profile 1

Locality: Žagana peč, Kamniška Bistrica, relevé No. 1 (Tab. 6), slope, NE exposition

Bedrock: limestone, hillside scree

Soil type: colluvial-delluvial soil

Profile description:

Ol: 2–0; maple and ash tree foliage, mosses, herbs

CA1: 0–20; silty-loamy, subangular blocky structure, explicitly humose, peds are of medium stability and clearly evident; consistence is loose and brittle; colour 5YR2, 5/1; wet, abundant roots; wet; 90% skeleton up to 100 mm; note: tuberously distributed humose part, mixed with sandy particles

CA2

HORIZON	depth	pH KCl	P_2O_5 AL	K_2O AL	org. matter %	C %	CN prop.	N %	text. class
			mg/100g						
Oh	0–2O cm	7.1	4.5	5.3	15.60	9.0	11.1	0.81	MI

AMMONACETATE extraction		Ca	Mg	K	Na	H	S	T	V	Ca	Mg	K	Na	H
HORIZON	depth			mmol C_+/100g		sample			%	%	%	%	%	%
Oh	0–20 cm	28.38	9.42	0.17	0.06	3.15	38.03	41.18	92.4	68.9	22.9	0.4	0.1	7.6

NOTE: Despite being shallow, the soil is relatively fertile, which is the result of large quantities of precipitation that is evenly distributed at the time of growth.

more favourable temperature conditions are provided with the southern exposition. On account of the warmer microclimate, decomposition of organic matter is faster, which is reflected in a closer C/N proportion (profiles 2 and 3) compared to C/N values in the soil profiles from the Snežnik region (profiles 4 and 5, variant *Adenostylea alliariae*). The soil richer in nutrients and the more favourable temperature conditions are also reflected in the group of differential species. The differential species of the variant var. *L.–A. typicum* var. *Lunaria rediviva* are: *Lunaria rediviva*, *Impatiens noli–tangere*, *Lilium martagon* and *Heracleum sphondylium*.

The stands of the variant with *Adenostyles alliariae* were located in the area of Snežnik, where they cover the coldest sites within the subassociation. In accordance with the unfavourable temperature conditions, decomposition of organic matter is slow, which is reflected in higher C/N proportions (profiles 4 and 5) compared to C/N proportions in the soil profiles from the Trnovski gozd plateau (profiles 2 and 3, variant *Lunaria rediviva*). The differential species of the variant *L.–A. typicum* var. *Adenostyles alliariae* are: *Adenostyles alliariae*, *Polystichum lonchitis*, *Cicerbita alpina* and *Adenostyles glabra*. These are the species of the order *Adenostyletalia* which are simultaneously treated in the group of the differential species of the association. They indicate the growth of the stands of this variant on colder sites in the altimontane belt.

Tab. 2. Soil profile description (Profile 2)

Profile 2
Locality: The Trnovski gozd plateau, relevé No. 9 (Tab. 6), sinkhole slope, E exposition
Bedrock: limestone-dolomite hillside scree
Soil type: brown rendzina on hillside scree, mull (RENDZIC LEPTOSOL)

Profile description:
Ol: 2(1)–0; evenly covers OhA; maple and beech foliage, herb remains
Of: in places up to 0,5 cm thick
OhA: 0–9 cm; subangular blocky and cloddy structure, silty loam, very humose; medium distinct peds of medium stability; consistence is loose and brittle; the colour is very dark grey, 5YR 2,5/2; fresh with abundant fine and medium roots; no skeleton; C/N proportion is characteristic for mull to moder mull
A: 9–15 cm; silty loam, fine angular blocky structure, humose; strong durable peds are clearly evident; consistence is of medium density and brittle; the colour is dark brown, 7,5YR 3/2; fresh and with common abundance of roots; skeleton is singular and composed of sharp-edged particles of up to 2 cm; C/N proportion is characteristic for mull
CB: 15–52 cm +; silty loam to loam, fine angular blocky structure, poorly humose to mineral; weakly distinct peds of bad stability; consistence is brittle and friable; the colour is brown to dark brown, 7,5YR 4/4; fresh to moist and with few roots; up to 90% of skeleton, composed of sharp-edged particles up to 2–3 cm**,** below even up to 15 cm; C/N proportion is characteristic for mull

HORIZON	depth	pH $CaCl_2$	P_2O_5 AL	K_2O AL	org. matter %	C %	CN prop	N toget. %
			mg/100g					
Oh	0–9 cm	5.0	8.8	33.1	29.5	17.1	15.4	1.11
A	9–15 cm	6.4	1.6	21.4	7.9	4.6	12.4	0.37
CB	15–52+ cm	7.6			1.0	0.6	12.0	0.05

Holotype of the subassociation *Lamio orvalae–Aceretum typicum* is relevé No. 18 in Tab. 6 hoc loco.

Fig. 4. presents ordination of the relevés from the analytic table (Tab. 6). The relevés were arranged on axis 1 with respect to thermophilicity and on axis 2 regarding initiality and the stage of development of the soil respectively. The stands of the subassociation *L.–A. fraxinetosum* therefore cover the warmest and most initial sites, the stands of the variant *L.–A. typicum* var. *Lunaria rediviva* the most developed soil (at least in terms of decomposition of organic matter) and the stands of the variant *L.–A. typicum* var. *Adenostyles alliariae* the coldest sites within the association.

Syntaxonomic situation of the community and related syntaxa

The synoptic table (Tab. 7) gives a comparison of the studied syntaxon with certain syntaxa of Illyrian noble hardwood forests and with related Central European syntaxa in the altimontane and subalpine belt, which are within the alliance *Tilio–Acerion* mainly classified into the association *Ulmo–Aceretum.* In the table we present the frequency of differential species of the association *Lamio orvalae–Aceretum*, character species of Illyrian noble hardwood forests *Fraxino–Acerion*, regionally cha-

Tab. 3. Soil profile description (Profile 3)

Profile 3

Locality: theTrnovski gozd plateau, relevé No. 12 (Tab. 6), sinkhole slope, EES exposition

Bedrock: limestone-dolomite hillside scree

Soil type: Brown rendzina on hillside scree, mull (RENDZIC LEPTOSOL)

Profile description:

Ol: 3–1; evenly covers the ground; maple and beech foliage, herb remains

Of : 1–0

OhA: 0–10(15) cm; subangular blocky and cloddy structure, almost organic; strong durable peds are clearly evident; consistence is loose and brittle, also friable; the colour is black, 5YR 2,5/1; fresh with abundant roots; singular skeleton; C/N proportion is characteristic for mull; sharp transition into C horizon.

C: 10(15)–40 cm +

HORIZON	depth	pH $CaCl_2$	P_2O_5 AL	K_2O AL	org. matter %	C %	CN raz	N toget. %
			mg/100g					
Oh		6.5	3.2	17.1	32.2	18.6	10.9	1.70

Tab. 4. Soil profile description (Profile 4)

Profile 4

Locality: Mt. Snežnik, Kamrica, relevé No. 18 (Tab. 6), the middle of the slope, NW exposition

Bedrock: limestone hillside scree

Soil type: Rendzina on hillside scree, mull (RENDZIC LEPTOSOL)

Profile description:

Ol: 3–0; evenly covers Oh; maple and beech foliage

Oh: 0–17 cm; subangular blocky structure, mainly organic matter; strong durable peds are clearly evident; consistence is loose and brittle; the colour is dark reddish brown, 5YR 2,5/2; fresh to moist with abundant roots; singular skeleton, sharp-edged up to 25 cm; C/N proportion is characteristic for mull to moder mull

AC: 17–41 cm; silty loam, subangular blocky structure with a slight angular tendency, explicitly humose; strong durable peds are clearly evident; consistence is loose and brittle; the colour is dark reddish brown, 5YR 2,5/2; fresh to moist and with abundant roots; 50% of skeleton, composed of sharp-edged particles up to 30 cm; C/N proportion is characteristic for mull

C: 41–51 cm +; small grained sharp limestone rubble and sand

HORIZON	depth	pH $CaCl_2$	P_2O_5 AL	K_2O AL	org. matter %	C %	CN prop	N toget. %
			mg/100g					
Oh1	0–17 cm	6.1	7.2	29.0	44.5	25.8	15.2	1.70
AC	17–41 cm	6.9	0.6	13.7	22.0	12.7	12.3	1.03

Tab. 5. Soil profile description (Profile 5)

Profile 5

Locality: Mt. Snežnik, Mašun, Veksel, relevé No. 27 (Tab. 6), the foot of the slope, NW to N exposition

Bedrock: limestone

Soil type: Rendzina on limestone, mull (RENDZIC LEPTOSOL)

Profile description:

Ol: 2–0; evenly covers OhA; maple and beech foliage, herb remains

OhA: 0–9 cm; subangular blocky and cloddy structure, silty loam, explicitly humose; medium distinct peds of medium stability; consistence is loose and brittle; the colour is very dark grey, 5YR 3/1; fresh with abundant roots; no skeleton; C/N proportion is characteristic for mull

A: 9–40 cm; silty loam, cloddy structure, explicitly humose; medium distinct peds of medium stability; consistence is loose and brittle; the colour is dark reddish brown, 5YR 3/2; fresh with abundant roots; 30% of skeleton, composed of sharp particles up to 15–20 cm in size; C/N proportion is characteristic for mull to moder mull

C: 40–50 cm +; tightly arranged stones and rocks with little soil material in narrow crevices

HORIZON	depth	pH $CaCl_2$	P_2O_5 AL	K_2O AL	org. matter %	C %	CN raz	N toget. %
			mg/100g					
OhA	0–9 cm	5.0	7.7	34.8	29.0	16.8	13.7	1.23
AC	9–40 cm	4.9	1.3	11.2	14.6	8.5	15.2	0.56

racteristic species of the alliance *Fraxino–Acerion* and the species of Illyrian alliances within the order *Fagetalia sylvaticae*, *Aremonio–Fagion* and *Erythronio–Carpinion*, which in the region of the Illyrian floral province occur also in noble hardwood forests of the alliance *Fraxino–Acerion*. Regionally characteristic species (DIERSCHKE, 1994) are those that are characteristic of the alliance of Illyrian noble hardwood forests in the region of the Illyrian floral province, as well as differential towards the alliance *Aremonio–Fagion*, but are at the same time characteristic for Central European noble hardwood forests of the alliance *Tilio–Acerion* in the region of the Central European province. As is evident in the synoptic table, they occur in Illyrian and Central European noble hardwood forests.

Within the association described, the character species of the alliance *Fraxino–Acerion* are well represented, and the species of the alliance *Aremonio–Fagion* occur as well, which positively classifies the association into Illyrian noble hardwood forests and differentiates it from the related stands of the alliance *Tilio–Acerion* in Central Europe.

The studied community is synsystematically classified as follows:

Querco–Fagetea Br.-Bl. et Vlieger in Vlieger 1937

Fagetalia sylvaticae Pawlowski in Pawlowski et al. 1928

Fraxino–Acerion Fukarek 1969

Lamio orvalae–Aceretum pseudoplatani P. Košir et Marinček 1999

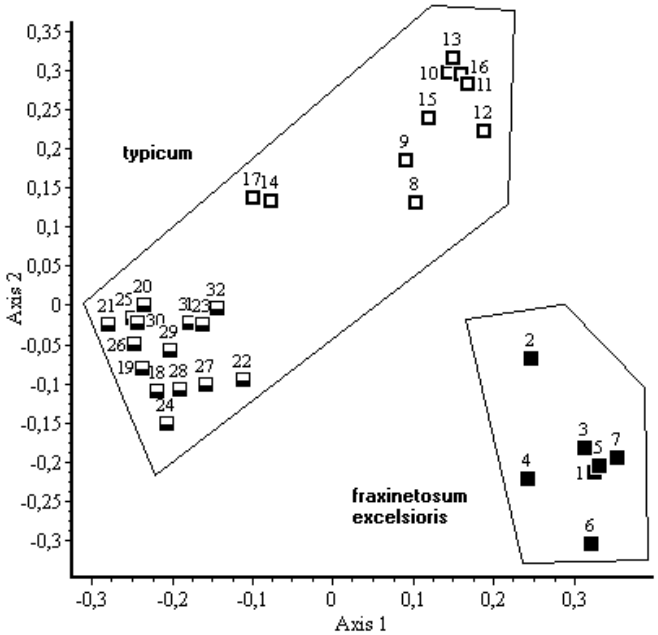

Fig. 4. Ordination of the relevés of the association *Lamio orvalae–Aceretum* according to the analytic table (Tab. 6) Legend: – *L.–A. fraxinetosum excelsioris*, – *L.–A. typicum* var. *Lunaria rediviva*, – *L.–A. typicum* var. *Adenostyles alliariae*.

To a certain degree, the syntaxon *Aceri–Fraxinetum* (FUKAREK & STEFANOVIĆ, 1958; Tab. 7; syntaxon No.11) from Peručica virgin forest (B&H), which occurs here in the altimontane and subalpine belt, resembles the stands of the association *Lamio orvalae–Aceretum*. Above all, it is the species *Fagus sylvatica* subsp. *moesiaca* which dominates the stands, whereas the species of noble hardwood forests are not as well represented. We are of the opinion that for the most part these are the stands of the community *Aceri–Fagetum* s. lat. As these are transitional stands between beech and maple communities, the character species of the alliance *Fraxino–Acerion* are poorly represented. These stands should be given a closer look in the future in order to determine whether some of them could be classified within the studied vegetation.

We believe the same obtains for the syntaxon *Aceri–Fraxinetum adenostyletosum* (FUKAREK, 1970) from the region of Peručica and the syntaxon *Ulmo–Aceretum* (FUKAREK, 1964) from the region of Igman in B&H, which, however, were not included in the table as the list of species is incomplete.

Also not included in the table is the syntaxon *Aceri–Ulmetum* (PISKERNIK, 1954) from Snežnik, Javornik and the Trnovski gozd plateau, as it comprises heterogeneous relevé material.

Other noble hardwood forests of the Illyrian floral province of the altimontane belt, mentioned in the Introduction, were published without the relevé material.

Tab. 6. Analytic table of the association *Lamio orvalae – Aceretum* P. Košir et Marinček 1999

Relevé number		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	31	32	
Date: day		19	19	9	15	19	9	15	20	23	3	3	23	13	23	3	3	23	22	23	4	22	22	22	22	22	23	22	22	23	22	22	22	
month		6	6	6	6	6	6	6	7	5	6	6	5	5	5	6	6	5	6	6	7	6	6	6	6	6	6	6	6	6	6	6	6	
year		19	19	19	19	19	19	19	19	20	20	20	20	20	20	20	20	20	19	19	20	19	19	19	19	19	19	19	19	19	19	19	19	
		98	98	99	99	98	99	99	96	01	00	00	01	02	01	00	00	01	99	99	02	99	99	99	99	99	99	99	99	99	99	99	99	
Relevé area (m2)		400	300	200	400	300	400	400	400	400	400	200	400	400	200	200	400	400	400	300	300	400	400	400	300	400	200	400	400	400	400	300	400	
Altitude (x10 m)		78	75	96	79	77	93	79	120	120	102	104	130	103	115	104	103	120	125	123	124	119	130	116	115	128	124	114	128	117	115	117	120	
Aspect		NE	SE	SE	E	E	SE	E	S	N	NE	N	EES	W	EES	NE	N	N	NW	NW	S	NW	NNW	NNW		NW	N	NNW	W	NNW	N	N	S	
Slope (degrees)		35	5	30	10	15	35	10	15	20	15	15	25	5	30	30	20	20	35	25	10	25	30	20		15	15	5	20	35	25	25	5	
Cover bare rock (%)		40	10	50	70	30	50	30	2	5	0	10	50	5	5	60	5	20	70	70	5	10	40	80	5	50	10	5	5	5	40	80	10	
Cover upper tree layer (%)	Ia	70	70	60	60	50	90	70	70	90	70	80	70	60	80	40	70	80	80	80	75	90	75	70	60	75	60	90	80	80	80	60	85	
Cover lower tree layer (%)	Ib	20	30	0	10	35	10	30	10	5	5	0	10	5	5	40	20	5	5	5	35	10	5	0	10	40	40	5	5	5	5	5	20	
Cover shrub layer (%)	II	15	15	40	10	30	20	10	20	5	5	10	5	5	30	30	5	5	5	30	5	5	20	10	5	5	20	5	5	20	5	5	5	
Cover herb layer (%)	III	90	90	70	80	90	50	100	100	90	100	100	90	90	90	80	100	90	90	80	80	90	100	100	100	80	90	100	100	100	80	90	100	
Cover moss layer (%)	IV	40	30	10	60	30	0	30	2	5	0	5	30	0	1	30	1	0	40	30	5	5	5	50	0	30	5	0	5	1	30	60	5	
		var. geogr. *Dentaria pentaphyllos*																	var. geogr. *Calamintha grandiflora*																frequency
		fraxinetosum excel.							*typicum*																									
									var. *Lunaria rediviva*										var. *Adenostyles alliariae*															
DIFFERENTIAL SPECIES OF THE ASSOCIATION																																		
AU *Stellaria nemorum*	III	1	.	.	1	2	.	+	1	+	2	2	.	2	.	+	2	+	1	1	+	.	+	2	+	+	+	.	2	2	.	+	.	72
A *Saxifraga rotundifolia*	III	1	+	.	+	.	.	+	+	+	+	+	+	.	+	+	+	.	1	1	.	.	+	r	.	+	+	r	.	1	+	1	.	69
A *Polygonatum verticillatum*	III	.	+	+	.	.	+	.	+	+	1	+	+	+	+	+	+	+	.	.	+	+	.	.	.	.	.	+	.	+	.	.	r	56
A *Ranunculus platanifolius*	III	.	.	.	.	.	.	.	+	.	+	+	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	19
GEOGRAPHICAL DIFFERENTIAL SPECIES																																		
F *Dentaria pentaphyllos*	III	+	2	.	.	.	.	.	1	.	1	2	.	1	.	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25
AF *Calamintha grandiflora*	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	1	+	.	+	.	.	.	.	+	22
AF *Geranium nodosum*	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	6
DIFFERENTIAL SPECIES OF THE SUBASSOCIATIONS																																		
FA *Fraxinus excelsior*	Ia	3	1	2	2	3	4	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	22
FA *Fraxinus excelsior*	Ib	+	+	.	.	1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13
FA *Fraxinus excelsior*	II	+	1	2	.	1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	16

	Relevé number		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	31	32	
FA	*Fraxinus excelsior*	III	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
F	*Salvia glutinosa*	III	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	16
O	*Eupatorium cannabinum*	III	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	16
AF	*Rhamnus fallax*	II	+	.	2	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13
O	*Hypericum hirsutum*	III	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
QF	*Arabis turrita*	III	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
O	*Arctium lappa*	III	+	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
QF	*Laburnum alpinum*	Ib	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
	DIFFERENTIAL SPECIES OF THE VARIANTS																																		
FA	*Lunaria rediviva*	III	2	2	2	1	2	1	2	3	4	4	3	5	3	.	2	4	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	50
AU	*Impatiens noli-tangere*	III	+	.	.	+	1	.	+	3	+	+	+	.	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	31
F	*Lilium martagon*	III	r	+	+	.	r	r	.	+	+	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25
F	*Heracleum sphondylium*	III	+	.	.	+	+	.	+	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	22
A	*Adenostyles alliariae*	III	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	3	3	4	3	+	r	3	3	3	2	2	2	1	.	44
AT	*Polystichum lonchitis*	III	r	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	r	.	.	+	+	.	.	.	.	.	.	.	+	22
A	*Cicerbita alpina*	III	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	1	.	.	.	.	.	.	.	.	.	.	.	13
A	*Adenostyles glabra*	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	+	9
FA	***FRAXINO – ACERION***																																		
	Acer pseudoplatanus	Ia	2	3	2	3	1	2	2	4	5	4	4	4	3	5	3	4	5	5	4	3	5	4	4	4	4	4	4	5	5	5	3	5	100
	Acer pseudoplatanus	Ib	2	+	.	2	2	+	3	+	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	1	+	.	+	+	.	+	+	.	47
	Acer pseudoplatanus	II	+	+	.	.	+	.	.	+	.	+	1	+	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	34
	Acer pseudoplatanus	III	+	.	+	.	+	+	.	+	+	+	.	+	.	+	1	+	+	+	+	.	1	1	+	.	1	.	+	1	+	.	+	1	72
	Urtica dioica	III	+	1	1	+	1	.	1	1	2	+	1	2	+	1	+	+	2	1	1	+	2	1	2	1	+	+	1	1	2	+	2	1	97
	Adoxa moschatellina	III	+	+	.	1	+	.	+	2	1	+	.	1	1	1	+	1	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	91
	Geranium robertianum	III	+	+	+	+	+	+	r	.	+	.	.	+	.	+	+	.	+	1	1	+	+	+	1	+	+	+	+	+	+	+	2	+	84
	Actaea spicata	III	+	+	+	+	+	.	+	+	.	+	+	.	+	.	+	+	.	+	+	+	+	+	+	+	+	+	+	+	+	+	r	.	81
	Lamium orvala	III	3	2	1	2	3	1	3	1	+	+	+	+	+	+	.	+	+	.	.	+	1	3	+	2	+	+	3	2	.	.	.	.	78
	Polystichum aculeatum	III	+	.	.	+	+	.	+	+	+	+	+	.	.	.	+	+	.	+	+	.	+	+	+	.	+	.	.	+	+	+	+	.	63
	Phyllitis scolopendrium	III	1	+	.	3	+	.	+	.	+	.	+	.	.	.	1	+	.	1	1	.	.	.	r	.	.	.	.	.	.	r	r	.	44
	Doronicum austriacum	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	+	+	+	1	+	+	+	+	+	.	41
	Stellaria montana	III	.	.	.	.	.	.	.	1	1	.	.	.	.	2	.	.	2	.	.	.	+	.	.	+	.	.	+	.	.	1	1	+	31
	Sambucus nigra	II	+	1	.	1	2	.	+	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	25
	Circaea alpina	III	.	.	.	.	.	.	.	.	.	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	16
	Ulmus glabra	Ia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	3

	Relevé number		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	31	32	
	Ulmus glabra	Ib	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
	Ulmus glabra	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	9
	Ulmus glabra	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	9
	Circaea x intermedia	III	+	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13
	Aruncus dioicus	III	.	.	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9
	Circaea lutetiana	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	+	2	9
	Geum urbanum	III	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	9
	Arum maculatum	III	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
	Ribes alpinum	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	6
F	***FAGETALIA SYLVATICAE***																																		
	Fagus sylvatica	Ia	.	.	+	.	.	.	.	+	.	.	.	+	+	+	+	+	+	.	+	2	.	+	+	.	+	+	.	.	.	+	+	.	50
	Fagus sylvatica	Ib	+	2	.	+	+	.	.	+	+	+	.	+	+	+	+	+	+	+	.	1	+	+	.	.	3	2	+	.	+	+	.	1	72
	Fagus sylvatica	II	.	1	.	.	.	.	+	.	+	+	+	+	+	+	.	1	+	+	1	+	+	1	+	+	+	1	+	+	1	+	.	+	75
	Fagus sylvatica	III	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	+	+	+	+	.	.	.	.	+	.	.	+	.	+	.	.	28
	Dryopteris filix-mas	III	1	2	1	3	1	.	1	2	1	1	1	+	.	2	2	1	1	3	3	1	+	3	+	+	2	3	+	1	+	1	+	+	94
	Dentaria bulbifera	III	+	+	+	+	+	.	+	.	1	+	+	1	+	+	+	1	+	+	+	+	1	+	+	+	+	.	+	.	+	+	+	1	88
	Paris quadrifolia	III	+	+	.	+	.	.	+	+	+	.	+	+	+	+	+	+	+	+	+	+	+	+	r	+	+	+	+	+	+	+	+	r	88
	Lamiastrum flavidum	III	+	2	1	+	+	2	+	1	1	1	1	+	1	1	+	1	+	+	+	1	.	+	1	+	.	.	.	.	+	+	.	1	81
	Mycelis muralis	III	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	+	+	+	+	.	.	+	+	.	.	+	+	+	+	+	+	63
	Galium odoratum	III	2	2	+	+	.	.	+	+	+	+	+	.	+	1	.	+	+	.	.	2	.	+	.	2	.	.	1	1	.	.	.	2	59
	Symphytum tuberosum	III	.	.	.	.	.	.	.	+	.	+	+	.	+	.	.	.	.	+	+	+	+	1	+	+	1	+	1	1	+	1	+	+	59
	Epilobium montanum	III	+	+	.	.	.	.	.	+	.	.	.	.	.	+	.	.	+	+	+	+	+	+	r	.	+	+	+	+	+	+	r	.	56
	Scrophularia nodosa	III	+	+	.	+	.	.	.	+	+	.	.	.	.	+	.	.	+	+	+	+	r	1	+	.	.	.	+	+	+	.	.	+	53
	Corydalis cava	III	+	+	.	.	+	.	+	.	1	.	1	2	1	2	.	+	1	.	.	.	+	.	+	.	.	.	+	.	.	+	+	1	53
	Ranunculus lanuginosus	III	+	.	.	+	+	.	.	+	+	+	+	.	.	.	.	+	+	.	+	+	.	+	.	.	+	+	.	+	+	.	.	.	50
	Mercurialis perennis	III	1	3	+	2	+	+	2	.	+	.	.	1	.	.	+	.	.	+	.	.	.	1	+	.	.	.	.	.	.	.	.	.	41
	Daphne mezereum	II	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	+	+	+	.	+	.	.	.	.	.	+	41
	Petasites albus	III	+	+	.	+	1	.	+	.	.	.	.	.	.	.	.	.	.	1	+	.	.	+	.	1	.	.	2	+	3	+	.	.	41
	Milium effusum	III	+	+	.	+	+	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	r	.	+	.	.	.	.	.	.	.	+	28
	Polygonatum multiflorum	III	+	+	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	19
	Euphorbia amygdaloides	III	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	.	.	+	19
	Galium schultesii	III	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	16
	Campanula trachelium	III	+	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	16
	Viola reichenbachiana	III	+	+	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	16

Relevé number		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	31	32	
Allium ursinum	III	+	.	.	1	.	.	3	+	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	16
Festuca altissima	III	+	.	.	+	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13
Leucojum vernum	III	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9
Lonicera alpigena	II	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	9
Pulmonaria officinalis	III	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
Carex sylvatica	III	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	6
Prenanthes purpurea	III	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	6
Bromus ramosus	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	6
QF ***QUERCO – FAGETEA***																																		
Anemone nemorosa	III	+	+	.	+	+	.	+	+	1	1	1	+	2	+	+	1	+	.	+	1	.	+	.	.	+	+	.	+	.	.	.	66
Brachypodium sylvaticum	III	+	+	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13
Lonicera xylosteum	II	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9
Aegopodium podagraria	III	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	6
Melica nutans	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	6
AF ***AREMONIO – FAGION***																																		
Dentaria enneaphyllos	III	+	+	+	+	+	.	+	.	2	+	+	2	1	2	+	+	2	+	1	+	1	1	+	.	2	1	1	1	1	1	1	+	91
Cardamine trifolia	III	+	+	.	.	.	.	.	.	.	+	.	.	.	+	+	+	.	+	+	1	+	.	+	+	+	+	+	.	r	1	+	+	59
Aremonia agrimonoides	III	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	+	.	.	+	.	.	.	+	.	.	+	.	.	.	.	r	22
Cyclamen purpurascens	III	r	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9
Aposeris foetida	III	r	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
Helleborus niger	III	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
AU ***ALNO – ULMION***																																		
Chrysosplenium alternifolium	III	+	+	.	+	1	.	.	+	+	+	+	.	+	.	+	+	+	+	.	+	+	+	+	+	+	+	+	.	+	+	+	+	78
Chaerophyllum hirsutum	III	+	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	19
Thalictrum aquilegiifolium	III	+	.	+	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	19
Veronica montana	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	r	+	.	r	.	.	16
Stachys sylvatica	III	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	r	9
Gagea lutea	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	r	.	.	.	.	+	9
Cardamine impatiens	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	r	.	+	9
Dryopteris carthusiana	III	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
VP ***VACCINIO – PICEETEA***																																		
Oxalis acetosella	III	1	2	.	+	2	.	+	.	1	+	+	.	+	1	1	+	1	+	1	1	+	1	.	+	1	+	+	+	+	2	+	+	84

	Relevé number		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	31	32	
	Abies alba	Ia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	3
	Abies alba	Ib	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	3
	Abies alba	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	r	r	.	+	+	.	.	.	+	.	r	31
	Picea abies	Ia	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	9
	Picea abies	Ib	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	+	.	+	.	.	+	.	.	.	13
	Picea abies	II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	2	.	.	.	+	+	.	.	.	.	+	.	.	.	16
	Gentiana asclepiadea	III	.	+	+	.	r	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	r	.	.	.	.	.	19
	Dryopteris dilatata	III	.	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	13
	Veronica urticifolia	III	r	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	9
	Dryopteris affinis	III	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
	Dryopteris expansa	III	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
A	*ADENOSTYLETALIA*																																		
	Senecio fuchsii	III	1	+	+	1	1	2	+	2	1	+	1	.	+	1	+	+	1	1	1	1	1	3	4	4	1	+	2	2	1	4	3	5	97
	Athyrium filix-femina	III	+	1	.	+	+	.	+	2	+	2	2	.	1	1	+	2	+	+	1	+	+	1	1	1	+	+	+	+	+	1	+	+	91
	Veratrum album	III	+	+	.	+	+	.	+	+	+	+	.	+	+	+	+	+	1	+	+	+	+	1	+	.	+	+	+	r	.	+	.	1	81
	Myosotis sylvatica	III	+	+	.	.	+	.	.	+	1	+	.	.	+	+	+	.	+	+	+	.	.	+	+	+	+	.	.	+	+	+	+	+	66
	Silene dioica	III	+	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	+	r	.	.	+	.	.	.	.	.	+	+	.	.	+	38
	Anthriscus nitida	III	+	.	.	1	3	.	1	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	+	+	1	.	.	.	31
	Aconitum paniculatum	III	+	+	+	+	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	19
	Clematis alpina	III	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9
AT	*ASPLENIETEA TRICHOMANIS*																																		
	Cystopteris fragilis	III	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	r	.	+	+	+	+	+	+	+	.	53
	Asplenium viride	III	.	.	+	+	+	.	.	.	.	.	.	+	.	.	+	.	+	+	+	.	.	.	r	.	+	.	.	.	.	.	.	.	31
	Asplenium trichomanes	III	+	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	25
	Polystichum x illyricum	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	+	.	+	.	22
	Moehringia muscosa	III	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	+	.	.	.	.	19
	Polypodium vulgare	III	+	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	13
	Gymnocarpium robertianum	III	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	13
	Cardaminopsis arenosa	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	6
O	**OTHER SPECIES**																																		
	Galeopsis speciosa	III	+	+	.	+	.	.	.	+	+	.	.	+	.	.	.	.	+	+	+	.	+	r	+	+	+	+	+	+	+	+	+	+	66
	Rubus idaeus	II	.	.	.	.	.	.	.	1	+	.	+	.	.	2	+	.	+	+	.	+	.	2	.	+	+	.	+	.	.	.	.	.	38
	Rubus idaeus	III	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	+	+	+	.	.	.	.	.	.	.	.	+	.	.	.	.	19

	Relevé number		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	31	32	
	Cardamine flexuosa	III	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	+	.	.	+	.	22
	Fragaria vesca	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	.	.	.	.	+	.	.	.	+	19
	Sorbus aucuparia	II	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	6
	Sorbus aucuparia	III	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	r	+	.	.	.	.	.	.	.	.	.	.	.	.	+	13
	Dactylorhiza maculata	III	.	r	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13
	Calamagrostis varia	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	9
	Hypericum maculatum	III	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	r	.	.	.	.	6
M	**MOSSES**																																		
	Ctenidium molluscum	IV	3	1	+	3	.	.	1	+	+	.	+	+	.	.	1	+	+	3	2	+	+	1	3	.	2	+	.	+	+	2	3	+	78
	Brachythecium rutabulum	IV	1	.	.	2	.	.	1	.	.	.	+	.	.	.	+	+	+	.	.	.	+	.	+	.	+	+	.	+	+	.	+	.	44
	Hypnum cupressiforme	IV	+	+	+	1	+	.	.	+	+	.	.	+	.	.	+	.	+	+	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	41
	Brachythecium populeum	IV	1	.	1	+	.	.	+	.	+	.	.	.	.	.	+	.	+	.	.	.	.	+	.	.	+	.	.	.	+	.	.	+	34
	Homalothecium philippeanum	IV	+	.	+	+	.	.	.	.	.	.	.	3	.	.	.	.	1	+	+	.	.	+	.	.	+	.	.	.	.	.	.	.	.	28
	Plagiomnium undulatum	IV	+	2	.	+	3	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	+	+	.	25
	Rhynchostegium murale	IV	.	.	.	.	.	.	.	.	+	.	+	.	.	+	+	.	.	.	.	.	.	.	+	.	.	+	.	+	.	.	.	.	22
	Isotechyum alopecuroides	IV	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	+	.	.	+	.	19
	Plagiothecium nemorale	IV	.	.	.	.	.	.	.	.	+	.	+	2	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	19
	Eurhynchium praelongum	IV	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	19
	Thamnobryum alopecurum	IV	+	.	.	.	.	.	+	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	16
	Bryum species	IV	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	16
	Plagiochila asplenioides	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	1	+	.	16
	Plagiomnium cuspidatum	IV	+	.	.	+	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13
	Fissidens dubius	IV	.	.	.	.	.	.	.	.	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	13
	Cirriphyllum tommasinii	IV	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	13
	Tortella tortuosa	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	13
	Rhodobryum roseum	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	+	.	.	+	.	13
	Eurhynchium speciosum	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	.	.	.	.	+	.	13
	Thuidium tamariscinum	IV	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
	Homomallium incurvatum	IV	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	6
	Anomodon viticulosus	IV	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
	Mnium thomsonii	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	6
	Eurinchium angustirete	IV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	6

APPENDIX to Tab. 6

Localities of relevés:

1. Kamniška Bistrica, Žagana Peč, **2.** Kamniška Bistrica, from Žagana Peč towards Jermanca, **3.** Kamniška Bistrica, Jermanca, **4.** Kamniška Bistrica, Žagana Peč, **5.** Kamniška Bistrica, Žagana Peč, **6.** Kamniška Bistrica, Jermanca, **7.** Kamniška Bistrica, Žagana Peč, **8.** Blegoš, Prva ravan, **9.** Trnovski gozd, x0411928, y5088323, **10.** Trnovski gozd, under Mt. Putrih, **11.** Trnovski gozd, under Mt. Putrih, **12.** Trnovski gozd, x0411825, y5088049, **13.** Trnovski gozd, under Mt. Putrih, **14.** Trnovski gozd, x0410301, y5092527, **15.** Trnovski gozd, under Mt. Putrih, **16.** Trnovski gozd, under Mt. Putrih, **17.** Trnovski gozd, Črmenjak, x0408994, y5091066, **18.** Snežnik, from Mašun towards Sviščaki, **19.** Snežnik, from Mašun towards Sviščaki, **20.** Snežnik, Sviščaki, **21.** Snežnik, Šintovnik, **22.** Snežnik, from Mašun towards Sviščaki-Kamrica, **23.** Snežnik, above Barka, **24.** Snežnik, Veksel, **25.** Snežnik, from Mašun towards Sviščaki-Kamrica, **26.** Snežnik, from Mašun towards Sviščaki-Kamrica, **27.** Snežnik, Veksel, **28.** Snežnik, from Mašun towards Sviščaki-Kamrica, **29.** Snežnik, from Mašun towards Sviščaki, **30.** Snežnik, Veksel, **31.** Snežnik, above Barka, **32.** Snežnik, Šintovnik.

Species only in one relevé: **F;** *Lathyrus vernus* III 20 (+), *Hordelymus europaeus* III 32 (+), *Sanicula europaea* III 32 (+), **QF;** *Corylus avellana* II 6 (1), *Moehringia trinervia* III 28 (r), **AF;** *Euphorbia carniolica* III 16 (+), *Omphalodes verna* III 16 (+), **AU;** *Carduus personata* III 8 (+), *Deschampsia cespitosa* III 23 (+), *Lysimachia nemorum* III 32 (+), **VP;** *Luzula sylvatica* III 18 (+), *Phegopteris connectilis* III 24 (+), *Maianthemum bifolium* III 32 (+), **A;** *Senecio nemorensis* III 20 (+), *Aconitum vulparia* agg. III 21 (+), **O;** *Lamium maculatum* III 8 (+), *Euphorbia sp.* III 14 (+), *Rubus fruticosus agg.* II 15 (+), *Sambucus racemosa* II 18 (+), *Rosa sp.* III 20 (+), **M;** *Brachythecium velutinum* IV 8 (+), *Plagiomnium affine* IV 8 (+), *Rhizomnium punctatum* IV 11 (+), *Eurhynchium striatulum* IV 12 (+), *Schistidium apocarpum* IV 12 (+), *Anomodon attenuatus* IV 17 (+), *Plagiomnium ellipticum* IV 17 (+), *Brachythecium salebrosum* IV 18 (1), *Brachythecium sp.* IV 22 (+), *Neckera crispa* IV 23 (+), *Mnium sp.* IV 26 (+), *Dicranum sp.* IV 31 (+).

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Tab. 7. Synoptic table of Illyrian maple forests and comparison to Central European maple forests of association *Ulmo – Aceretum*

Number of the syntaxon		1	2	3	4	5	6	7	8	9	10	11	**12**	13	14	15
Number of relevés		18	9	15	15	18	22	51	5	7	37	8	**32**	10	11	16
		Fraxino – Acerion												*Tilio – Acerion*		
DIFFERENTIAL SPECIES OF ASSOCIATION *Lamio orvalae – Aceretum*																
Stellaria nemorum	III	.	.	.	.	.	.	8	.	.	8	.	**72**	30	64	56
Saxifraga rotundifolia	III	17	22	.	7	.	.	.	.	.	5	12	**69**	70	82	62
Polygonatum verticillatum	III	6	.	33	13	6	.	.	.	.	27	50	**56**	60	18	69
Adenostyles alliariae	III	.	.	.	.	.	.	.	.	.	.	.	**44**	30	82	25
Polystichum lonchitis	III	.	.	.	.	.	18	.	.	.	.	38	**22**	90	18	.
Ranunculus platanifolius	III	.	.	.	.	.	.	.	.	.	.	12	**19**	.	.	56
Cicerbita alpina	III	.	.	.	.	.	.	.	.	.	5	25	**12**	.	64	38
Adenostyles glabra	III	.	.	.	.	.	.	.	.	.	.	.	**9**	20	36	.
CHARACTER SPECIES OF ALLIANCE *Fraxino – Acerion*																
Lamium orvala	III	50	56	100	93	78	32	75	80	86	22	25	**78**	.	.	.
Doronicum austriacum	III	11	.	7	7	33	32	22	60	100	57	.	**41**	.	9	.
Stellaria montana	III	50	33	13	53	39	73	47	.	100	92	25	**31**	.	.	.
Polystichum setiferum et xbicknellii	III	.	11	.	33	17	14	61	.	.	35	.	**.**	.	.	.
Isopyrum thalictroides	III	.	.	100	60	39	.	53	.	71	14	.	**.**	.	.	.
Scopolia carniolica	III	.	.	.	.	17	45	53	.	43	19	.	**.**	.	.	.
Polystichum braunii et xluerssenii	III	22	.	.	47	.	50	.	.	.	43	.	**.**	.	.	.
Tanacetum macrophyllum	III	.	.	.	.	.	.	.	100	.	.	.	**.**	.	.	.
REGIONAL CHARACTER SPECIES OF ALLIANCE *Fraxino – Acerion* (differential species towards *Aremonio – Fagion*)																
Acer pseudoplatanus	I	94	78	80	67	94	100	100	80	86	95	100	**100**	100	91	100
Acer pseudoplatanus	II	83	67	67	53	61	36	53	40	71	35	75	**34**	.	18	75
Acer pseudoplatanus	III	6	.	47	73	78	77	75	40	29	73	88	**72**	.	55	.
Fraxinus excelsior	I	94	100	100	100	100	5	14	100	100	43	100	**25**	10	9	19
Fraxinus excelsior	II	83	100	60	73	61	.	10	40	86	32	100	**16**	20	.	6
Fraxinus excelsior	III	39	.	33	.	78	5	4	100	29	30	100	**3**	.	.	.
Ulmus glabra	I	56	22	.	13	50	41	53	40	57	38	100	**9**	10	9	44
Ulmus glabra	II	.	22	20	60	61	45	49	60	29	57	25	**9**	.	.	6
Ulmus glabra	III	.	.	.	.	6	9	2	40	.	27	75	**9**	.	.	.
Actaea spicata	III	89	56	27	60	56	73	49	100	14	51	88	**81**	70	36	50
Urtica dioica	III	56	44	20	53	39	82	92	100	100	78	38	**97**	60	45	81
Lunaria rediviva	III	17	11	13	47	22	14	75	100	100	32	100	**50**	50	91	38
Sambucus nigra	I	.	.	.	.	.	.	2	.	14	11	.	**.**	.	.	.
Sambucus nigra	II	67	89	7	47	78	86	96	100	100	54	38	**25**	.	9	.
Sambucus nigra	III	.	.	.	.	.	.	2	.	.	30	.	**.**	.	.	.
Aruncus dioicus	III	50	22	20	20	67	.	8	20	43	46	50	**9**	.	27	12
Phyllitis scolopendrium	III	61	44	.	40	28	68	63	.	29	3	38	**44**	100	18	6
Circaea lutetiana	III	39	11	7	47	22	50	61	100	57	51	12	**9**	.	.	12
Geranium robertianum agg.	III	72	67	.	27	11	73	51	100	14	54	.	**84**	90	73	81
Adoxa moschatellina	III	33	.	73	73	39	73	71	.	100	76	.	**91**	.	45	12

Number of the syntaxon		1	2	3	4	5	6	7	8	9	10	11	**12**	13	14	15
Arum maculatum	III	33	22	67	80	72	86	88	40	100	.	25	**6**	.	.	.
Polystichum aculeatum	III	39	11	.	20	39	50	16	.	.	32	.	**62**	100	64	56
Geum urbanum	III	39	22	47	33	6	.	.	100	57	11	.	**9**	.	27	19
Glechoma hederacea agg.	III	22	44	27	13	28	.	51	100	86	14	100	**.**	.	.	.
Tilia platyphyllos	I	22	11	.	.	.	27	8	.	.	3	.	**.**	.	.	.
Tilia platyphyllos	II	.	11	13	.	22	5	8	.	.	.	.	**.**	.	.	.
Tilia platyphyllos	III	.	.	.	13	6	5	.	.	.	.	.	**.**	.	.	.
Acer platanoides	I	6	.	.	13	11	.	29	40	.	.	38	**.**	.	.	.
Acer platanoides	II	.	.	40	27	28	.	16	40	14	.	12	**.**	.	.	.
Acer platanoides	III	.	.	.	27	6	.	4	20	.	.	12	**.**	.	.	.
Euonymus latifolia	II	17	.	.	20	6	.	12	.	.	.	50	**.**	.	.	.
Euonymus latifolia	III	.	22	.	.	.	.	.	.	14	.	.	**.**	.	.	.
Circaea x intermedia	III	6	.	.	.	.	9	4	.	.	5	.	**12**	.	9	.
Tilia cordata	I	50	11	.	.	.	.	.	.	.	.	.	**.**	.	.	.
Tilia cordata	II	44	.	.	7	.	.	.	.	.	.	.	**.**	.	.	.
Tilia cordata	III	6	.	.	.	.	.	.	.	.	.	.	**.**	.	.	.
Circaea alpina	III	.	.	.	.	.	.	.	.	.	8	.	**16**	.	9	.
Hesperis matronalis	III	.	.	.	7	.	.	4	.	43	.	.	**.**	.	.	.
Ribes alpinum	II	.	.	.	.	6	.	.	.	.	.	.	**6**	20	.	.
Staphylea pinnata	II	.	.	.	.	11	23	.	.	.	.	.	**.**	.	.	.
Asperula taurina	III	33	11	.	.	.	.	.	.	.	.	.	**.**	.	.	.
Ribes uva-crispa	II	.	.	.	.	.	5	.	.	.	.	.	**.**	.	.	.
Botrychium virginianum	III	.	.	20	.	.	.	.	.	.	.	.	**.**	.	.	.
***AREMONIO – FAGION* and *ERYTHRONIO – CARPINION* SPECIES (DIFFERENTIAL SPECIES TOWARDS *Tilio – Acerion*)**																
Cardamine trifolia	III	17	44	87	40	50	73	4	100	29	51	.	**59**	.	9	.
Cyclamen purpurascens	III	22	22	53	40	50	.	16	40	14	8	.	**9**	.	.	.
Dentaria enneaphyllos	III	11	.	47	53	28	86	65	100	57	5	.	**91**	.	.	.
Aposeris foetida	III	6	33	100	80	83	.	.	60	71	.	12	**6**	.	.	.
Aremonia agrimonoides	III	6	.	33	7	.	23	4	40	.	.	62	**22**	.	.	.
Vicia oroboides	III	.	.	13	27	28	9	8	60	71	.	.	**.**	.	.	.
Primula vulgaris	III	44	56	47	7	11	.	.	60	.	.	.	**.**	.	.	.
Helleborus niger	III	6	.	53	7	17	.	.	.	.	.	.	**6**	.	.	.
Dentaria polyphylla	III	.	.	.	.	.	5	78	80	57	.	.	**.**	10	.	.
Dentaria trifolia	III	.	.	73	53	.	.	53	.	43	57	.	**.**	.	.	.
Helleborus odorus	III	56	22	.	33	50	.	8	.	.	.	.	**.**	.	.	.
Hacquetia epipactis	III	.	.	73	67	72	.	8	20	.	.	.	**.**	.	.	.
Knautia drymeia	III	11	.	.	.	11	.	.	20	57	14	.	**.**	.	.	.
Euphorbia carniolica	III	.	.	.	20	50	.	.	.	57	8	.	**3**	.	.	.
Omphalodes verna	III	17	.	.	20	39	86	.	.	.	.	.	**3**	.	.	.
Lonicera caprifolium	III	.	11	.	.	.	.	.	.	.	.	.	**.**	.	.	.
Lonicera caprifolium	II	11	.	.	7	39	.	.	.	.	.	.	**.**	.	.	.
Anemone trifolia	III	28	67	.	.	50	.	.	.	.	.	.	**.**	.	.	.
Crocus napolitanus	III	.	.	100	53	78	.	.	.	.	.	.	**.**	.	.	.
Geranium nodosum	III	11	.	.	.	.	64	.	.	.	.	.	**6**	.	.	.
Calamintha grandiflora	III	.	.	.	.	.	32	.	.	.	.	.	**22**	.	.	.

Number of the syntaxon		1	2	3	4	5	6	7	8	9	10	11	**12**	13	14	15
Erythronium dens-canis	III	.	11	.	.	.	.	.	40	.	.	.	.	.	.	.
Rhamnus fallax	II	.	.	.	.	.	.	.	.	.	.	75	**12**	.	.	.
Ruscus hypoglossum	III	.	.	.	.	6	.	4	.	.	.	.	.	.	.	.
Helleborus atrorubens	III	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.
Eranthis hyemalis	III	.	.	.	.	.	.	8	.	.	.	.	.	.	.	.
Epimedium alpinum	III	.	33	.	.	.	.	.	.	.	.	.	.	.	.	.

1. *Hacquetio–Fraxinetum* var. geogr. *Anemone trifolia* (Lasen & Urbinati 1995, Table 1, group H)
2. *Hacquetio–Fraxinetum* var. geogr. *Anemone trifolia* (Poldini & Nardini 1993, Table 1, relevés 1–9)
3. *Hacquetio–Fraxinetum* var. geogr. *Dentaria pentaphyllos dentarietosum trifoliae* var. *Carpinus betulus* (Marinček 1995, Table 4, relevés 1–15)
4. *Hacquetio–Fraxinetum dentarietosum trifoliae* et *omphalodetosum vernae* (Marinček 1990, Table, releves 1–18, without relevés 6, 9, 10)
5. *Hacquetio–Fraxinetum* (P. Košir 2002, Table 1, relevés 1–18)
6. *Omphalodo–Aceretum* (P. Košir 2000, Table 2, relevés 1–22)
7. *Dentario polyphyllae–Aceretum* (P. Košir 2000, Table 3, relevés 1–51)
8. *Aceri–Fraxinetum* (Petračić & Anić 1952, Table 2, relevés 1–5)
9. *Chrysanthemo macrophylli–Aceretum* (P. Košir 2004, Table 8, relevés 1–7)
10. *Dryopterido affini–Aceretum* (P. Košir 2004, Table 4, relevés 1–37)
11. *Aceri–Fraxinetum* (Fukarek & Stefanović 1958, Table, relevés 1–8)
12. *Lamio orvalae–Aceretum* (P. Košir hoc loco, Table 1, relevés 1–32)
13. *Phyllitido–Aceretum lonchitidetosum* (Moor 1975, Table, relevés 71–80)
14. *Ulmo–Aceretum* (Phadenauer 1969, Table 22, 11 relevés)
15. *Ulmo–Aceretum mercurialetosum* var. *Petasites albus* subvar. *typica* (Clot 1989, Table 6, relevés 184–199)

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SAŽETAK

Šume plemenitih listača altimontanskog pojasa (*Lamio orvalae–Aceretum pseudoplatani* P. Košir et Marinček 1999) u Sloveniji (zapadni dio ilirske florne provincije)

P. Košir

Istraživanje asocijacije *Lamio orvalae–Aceretum* P. Košir et Marinček 1999 u altimontanskom pojasu dinarskog (Snežnik, Trnovski gozd) i u altimontanskom te montanskom pojasu predalpskog područja Slovenije (Blegoš, Kamniška Bistrica) obavljeno je po standardnoj Braun-Blanquetovoj metodi. U predalpskom području asocijacija obrašta padine nagomilanog šljunka i koluvijalne jarke, a u dinarskom se svijetu pojavljuje prvenstveno u vrtačama. Asocijaciju razlikuju vrste svojstvene za red *Adenostyletalia*, koje na taj način dobro karakteriziraju asocijaciju kao zajednicu plemenitih listača altimontanskog pojasa. Zajednica uspijeva isključivo na karbonatnom matičnom supstratu. Pojavljuje se na slabo razvijenim tlima, prevladavaju rendzine na padinskom šljunku i vapnencu, a pojavljuju se i nerazvijena koluvijalno-deluvijalna tla. Asocijacija je razdijeljena na dvije geografske varijante; *L.–A.* var. geogr. *Dentaria pentaphyllos* u predalpskom svijetu i zapadnom dijelu dinarskog svijeta, i *L.–A.* var. geogr. *Calamintha grandiflora* u središnjem dijelu dinarskog svijeta Slovenije. Ekološki je asocijacija razdijeljena na dvije subasocijacije: *L.–A. fraxinetosum* na najtoplijim i najinicijalnijim tlima, te *L.–A. typicum* kao središnji oblik asocijacije. U okviru subasocijacije *L.–A. typicum* razlikuju se dvije varijante; varijanta s vrstom *Lunaria rediviva* na toplijim staništima u okviru subasocijacije i na najrazvijenijim tlima u okviru asocijacije, te varijanta s vrstom *Adenostyles alliariae* na najhladnijim staništima u okviru asocijacije i na manje razvijenim tlima u okviru subasocijacije. Asocijacija je uvrštena u svezu ilirskih šuma plemenitih listača *Fraxino–Acerion* Fukarek 1969. Sastojine asocijacije su u sinoptički tablici uspoređivane s ostalim ilirskim asocijacijama javora i sa sličnim srednjoeuropskim šumama javora sveze *Tilio–Acerion* Klika 1955.

SUMMARY

Noble hardwood forests of the altimontane belt (*Lamio orvalae–Aceretum pseudoplatani* P. Košir et Marinček 1999) in Slovenia (western part of the Illyrian floral province)

P. Košir

The association *Lamio orvalae–Aceretum* P. Košir et Marinček 1999 was sampled in the altimontane belt of the Dinaric region (Mt. Snežnik, the Trnovski gozd plateau), and in the altimontane and montane belt of the Pre-Alpine region of Slovenia (Mt.

Blegoš, Kamniška Bistrica valley) according to the standard procedures of Braun-Blanquet. In the pre-Alpine region, the association overgrows the slopes of alluvial fans and colluvial ditches, but it occurs mostly in sinkholes in the Dinaric region. It is differentiated by the species characteristic of the order *Adenostyletalia* which so well characterize the association as a community of noble hardwoods of the altimontane belt. The community thrives exclusively on calcareous bedrock. It occurs on underdeveloped soil dominated by rendzinas on hillside scree and limestone, but can also be detected on colluvial-delluvial soil. The association was divided into two geographical variants: *L.–A.* var. geogr. *Dentaria pentaphyllos* in the pre-Alpine region and in the western part of the Dinaric region, and *L.–A.* var. geogr. *Calamintha grandiflora* in the central part of the Dinaric region of Slovenia. Ecologically, the association was divided into two subassociations: *L.–A. fraxinetosum* on the warmest and most initial sites, and *L.–A. typicum* as the central form of the association. Within the subassociation *L.–A. typicum* two variants were determined; the variant with the species *Lunaria rediviva* on warmer sites within the subassociation and on the most developed soil within the association; and the variant with the species *Adenostyles alliariae* on the coldest sites within the association and on less developed soil within the subassociation. The association was classified into the alliance of Illyrian noble hardwood forests *Fraxino–Acerion* Fukarek 1969. In the synoptic table the stands of the association were compared with other Illyrian maple associations and related Central European maple associations of the alliance *Tilio–Acerion* Klika 1955.