SUCCESSIONAL STAGES IN THE DEVELOPMENT OF FOREST VEGETATION IN CIRQUES OF TWO VALLEYS IN THE JULIAN ALPS (NW SLOVENIA)

SUKCESIJSKE STOPNJE V RAZVOJU GOZDNE VEGETACIJE V KRNICAH DVEH ALPSKIH DOLIN V JULIJSKIH ALPAH (SEVEROZAHODNA SLOVENIJA)

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ABSTRACT

Successional stages in the development of forest vegetation in cirques of two valleys in the Julian Alps (NW Slovenia)

We investigated different types of vegetation in cirques of two valleys in the Julian Alps, Zadnjica and Kot, which develop on slope screes and are heavily influenced by avalanches that occur here every year. Our phytosociological analysis identified the following shrub-forest developmental stages: *Saliceteum eleagno-purpureae hieracietosum porrifolii* var. *Achnatherum calamagrostis*, *Homogyno sylvestris-Salicetum glabrae, Polysticho lonchitis-Rhamnetum fallacis*, *Rhododendro hirsuti-Laburnetum alpini*, *Rhodothamno-Laricetum deciduae anemonetosum trifoliae* and *Rhododendro hirsuti-Fagetum sylvaticae* var. *Sorbus chamaemespilus*. On unconsolidated fluvio-glacial deposits in the Kot Valley we determined the following successional stages: *Salicetum eleagno-purpurae hieracietosum porrifolii* var. *Pinus mugo, Amelanchiero ovalis-Pinetum mugo laricetosum* and *Rhododendro hirsuti-Fagetum sylvaticae petasitetosum paradoxi*.

Key words: phytosociology, succession, glacial valley, Julian Alps, Natura 2000, Triglav National Park, Slovenia

IZVLEČEK

Sukcesijske stopnje v razvoju gozdne vegetacije v krnicah dveh alpskih dolin v Julijskih Alpah (severozahodna Slovenija)

Raziskali smo različne oblike vegetacije v krnicah dveh dolin v Julijskih Alpah, Zadnjici in Kotu, ki nastajajo na pobočnem grušču in nanje odločilno vplivajo vsakoletni snežni plazovi. S fitocenološko analizo smo lahko prepoznali naslednje grmiščno-gozdne razvojne stopnje: *Saliceteum eleagno-purpureae hieracietosum porrifolii* var. *Achnatherum calamagrostis*, *Homogyno sylvestris-Salicetum glabrae, Polysticho lonchitis-Rhamnetum fallacis*, *Rhododendro hirsuti-Laburnetum alpini*, *Rhodothamno-Laricetum deciduae anemonetosum trifoliae* in *Rhododendro hirsuti-Fagetum sylvaticae* var. *Sorbus chamaemespilus*. Na nesprijetih rečno-ledeniško nanosih v dolini Kot pa smo ugotovili naslednje sukcesijske stopnje: *Salicetum eleagno-purpurae hieracietosum porrifolii* var. *Pinus mugo, Amelanchiero ovalis-Pinetum mugo laricetosum* in *Rhododendro hirsuti-Fagetum sylvaticae petasitetosum paradoxi*.

Ključne besede: fitocenologija, sukcesija, ledeniška dolina, Julijske Alpe, Natura 2000, Triglavski narodni park, Slovenija

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1 INTRODUCTION

In recent years, successional processes and development of forest vegetation in Alpine valleys in Slovenia were studied in particular by M. Zupančič and collaborators (Zupančič & Žagar 2009, Zupančič, Skumavec & Mihorič 2017) as well as several geographers (Lovrenčak 2002, Blatnik & Repe 2013, Geršič et al. 2014). On our sporadic visits to the mountains through the Alpine valleys of Zadnjica in Trenta and Kot in the Upper Sava Valley (both in the Triglav National Park) our attention was drawn to different types of vegetation on slope screes and alluvial fans in their cirques, where annual avalanche activity is obviously one the main ecological factors. The human impact on the natural processes can be seen only in Zadnjica (the vicinity of a marked mountain trail) and is insignificant in the gable end of the Kot Valley (above the Kotarica falls). We made a phytosociological inventory of these, spatially relatively well-delimited shrub and forest communities and tried to classify them into a syntaxonomic system.

2 METHODS

The vegetation of gable ends of the Zadnjica and Kot valleys was inventoried using the Central-European method (Braun-Blanquet 1964). A total of 28 relevés (Figure 1) were entered into the FloVegSi database (T.

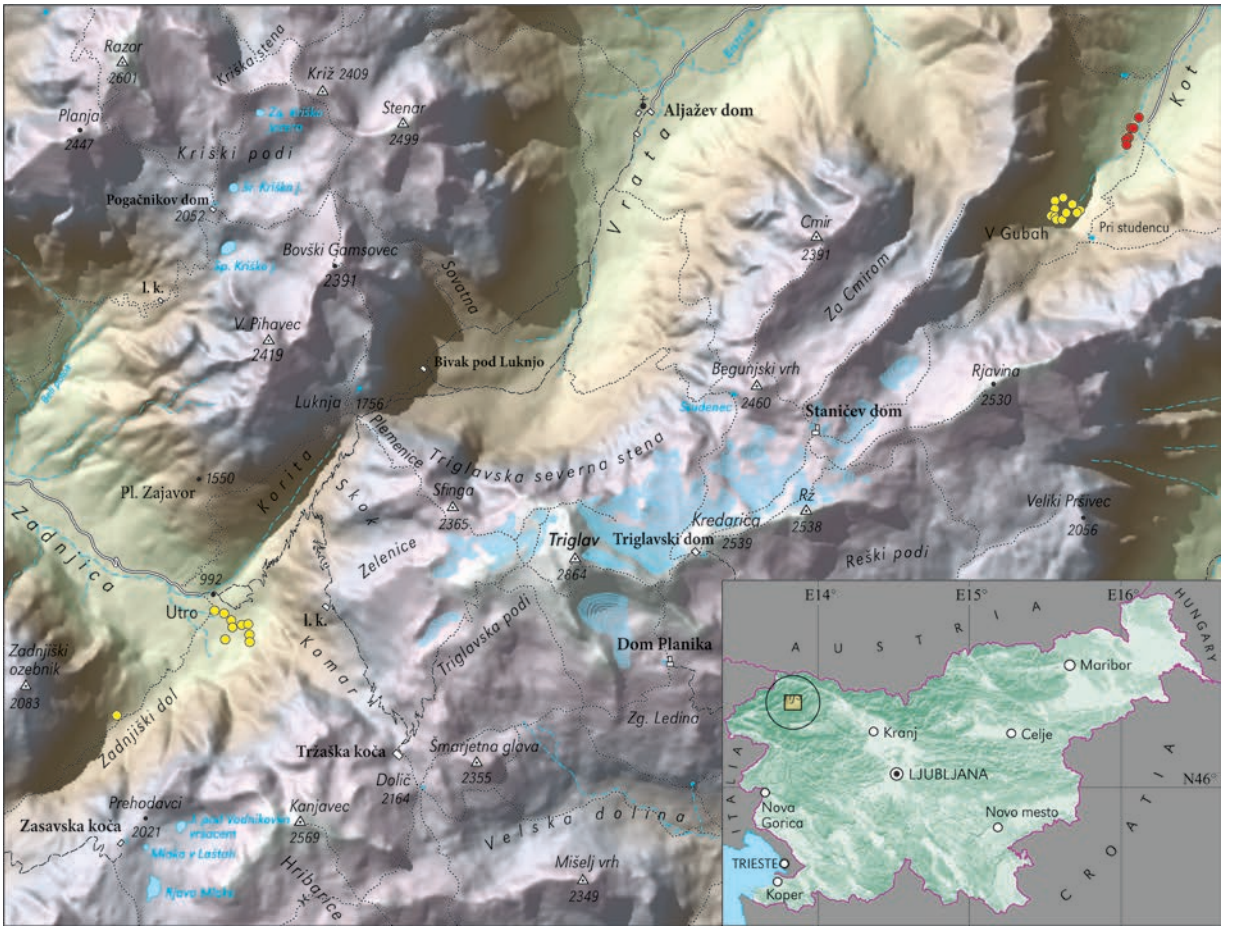

Figure 1: Research area with approximate localities of investigated stands (yellow circles: stands on slope screes, red circles: stands on fluvio-glacial deposits)
Slika 1: Raziskovano območje s približnimi nahajališči preučenih sestojev (rumeni krogci: sestoji na pobočnem grušču, rdeči krogci: sestoji na rečno-ledniških nanosih)

Seliškar, Vreš & A. Seliškar 2003). The relevés were arranged in two tables. Those on slope screes in the cirques of Zadnjica and Kot (above the Kotarica falls) and the relevés on gravelly plains in the upper part of Kot (Klin) were analysed separately. They were mutually compared by means of hierarchical classification, using the (unweighted) average linkage – UPGMA method with Wishart's similarity ratio. For this purpose, we transformed combined cover-abundance values into ordinal values 1– 9 (van der Maarel 1979). We used SYN-TAX 2000 (Podani 2001) software package. The nomenclatural source for the names of vascular plants is Martinčič & al. (2007), except for *Sesleria caerulea* (Aeschimann et al. 2004b). Martinčič (2003, 2011) is the nomenclatural source for the names of mosses and Suppan et al. (2000) for the names of lichens. The nomenclatural source for the names of syntaxa are Šilc & Čarni (2012), except for the name of the class *Querco-Fagetea* Braun-Blanquet et Vlieger in Vlieger 1937.

2.1 Ecological description of the study area

Both cirques, in Zadnjica and Kot, have a predominantly shady aspect (northeast and partly northwest); parent material is unconsolidated moraine (till) and above all slope screes (Jurkovšek 1987 a, b). The elevation of both cirques is similar, spanning 1000 to 1300 m. There are no significant differences in the precipitation volume either, with the average exceeding 2000 mm (B. Zupančič 1998), a large portion of which falls as snow. The mean annual temperature is similar too, ranging between 4 and 6 °C (Cegnar 1998), with the Zadnjica Valley still showing some sub-Mediterranean influence. In recent decades the area has seen a distinctly downward trend in precipitation and higher average temperatures (Dolinar 2018). Both cirques have a characteristically cold local climate and over the winter they receive snow avalanches from their rock walls or steps (Volk Bahun, Zorn & Pavšek 2018). The soil is therefore very shallow, partly colluvial and undeveloped, lithosol and moder rendzina.

3 RESULTS AND DISCUSSION

3.1 Phytosociological analysis of the shrub-forest vegetation sequence on slope screes in the avalanche area in the gable end of the Zadnjica and Kot valleys

Table 1 comprises 22 relevés of stands on slope screes that grouped by floristic similarity as indicated in Figure 2.

In Table 1 we arranged the relevés by taking into account the dominant species of the highest stand layer, which means that our classification does not fully follow the results of hierarchical classification. The most unique form, the community of red and grey willow (*Salicetum eleagno-purpureae hieracietosum porrifolii* var. *Achnatherum calamagrostis*) with *Achnatherum calamagrostis, Athamanta cretensis* and *Petasites paradoxus* dominating the herb layer, was found only along a small torrential brook running from under the waterfall in the Kanjavec rock face down the slope scree until it sinks (relevé 1in Table 1).

Open *Rhamnus fallax* shrub stands were found only in the gable end of Kot, on rather coarse and not entirely consolidated gravel – relevés 3–5 in Table 1. In terms of species composition they obviously belong to the association *Polysticho lonchitis-Rhamnetum fallacis*, which was described a few years ago (Dakskobler, Franz & Rozman 2013) and is more frequent in the Slovene Alps than previously thought (see also Blatnik & Repe 2013). In recent years it was spotted, but not yet inventoried, also in the Krma Valley. The dominant shrub layer species in one of the *Rhamnus fallax* stands in the gable of Kot (relevé 2 in Table 1) is *Salix glabra*, and this stand could be classified also into the association *Homogyno sylvestris-Salicetum glabrae* (comp. Dakskobler & Surina 2017). Similarly, larch dominated the highest stand layers only in the gable end of Kot, on one location on fully consolidated gravel. Its initial stand (relevé 6 in Table 1) can be classified into the association *Rhodothamno-Laricetum*. Although *Anemone trifolia* was not found in the recorded stand, based on the whole floristic composition it should be classified into the subassociation *anemonetosum trifoliae*, which is characterised by abundant *Sesleria caerulea* in the herb layer (comp. Dakskobler, Seliškar & Rozman 2018: 259)

Most relevés on the left side of the dendrogram in Figure 2, i.e. relevés in the central part of Table 1, characterise pioneer shrub communities with *Laburnum alpinum* dominating the highest stand layer. *Laburnum alpinum* is a south-European montane species distributed across most of the Alps (except the Northeastern and partly Central Alps), in the south and central Jura, the north and central Apennines, the Carpathians and the Dinaric Alps (Aeschimann et al.

2004a, Brus 1999, 2005). It occurs on calcareous, mixed and silicate bedrock, in the colline, montane and partly the subalpine belt, mainly on beech forest sites. As a shade-tolerant species it frequently occurs in the lower tree and shrub layer, and establishes itself as a pioneer in windthrow and landslide areas, and on erosion slopes. Figure 3 shows its distribution in Slovenia.

Laburnum alpinum is the most frequent in the stands of associations *Arunco-Fagetum, Ostryo-Fagetum, Seslerio autumnalis-Fagetum, Lamio orvalae-Fagetum, Ranunculo platanifolii-Fagetum, Anemono trifoliae-Fagetum, Homogyno sylvestris-Fagetum, Saxifrago cuneifolii-Fagetum, Rhododendro hirsuti-Fagetum, Polysticho lonchitis-Fagetum, Luzulo-Fagetum sylvaticae, Laburno alpini-Piceetum, Rhodothamno-Laricetum, Saxifrago petraeae-Tilietum, Seslerio albicantis--Ostryetum carpinifoliae, Fraxino orni-Ostryetum carpinifoliae, Rhododendro hirsuti-Ostryetum carpinifoliae, Rhodothamno-Pinetum mugo*, *Amelanchiero ovalis--Pinetum mugo*, but it occurs also in several other forest and shrub communities (source: FloVegSi database, T. Seliškar, Vreš & A. Seliškar, 2003). The highest it was recorded in the association *Rhodothamno-Pinetum mugo* at 1560 m a.s.l. (pasture Stržiškarska Planina under Mt. Poljanski Vrh and Mt. Hohkovbl), in the association *Polysticho lonchitis-Fagetum* at 1570 m (Planinica under Loška Stena rock wall), in the subassociation *Anemono-Fagetum laricetosum* at 1615 m (Pod Pečmi above the Tamar Valley, under Srednja Ponca), in the association *Rhodothamno-Laricetum* at

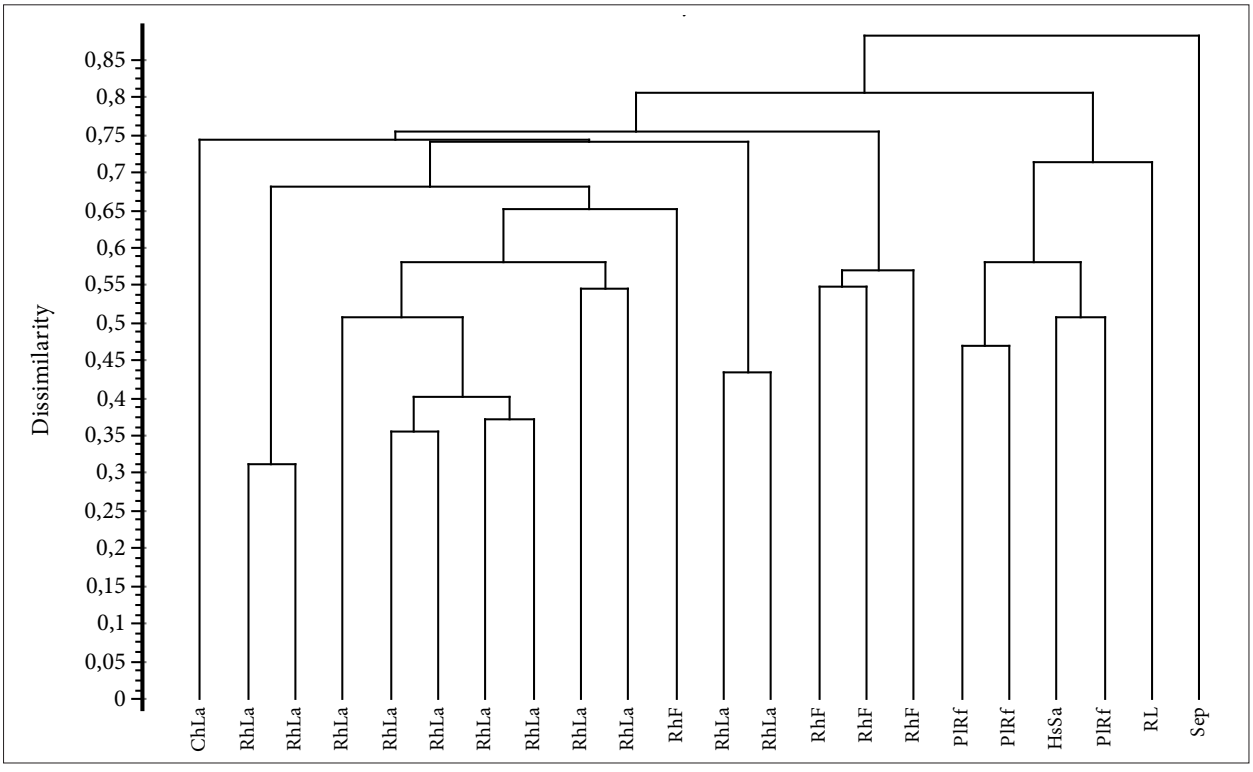

Figure 2: Dendrogram of relevés of shrub- and forest communities on slope screes in cirques of Zadnjica and Kot valleys (UPGMA, similarity ratio)
Slika 2: Dendrogram popisov grmiščnih in gozdnih združb na pobočnem grušč v krnicah dolin Zadnjice in Kota (UPGMA, similarity ratio)

Legend / Legenda
ChLa *Carici humilis-Laburnetum alpini* nom. prov.
RhLa *Rhododendro hirsuti-Laburnetum alpini*
RhF *Rhododendro hirsuti-Fagetum sylvaticae*
PlRf *Polysticho lonchitis-Rhamnetum fallacis*
HsSa *Homogyno sylvestris-Salicetum glabrae*
Sep *Salicetum eleagno-purpureae hieracietosum porrifolii* var. *Achnatherum calamagrostis*

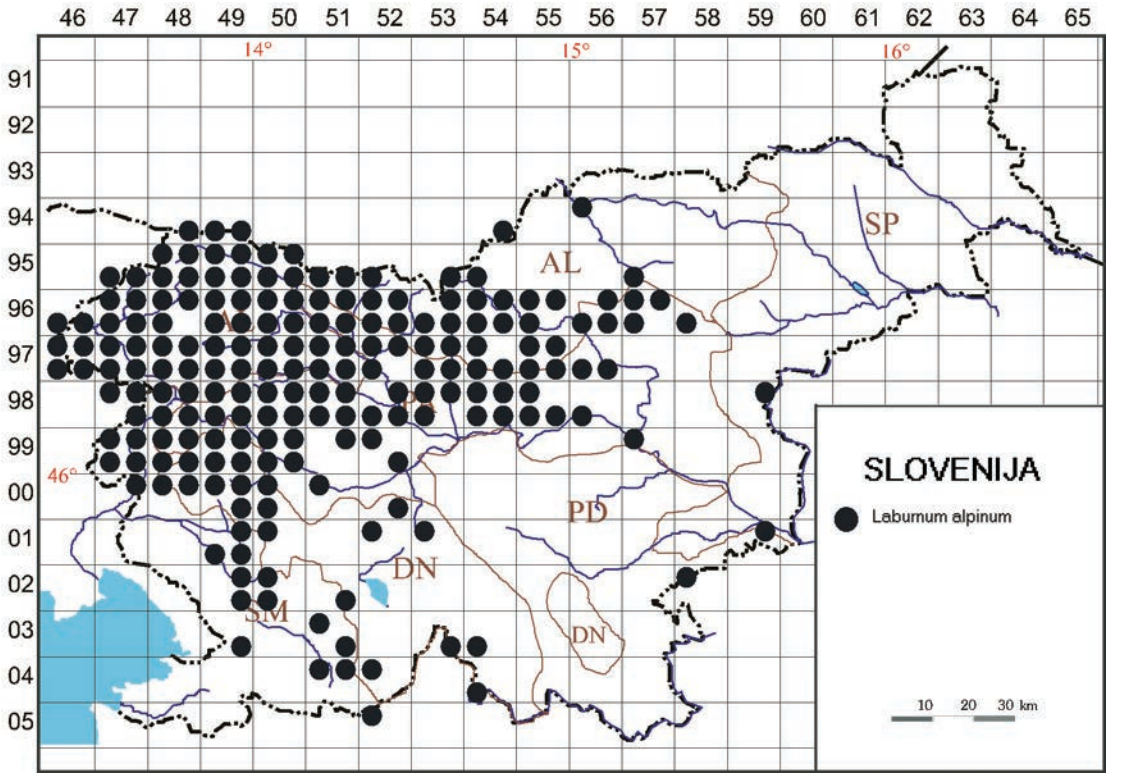

Figure 3: Distribution of Laburnum alpinum in Slovenia, according to the data in the FloVegSi database (authors of the map are I. Dakskobler, B. Anderle, A. Seliškar and B. Vreš)
Slika 3: Razširjenost vrste Laburnum alpinum v Sloveniji po podatkih v bazi FloVegSi (avtorji zemljevida so I. Dakskobler, B. Anderle, A. Seliškar in B. Vreš)

1660 m a.s.l. (Skok above Zadnjica under Mt. Triglav; under the peak Kumlehova Glava above the Suha Pišnica brook). These are the highest elevations of its occurrence known to us in the Julian Alps. Brus (1999: 206, 2005: 241) reports that on southern (the warmest, sunny) slopes this species occurs up to 1900 m a.s.l., which almost certainly does not refer to the Julian Alps, but to the Alps in general, (Brus, in litt.). As a pioneer it establishes itself on windthrow areas, in particular in stands of associations *Anemono trifoliae-Fagetum, Ranunculo platanifolii-Fagetum* and *Rhododendro hirsuti-Fagetum*. In the northern part of the Dinaric Alps we described a successional stage in natural gaps of montane beech and fir-beech forest as the association *Laburno alpini-Rhamnetum fallacis* (Dakskobler, Franz & Rozman 2013). In the Jura, the association *Sorbo mougeotii-Laburnetum alpini* Géhu & Géhu-Franck ex Foucault 2012 is described and designated as the edge shrub community on the sites of thermo-basophilous beech forests (Richard 1968, Géhu & Géhu-Franck 1987, Biondi, Pinzi & Gubellini 2004, Foucault 2012, Theurillat 2019, in litt.). In the Apennines, a successional stage *Geranio nodosi-Laburnetum alpini* Castelli, Biondi & Ballelli 2001 and its subassociation *sorbetosum ariae* Biondi, Pinzi et Gubellini 2004 were described on the sites of beech forests from the association *Cardamino kitaibelii-Fagetum sylvaticae* (Castelli, Biondi & Ballelli 2001, Biondi, Pinzi & Gubellini 2004).

Our relevés are distinctly different from the shrub communities in the Jura and the Apennines. The species shared with the stands of the association *Sorbo mougeotii-Laburnetum alpini* from the Jura are *Laburnum alpinum, Sorbus mougeotii, S. aria, S. chamaemespilus, Salix appendiculata, Fagus sylvatica, Lonicera xylosteum, Mercurialis perennis, Acer pseudoplatanus, Polygonatum verticillatum, Fragaria vesca, Rubus idaeus, Lonicera alpigena* and *Aconitum lycoctonum* s. lat. The species shared with the stands of the subassociation *Gerenio nodosi-Laburnetum alpini sorbetosoum ariae* from the Apennines are *Laburnum alpinum, Sorbus aria, Rhamnus fallax, Mercurialis perennis, Fagus sylvatica, Solidago virgaurea, Hepatica nobilis, Carex digitata, Ostrya carpinifolia, Fragaria vesca, Thalic-*

trum aquilegiifolium, Euonymus latifolia, Galium album and *Hypericum montanum*. Despite the listed species that they have in common, the studied *Laburnum alpinum* community from the Julian Alps differs from its communities from the Jura and the Apennines mainly with the presence of distinctly frigophilous species characteristic for subalpine beech, larch, spruce and dwarf pine communities, such as *Rhododendron hirsutum, Polystichum lonchitis, Pinus mugo, Clematis alpina, Homogyne sylvestris, Picea abies* and *Larix decidua*. Most of the stands with dominating *Laburnum alpinum* in the highest layer are therefore classified into the new association *Rhododendro hirsuti-Laburnetum alpini*. Its nomenclatural type, *holotypus*, is relevé 16 in Table 1. The diagnostic species of the new association are *Laburnum alpinum, Rhododendron hirsutum, Polystichum lonchitis, Pinus mugo, Gymnocarpium robertianum, Clematis alpina, Homogyne sylvestris, Larix decidua, Sorbus chamaemespilus* and *Salix appendiculata* and its phytogeographical differential species are *Rhodothamnus chamaecistus, Cyclamen purpurascens* and *Anemone trifolia*. The listed species characterise cold, stony sites where beech can still establish itself in favourable conditions (absence of avalanches), as manifested by the entire species composition. The new association is thus classified into the alliance *Aremonio-Fagion*, order *Fagetalia sylvaticae* and class *Querco-Fagetea* (*Carpino-Fagetea*), even though it could also be classified into the classes *Erico-Pinetea* or *Roso pendulinae-Pinetea mugo*.

There are several differences between the stands in the Zadnjica and Kot valleys. The stands in Kot on moister and coarser gravel are characterised in particular by a considerable admixture of sycamore maple (*Acer pseudoplatanus*), so they are described as a new subassociation *aceretosum pseudoplatani* (its nomenclatural type is the same as the nomenclatural type of the new association, relevé 16 in Table 1). The stands in the gable end of the Zadnjica Valley are mainly situated on finer gravel, on slightly drier and warmer sites, and are differentiated by *Ostrya carpinifolia* and *Carex alba*. The nomenclatural type, *holotypus*, of the new subassociation *ostryetosum carpinifoliae* is relevé 11 in Table 1. The most unique among the relevés of this subassociation is relevé 14, where the shrub layer is completely dominated by dwarf pine (*Pinus mugo*). Although this stand could also be classified into the association *Amelanchiero-Pinetum mugo*, it was included in the association *Rhododendro-Laburnetum alpini*, because in terms of entire species composition it grouped with other relevés of the latter association. However, the same cannot apply to relevé 7 in Table 1, which characterises an open *Laburnum alpinum* shrub on the debris cone under Mt. Zadnjiški Ozebnik. It is characterised by character scree and stony grassland species such as *Achnatherum calamagrostis*, *Adenostyles glabra, Calamagrostis varia* and *Carex humilis*. This stand is tentatively classified into the provisional association *Carici humilis-Laburnetum alpini* nom. prov. and is syndynamically related to the stands of the association *Anemono trifoliae-Fagetum*.

The tree layer in the forest stands located on the edge or at the bottom of the studied glacial cirques, in areas that are less exposed to avalanches (relevés 19–22 in Table 1), is dominated by beech. The entire species composition indicates a community on extreme sites, very similar to beech stands on the upper forest line, classified into the association *Polysticho lonchitis-Fagetum*. Also possible is classification into the association *Rhododendro hirsuti-Fagetum*, as these stands comprise almost all of the diagnostic species of this association that otherwise characterises beech sites in the submontane and montane belt up to some 1200 m a.s.l. Given the elevation of our relevés (under 1200 m) the latter association is considered more appropriate, but to demonstrate the similarity with the stands of the first, *Polysticho lonchitis-Fagetum*, it is described as a special altitudinal variant with *Sorbus chamaemespilus* (*Rhododendro hirsuti-Fagetum* var. *Sorbus chamaemespilus*). In the Julian Alps, this species otherwise characterises communities of the altimontane and subalpine belts, and in the (lower) montane belt it is usually limited to frost hollows. In the stands of the association *Rhododendro hirsuti-Fagetum* in the Julian Alps it was reported on only a few occasions (see Dakskobler 2003).

From the relevés in Table 1 we can infer the likely sequence in the development of shrub and forest vegetation on slope screes in avalanche areas in cirques of glacial valleys in the Julian Alps:

Polysticho lonchitis-Rhamnetum fallacis (*Homogyno sylvestris-Salicetum glabrae*) – *Rhododendro hirsuti-Laburnetum alpini* (*Amelanchiero-Pinetum mugo*) – *Rhododendro hirsuti-Fagetum sylvaticae* (*Rhodothamno-Laricetum*).

3.2 Phytosociological analysis of the sequence in shrub-forest vegetation on fluvio-glacial deposits in the Kot Valley (Klin).

In Table 2 we arranged six relevés made on the gravelly plain Klin in the upper part of the Kot Valley. They were mutually compared using hierarchical classification, which produced the dendrogram in Figure 4.

Successional development of vegetation in the upper part of the Kot Valley was studied in detail by Zupančič, Skumavec & Mihorič (2017). They determined and presented with a phytosociological table the sequence of the following plant communities:

Petasitetum paradoxi – Petasiti-Salicetum purpureo-albae – Calamagrostio variae-Pinetum mugo – Dryado-Piceetum – Rhodothamno-Pinetum mugo – Rhododendro-Fagetum – Anemono-Fagetum lycopodietosum.

In this area, i.e. on the gravelly plain under the Kotarica falls, we were interested mainly in beech stands with hairy alpenrose (*Rhododendro hirsuti-Fagetum*), as the findings by Zupančič et al. (ibid.) were new to the forest vegetation in this part of the Julian Alps. We inventoried several typical stands and contact communities of *Pinus mugo* and *Salix eleagnos*. Only six relevés, however, are not sufficient to allow us to infer the right sequence in the development of shrub-forest vegetation. Our goal is therefore not to correct or supplement the findings of the much more detailed recent analysis, but merely to classify our relevés into a syntaxonomic system.

Relevé 1 in Table 1 could be classified also into the association *Salicetum eleagno-purpureae*. Although a comparison with the relevés of this community from the foothills of the Julian Alps, in the Nadiža Valley (Šilc & Čušin 2000) does indicate some distinct differences, also with the variant with *Petasites paradoxus*. Oriolo & Poldini (2002) classify slightly similar

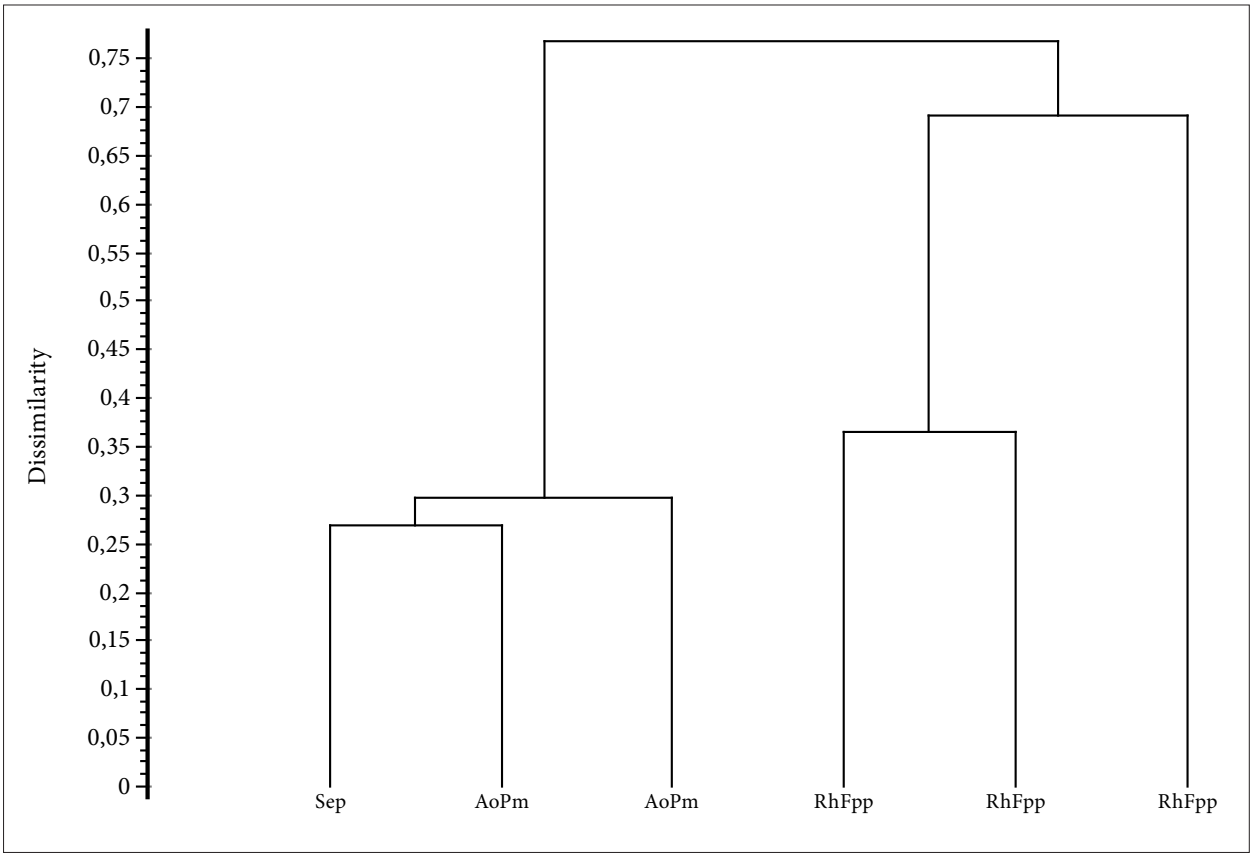

Figure 4: Dendrogram of relevés of shrub and forest vegetation on fluvio-glacial gravel sediments in Klin, in the upper part of the Kot Valley (UPGMA, similarity ratio)
Slika 4: Dendrogram popisov grmiščne in gozdne vegetacije na rečno-ledeniških sedimentih v Klinu v zgornjem delu doline Kot (UPGMA, similarity ratio)

Legend/ Legenda:
Sep *Salicetum eleagno-purpureae hieracietosum porrifolii* var. *Pinus mugo*
AoPm *Amelanchiero ovalis-Pinetum mugo laricetosum* nom. prov.
RhFpp *Rhododendro hirsuti-Fagetum sylvaticae petasitetosum paradoxi*

stands into the montane altitudinal form of the subassociation *typicum*. There is also a certain similarity with relevés of the subassociation *Salicetum eleagno-purpureae hieracietosum porrifolii* described by Čušin & Šilc (2006) on gravel bars of the Soča River near Bovec. The species that differentiate our relevé against the relevés published by Šilc & Čušin (2000) and Oriolo & Poldini (2002) are in particular *Pinus mugo, Hieracium porrifolium, Rhododendron hirsutum, Rhamnus fallax, Salix waldsteiniana, Dryas octopetala*, *Primula clusiana* and many species of the classes *Elyno-Seslerietea* and *Thlaspietea rotundifolii*. Some of the diagnostic species shared with the stands of the subassociation *-hieracietosum porrifolii* are *Hieracium porrifolium, H. piloselloides, Carduus crassifolius, Biscutella laevigata, Campanula cespitosa, Silene vulgaris* subsp. *glareosa, Achnatherum calamagrostis*, *Rumex scutatus, Sesleria caerulea* and *Dryas octopetala*. Our relevé at least slightly resembles also the relevé of the syntaxon *Petasiti-Salicetum purpureo-albae* (Zupančič, Skumavec & Mihorič 2017, relevé 2 in the phytosociological table), but with a significant difference – the dominant species there is *Salix eleagnos* and not *Salix alba* – which is a result of different site conditions (M. Zupančič, in litt.). The above comparisons allow us to classify our relevé into the new variant *Salicetum eleagno-purpureae hieracietosum porrifolii* var. *Pinus mugo* var. nov. The differential species of the new variant are *Pinus mugo, Rhododendron hirsutum, Salix waldsteiniana* and *Potentilla clusiana*.

Relevés 2 and 3 in Table 2 can be classified into the association *Amelanchiero ovalis-Pinetum mugo*, as it comprises several its diagnostic species, but not *Fraxinus ornus* and *Ostrya carpinifolia*. Another option would be classification into the association *Rhodothamno-Pinetum mugo*. Given the elevation of occurrence we prefer (like in the case of similar associations *Rhododendro hirsuti-Fagetum* / *Polysticho lonchitis-Fagetum*) the dwarf pine community of lower altitudes (*Amelanchiero-Pinetum mugo*), indicating its similarity with the stands of the association *Rhodothamno-Pinetum mugo* with the provisional name of the subassociation, *laricetosum*.

Stands in relevés 4–6 can be classified into the association *Rhododendro hirsuti-Fagetum sylvaticae*, as they comprise most of its diagnostic species. However, these stands could also be classified into the association *Polysticho lonchitis-Fagetum*. The species supporting this classification is *Sorbus chamaemepsilus,* so these stands can also be treated within the already mentioned altitudinal variant. On the other hand, the studied stands differ from other previously described forms of the association *Rhododendro hirsuti-Fagetum* with certain ecological characteristics. The stands of this association dominate on steep to precipitous shady slopes, whereas ours were found on levelled terrain and gravel deposits. Based on the above, they can be described and typified as a new subassociation *Rhododendro hirsuti-Fagetum sylvaticae petasitetosum paradoxi* subass. nov. The nomenclatural type, *holotypus*, is relevé 6 in Table 2. The differential species of the new subassociation are *Petasites paradoxus* and *Brachypodium rupestre*.

3.3 An overview of syntax described or discussed in the article:

Salicetea purpureae Moor 1958
Salicetalia purpureae Moor 1958
Salicion eleagno-daphnoidis (Moor 1958) Grass 1993
Salicetum eleagno-purpureae Sillinger 1933
-hieracietosum porrifolii Čušin et Šilc 2006
var. *Pinus mugo* var. nov.
var. *Achnatherum calamagrostis* var. nov.
Querco-Fagetea Br.-Bl. & Vlieg. 1937
Rhamnetali fallacis Fukarek 1969
Seslerio calcariae-Rhamnion fallacis Dakskobler, Franz et Rozman 2013
Polysticho lonchitis-Rhamnetum fallacis Dakskobler, Franz et Rozman 2013
Fagetalia sylvaticae Pawł. in Pawł. & al. 1928
Aremonio-Fagion (Ht. 1938) Borhidi in Török, Podani & Borhidi 1989
Rhododendro hirsuti-Laburnetum alpini ass. nov. hoc loco
-ostryetosum carpinifoliae subass. nov. hoc loco
-aceretosum pseudoplatani subass. nov. hoc loco
Carici humilis-Laburnetum alpini nom. prov.
Rhododendro hirsuti-Fagetum sylvaticae Accetto ex Dakskobler 1998
-petasitetosum paradoxi subass. nov. hoc loco
Vaccinio-Piceetea Br.-Bl. in Br.-Bl., Sissingh et Vlieger 1939
Piceetalia excelsae Pawłowski in Pawłowski et al. 1928
Erico-Pinion mugo Leibundgut 1948
Rhodothamno-Laricetum deciduae Willner et Zukrigl 1999
-anemonetosum trifoliae Dakskobler 2006
Erico-Pinetea Horvat 1959
Erico-Pinetalia Horvat 1959
Fraxino orni-Pinion nigrae-sylvestris Zupančič 2007
Helleboro nigri-Pinenion (Horvat 1959) Zupančič 2007
Amelanchiero-Pinetum mugo Minghetti in Pedrotti 1994

-laricetosum nom. prov.

Rhododendro hirsuti-Ericetea carneae Schubert et al. 2001

Rhododendro hirsuti-Ericetalia carneae Grabherr, Greimler et Mucina 1993

Ericion carneae Rübel ex Grabherr, Greimler et Mucina 1993

Homogyno sylvestris-Salicetum glabrae Dakskobler et Surina 2017

4 CONCLUSIONS

On slope screes and gravel deposits in the gable end of two glacial valleys in the Julian Alps, in Zadnjica and Kot (Triglav National Park), we phytosociologically described several shrub and forest communities whose development is affected not only by the size, consolidation and moisture level of the gravel, but most decisively by avalanches that occur there every year. Only two shrub and one forest community were documented with a sufficient number of relevés. Stands of associations *Polysticho lonchitis-Rhamnetum fallacis* and *Amelanchiero ovalis-Pinetum mugo* are new to the Kot Valley. We described a new association *Rhododendro hirsuti-Laburnetum alpini*, which belongs to the group of shrub-forest communities of the montane-subalpine belt (*Rhododendro hirsuti-Sorbetum aucupariae, Rhododendro hirsuti-Salicetum appendiculatae, Rhododendro hirsuti-Betuletum carpaticae, Alno viridis-Sorbetum aucupariae, Calamagrostio arundinaceae-Sorbetum ariae*) – comp. Dakskobler, Kutnar & Rozman (2016) that are a more or less long-term stages on potential beech sites and their occurrence could, although not necessarily, be associated with human impact or past activities. In our case, the stands of the new association are a stage in development towards beech forest on extreme sites in the montane belt classified into the association *Rhododendro hirsuti-Fagetum*. The stands of this association in the gable ends of Zadnjica and Kot valleys are characterised by their similarity with stands of the association *Polysticho lonchitis-Fagetum* (and are therefore treated as a special altitudinal variant with *Sorbus chamaemespilus*). Its form on fluvioglacial gravel deposits that can be treated as a new subassociation *petasitetosum paradoxi* was found only on levelled terrain in the Kot Valley. Our findings confirm and supplement the findings of Zupančič, Skumavec & Mihorič (2017) on the exceptionally diverse and fascinating shrub-forest vegetation in the gable end of the Kot Valley and its substantial biotic value. Most of this vegetation belongs to Natura 2000 habitat types: 91K0 Illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*), 4070 *Pinus mugo* and *Rhododendrum hirsutum* shrubs (*Mugo-Rhododendretum hirsuti*) and 9420 Alpine *Larix decidua* forests. It comprises several protected (*Cypripedium calceolus* – also a Natura 2000 species, *Gymnadenia odoratissima, G. conopsea, Epipactis helleborine, Dianthus sternbergii, Gentiana clusii, Lycopodium annotinum*), endemic (*Cerastium subtriflorum, Papaver alpinum* subsp. *ernesti-mayeri = P. ernesti-mayeri*) and rare species (*Sorbus mougeotii*). The study area is situated in the inner Triglav National Park area, so human impact on the development of vegetation here (other than increased mountaineering in recent years and human-induced climate changes) is insignificant.

5 POVZETEK

V zatrepu dveh ledeniških dolin v Julijskih Alpah, v Zadnjici in Kotu (Triglavski narodni park), smo na pobočnih gruščih in prodnatih nanosih fitocenološko opisali več grmiščnih in gozdnih združb, na katerih razvoj poleg velikosti in ustaljenosti ter vlažnosti grušča najbolj odločilno vplivajo predvsem vsakoletni snežni plazovi. Z zadostnim številom popisov smo v obeh dolinah dokumentirali le dve grmiščni in eno gozdno združbo. Sestoji asociacij *Polysticho lonchitis-Rhamnetum fallacis* in *Amelanchiero ovalis-Pinetum mugo* so novost v dolini Kota. V obeh raziskovanih dolinah smo našli sestoje subasociacije *Salicetum eleagno-purpureae hieracietosum porrifolii*, ki smo jo do zdaj poznali le v Zgornjem Posočju (Čušin & Šilc 2006). Kot novo smo opisali asociacijo *Rhododendro hirsuti-Laburnetum alpini*, ki sodi v skupino grmiščno-gozdnih združb montansko-subalpinskega pasu (*Rhododendro hirsuti-Sorbetum aucupariae, Rhododendro hirsuti-Salicetum appendiculatae, Rhododendro hirsuti-Betuletum carpaticae, Alno viridis-Sorbetum aucupariae, Calamagrostio arundinaceae-Sorbetum ariae*) – prim. Dakskobler, Kutnar & Rozman

(2016), ki so bolj ali manj dolgotrajen stadij na potencialno bukovih rastiščih in je njihov nastanek lahko, ne pa nujno, povezan tudi s človekovimi vplivi oz. njegovo preteklo dejavnostjo. V našem primeru so sestoji nove asociacije razvojna stopnja proti bukovemu gozdu na skrajnih rastiščih v montanskem pasu, ki jih uvrščamo v asociacijo *Rhododendro hirsuti-Fagetum*. Za sestoje te asociacije v zatrepih dolin Zadnjice in Kota je značilna podobnost s sestoji asociacije *Polysticho lonchitis-Fagetum* (zato jih obravnavamo kot posebno višinsko varianto z vrsto *Sorbus chamaemespilus*). Samo v dolini Kot pa smo doslej našli njeno obliko na rečno-ledeniških prodnatih nanosih, na uravnavi, ki jo lahko vrednotimo kot novo subasociacijo *petasitetosum paradoxi*. Naša spoznanja potrjujejo in dopolnjujejo ugotovitve Zupančiča in sodelavcev (2017) o izredno raznolikem in zanimivem grmiščno-gozdnem rastju v zatrepu doline Kot in o njegovi veliki biotski vrednosti. Večinsko sodi v evropsko varstveno pomembne habitatne tipe: 91K0 Ilirski bukovi gozdovi (*Aremonio-Fagion*), 4070 *Ruševje z dlakavim slečem (*Mugo-Rhododendretum hirsuti*) in 9420 Alpski macesnovi gozdovi. V njem raste več zavarovanih vrst (*Cypripedium calceolus* – tudi Natura 2000 vrsta, *Gymnadenia odoratissima, G. conopsea, Epipactis helleborine, Dianthus sternbergii, Gentiana clusii, Lycopodium annotinum*), endemitov (*Cerastium subtriflorum, Papaver alpinum* subsp. *ernesti-mayeri = P. ernesti-mayeri*) in redkih vrst (*Sorbus mougeotii*). Ker raziskano območje leži v strožje varovanem delu Triglavskega narodnega parka, so človekovi vplivi na tukajšnji razvoj vegetacije (z izjemo povečanega obiska planincev v zadnjih letih in od človeka povzročenih podnebnih sprememb) majhni.

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Figure 5: Stand of the syntaxon Salicetum eleagno-purpureae hieracietosum porrifolii var. Achnatherum calamagrostis in the Zadnjica Valley
Slika 5: Sestoj sintaksona Salicetum eleagno-purpureae hieracietosum porrifolii var. Achnatherum calamagrostis v dolini Zadnjice

Figure 6: Stand of the syntaxon Rhododendro hirsuti-Laburnetum alpini ostryetosum in the Zadnjica Valley
Slika 6: Sestoj sintaksona Rhododendro hirsuti-Laburnetum alpini ostryetosum v dolini Zadnjice

Figure 7: Stand of the association Polysticho lonchitis-Rhamnetum fallacis in the Kot Valley
Slika 7: Sestoj asociacije Polysticho lonchitis-Rhamnetum fallacis v dolini Kot

Figure 8: Successional stages of vegetation on slope screes in the gable end of the Kot Valley (from the left to the right): Rhododendro-Laburnetum – Rhodothamno-Laricetum – Polysticho-Rhamnetum – Rhododendro-Laburnetum – Rhododendro-Fagetum
Slika 8: Sukcesijske stopnje rastja na pobočnem grušču v zatrepu doline kot (od leve proti desni): Rhododendro-Laburnetum – Rhodothamno-Laricetum – Polysticho-Rhamnetum – Rhododendro-Laburnetum – Rhododendro-Fagetum

Figure 9: Stand of the syntaxon Salicetum eleagno-purpureae hieracietosum porrifolii var. Pinus mugo in the Kot Valley
Slika 9: Sestoj sintaksona Salicetum eleagno-purpureae hieracietosum porrifolii var. Pinus mugo v dolini Kot

Figure 10: Stand of the syntaxon Rhododendro hirsuti-Fagetum petasitetosum paradoxi in the Kot Valley
Slika 10: Sestoj sintaksona Rhododendro hirsuti-Fagetum petasitetosum paradoxi v dolini Kot

Table 1: Successional stages of shrub-forest vegetation on slope screes in glacial cirques of Zadnjica and Kot valleys in the Julian Alps
Preglednica 1: Sukcesijski stadiji rastja na pobočnem grušču v krnicah dolin Zadnjice in Kota v Julijskih Alpah

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
Database number of relevé (Delovna številka popisa)		273163	273181	273178	273180	273184	273186	2589336	273144	273164	273145	273146	273148	273147	273161	273177	273182	273171	273183	273162	273149	273185	273176
Elevation in m (Nadmorska višina v m)		1030	1190	1180	1200	1200	1150	1280	1015	1000	1050	1070	1080	1070	1030	1170	1140	1130	1115	1030	1090	1190	1190
Aspect (Lega)		NW	SE	NE	E	SE	E	SEE	NW	NW	W	W	W	NW	NW	NE	SE	NW	N	NW	NW	SE	NE
Slope in degrees (Nagib v stopinjah)		15	35	30	35	40	25	30	15	10	10	15	20	20	25	35	30	40	40	15	45	40	35
Parent material (Matična podlaga)		Gr-Sc																					
			Sc	Sc	Sc	Sc	Sc	Sc	Sc-Mo	Sc-Mo	Sc-Mo	Sc-Mo	Ta	Sc-Mo	Sc	Sc	Rs	Sc	Sc	Rs	D	Sc	Sc
Soil (Tla)		Co	Li	Li	Li	Li	Re	Li	Re	Re	Re	Re	Re	Re	Re	Re	Re	Co	Co	Re	Re	Re	Re
Stoniness in % (Kamnitost v %)		40	40	35	50	30	30	30	20	20	20	20	20	20	20	20	30	10	20	30	30	20	20
Cover in % (Zastiranje v %):																							
Upper tree layer (Zgornja drevesna plast)	E3b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	70	80	80	70
Lower tree layer (Spodnja drevesna plast)	E3a	.	.	.	.	.	10	60	60	70	10	80	70	60	20	60	80	60	80	.	.	.	.
Shrub layer (Grmovna plast)	E2	90	70	70	70	80	70+40	60	20	20	80+30	50	60+40	40+30	90+50	20+20	30	20+30	20	60+30	15	10	20
Herb layer (Zeliščna plast)	E1	40	50	75	40	50	80	80	80	80	70	80	80	80	60	60	60	80	70	80	50	50	70
Moss layer (Mahovna plast)	E0	.	5	.	10	5	10	.	5	5	15	10	10	10	30	10	20	10	10	10	20	5	10
Maximum diameter of trees (Največji prsni premer dreves)	cm	.	.	.	.	.	10	15	10	15	10	15	15	15	10	15	10	15	15	30	35	50	20
Maximum height of trees (Največja drevesna višina)	m	.	.	.	.	.	10	6	8	5	10	15	6	8	5	6	6	10	5	16	16	14	10
Number of species (Število vrst)		49	42	57	48	36	52	33	57	45	52	49	50	48	41	42	48	55	68	52	61	52	51
Relevé area (Velikost popisne ploskve)	m^2	100	200	400	200	100	200	100	400	200	400	400	400	400	200	400	200	200	200	400	400	400	400
Date of relevé (Datum popisa)		9/21/2018	9/19/2018	9/19/2018	9/19/2018	9/19/2018	9/19/2018	7/3/2015	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/21/2018	9/19/2018	9/19/2018	9/19/2018	9/19/2018	9/21/2018	9/19/2018	9/19/2018	9/19/2018
Locality (Nahajališče)		Zadnjica-Utro	Kot	Kot	Kot	Kot	Kot	Zadnjiški dol	Zadnjica-Utro	Zadnjica-Utro	Zadnjica-Utro	Zadnjica-Utro	Zadnjica-Utro	Zadnjica-Utro	Zadnjica-Utro	Kot	Kot	Kot	Kot	Zadnjica-Utro	Zadnjica-Utro	Kot	Kot
Quadrant (Kvadrant)		9648/2	9549/3	9549/3	9549/3	9549/3	9549/3	9648/2	9648/2	9648/2	9648/2	9648/2	9648/2	9648/2	9648/2	9549/3	9549/3	9549/3	9549/3	9648/2	9648/2	9549/3	9549/3
Coordinate GK Y (D-48)	m	408256	414505	414509	414482	414510	414595	407384	408199	408127	408335	408395	408392	408385	408208	414558	414640	414680	414701	408264	408395	414572	414528

	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	Pr.	Fr.
	Coordinate GK X (D-48)	m	5137338	5140471	5140406	5140416	5140525	5140436	5136616	5137390	5137412	5137304	5137316	5137228	5137308	5137195	5140389	5140501	5140443	5140460	5137291	5137177	5140552	5140385		
	Diagnostic species of the associations and subassociations (Diagnostične vrste asociacij in subasociacij)																								Pr.	Fr.
SP	*Salix purpurea*	E2b	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
SP	*Salix eleagnos*	E2b	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
BA	*Salix glabra*	E2	+	4	.	+	2	.	.	.	.	.	.	+	+	2	2	.	+	+	.	.	+	.	11	50
AF	*Rhamnus fallax*	E2b	.	1	4	4	4	1	.	.	.	.	.	.	.	.	+	1	+	+	.	.	+	+	11	50
AF	*Rhamnus fallax*	E2a	.	.	1	.	.	1	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	+	5	23
AF	*Rhamnus fallax*	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	2	9
EP	*Rhododendron hirsutum*	E2a	+	.	.	+	.	.	.	+	+	3	3	3	3	4	+	2	1	+	2	1	r	1	17	77
VP	*Polystichum lonchitis*	E1	.	.	1	+	+	+	+	+	+	+	.	.	.	.	r	1	+	1	.	1	1	+	15	68
MuA	*Aconitum lycoctonum subsp. ranunculifolium*	E1	+	.	+	.	+	1	.	3	3	2	2	+	+	.	+	2	+	.	+	+	.	.	15	68
TR	*Gymnocarpium robertianum*	E1	+	.	1	.	1	1	1	1	+	1	1	+	1	1	+	2	1	1	1	2	1	1	20	91
FS	*Laburnum alpinum*	E3	.	.	.	.	.	.	4	4	4	4	4	4	4	2	3	4	3	4	1	+	.	.	14	64
FS	*Laburnum alpinum*	E2b	+	+	1	+	+	.	.	.	1	3	.	1	2	+	.	.	1	.	.	+	.	+	13	59
FS	*Laburnum alpinum*	E2a	+	.	+	.	.	+	1	1	.	1	1	.	1	+	+	1	.	+	1	1	+	+	16	73
FS	*Laburnum alpinum*	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	+	2	9
EP	*Pinus mugo*	E2b	.	.	.	.	.	1	.	1	2	.	3	3	4	5	+	1	+	+	1	+	.	+	14	64
EP	*Pinus mugo*	E2a	.	.	1	.	.	1	.	.	1	.	.	1	.	1	.	1	.	.	.	.	.	+	7	32
VP	*Clematis alpina*	E1	+	.	.	.	.	.	.	+	.	+	+	+	1	+	.	.	.	.	+	1	.	.	9	41
VP	*Homogyne sylvestris*	E1	.	.	.	.	.	.	.	.	.	+	.	.	r	+	+	.	+	.	1	1	.	1	8	36
BA	*Salix appendiculata*	E2	+	.	.	.	.	.	.	+	.	+	.	.	+	+	.	.	1	+	+	.	.	+	9	41
BA	*Sorbus chamaemespilus*	E2a	.	.	.	.	.	.	.	.	.	+	+	.	+	+	+	.	+	.	+	.	.	+	8	36
VP	*Larix decidua*	E3a	.	.	.	.	.	1	.	.	.	.	.	r	.	+	.	1	+	.	+	r	.	.	7	32
VP	*Larix decidua*	E2b	.	.	+	+	.	4	.	.	.	.	r	.	.	.	.	.	+	+	.	.	.	+	7	32
VP	*Larix decidua*	E2a	.	.	.	.	.	1	.	.	.	.	.	.	.	+	.	+	+	+	+	.	.	.	6	28
EP	*Carex alba*	E1	.	.	.	.	.	.	.	+	+	2	3	3	+	.	.	.	.	.	1	.	.	.	7	32
QP	*Ostrya carpinifolia*	E3	.	.	.	.	.	.	.	+	+	.	+	r	.	.	.	.	.	.	.	+	.	.	5	23
QP	*Ostrya carpinifolia*	E2b	.	.	.	.	.	.	.	.	.	r	.	+	+	+	.	.	.	.	.	r	.	.	5	23
QP	*Ostrya carpinifolia*	E2a	.	.	.	.	.	.	.	r	.	.	+	.	+	.	.	.	.	.	.	r	.	.	4	18
QP	*Ostrya carpinifolia*	E1	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	2	9
TA	*Acer pseudoplatanus*	E3a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	2	1	.	.	.	.	3	14
TA	*Acer pseudoplatanus*	E2b	.	+	1	+	1	.	.	.	.	.	.	.	.	.	+	.	+	1	.	.	.	+	8	36
TA	*Acer pseudoplatanus*	E2a	.	.	.	+	.	+	.	+	.	.	+	.	.	.	+	1	1	+	.	.	.	+	9	41
TA	*Acer pseudoplatanus*	E1	.	.	.	.	1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	4	18
FS	*Fagus sylvatica*	E3b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	4	5	4	4	18
FS	*Fagus sylvatica*	E3a	.	.	.	.	.	.	.	.	.	+	.	r	.	.	.	.	.	.	.	.	.	.	2	9
FS	*Fagus sylvatica*	E2b	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	+	.	1	1	+	.	6	27
FS	*Fagus sylvatica*	E2a	.	.	.	.	.	+	.	+	+	+	.	.	+	.	+	+	.	.	+	+	+	.	10	45
FS	*Fagus sylvatica*	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5
EP	*Rhodothamnus chamaecistus*	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	+	+	.	+	7	32
ES	*Carex ferruginea*	E1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	1	4	18
AT	*Carex brachystachys*	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	.	.	2	9

	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	Pr.	Fr.
AF	***Aremonio-Fagion***																									
	Cyclamen purpurascens	E1	.	1	1	1	1	+	1	+	1	1	1	1	+	1	1	1	.	.	1	1	1	1	19	86
	Anemone trifolia	E1	.	.	+	.	+	.	.	+	.	1	+	.	+	1	+	1	.	.	1	1	1	+	13	59
	Knautia drymeia	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	+	3	14
	Helleborus niger	E1	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Cardamine enneaphyllos	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
TA	***Tilio-Acerion***																									
	Thalictrum aquilegiifolium	E1	.	.	+	+	.	+	.	.	.	.	.	.	.	.	+	.	1	1	.	.	.	.	6	27
	Polystichum aculeatum	E1	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	4	18
	Geranium robertianum	E1	.	.	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	14
	Euonymus latifolia	E2b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	1	5
	Aruncus dioicus	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1	5
FS	***Fagetalia sylvaticae***																									
	Melica nutans	E1	.	.	+	+	+	1	+	2	1	1	1	1	2	1	+	1	+	+	1	1	1	+	20	91
	Mercurialis perennis	E1	+	+	1	.	1	1	2	1	1	1	1	1	+	+	1	+	1	+	.	+	1	+	20	91
	Galium laevigatum	E1	.	.	+	.	.	.	1	.	.	+	1	1	+	+	+	+	+	+	1	1	+	+	15	68
	Daphne mezereum	E2a	.	.	+	.	+	.	.	1	1	1	+	+	+	.	.	.	+	+	.	+	+	+	13	59
	Lonicera alpigena	E2a	.	.	+	+	.	.	.	.	.	1	+	.	+	+	+	+	.	+	1	+	+	.	12	55
	Galeobdolon flavidum	E1	.	+	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	1	.	7	32
	Dryopteris filix-mas	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	+	+	6	27
	Euphorbia amygdaloides	E1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	+	1	5	23
	Mycelis muralis	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	5	23
	Salvia glutinosa	E1	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	+	.	.	.	5	23
	Actaea spicata	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2	9
	Brachypodium sylvaticum	E1	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Luzula nivea	E1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	.	.	.	.	2	9
	Paris quadrifolia	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	2	9
	Epilobium montanum	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	5
	Epipactis helleborine	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	5
	Poa nemoralis	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
QP	***Quercetalia pubescenti-petraeae***																									
	Sorbus aria (Aria edulis)	E3a	.	.	.	.	.	.	.	1	1	1	+	.	1	+	.	+	.	.	.	.	+	.	8	36
	Sorbus aria	E2b	.	.	.	.	+	.	.	.	.	1	+	1	+	+	+	.	.	+	1	.	.	.	9	41
	Sorbus aria	E2a	.	.	.	.	+	.	+	+	.	.	1	1	+	.	.	.	.	.	1	2	.	+	9	41
	Sorbus aria	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	2	9
	Primula veris	E1	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Hypericum montanum	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Convallaria majalis	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	5
QF	***Querco-Fagetea***																									
	Hepatica nobilis	E1	.	.	.	.	.	.	.	.	.	1	1	1	1	+	.	.	.	.	1	1	.	.	7	32
	Carex digitata	E1	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	5	23
QR	Potentilla erecta	E1	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Lonicera xylosteum	E2a	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	2	9
	Platanthera bifolia	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	5
AI	*Dryopteris carthusiana*	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	1	5

	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	Pr.	Fr.
VP	***Vaccinio-Piceetea***																									
	Picea abies	E2b	.	.	+	.	.	1	.	.	+	.	.	.	+	.	.	.	+	.	.	.	.	.	5	23
	Picea abies	E2a	.	+	+	r	.	1	.	+	+	+	.	.	.	.	.	+	+	+	.	.	+	.	11	50
	Vaccinium myrtillus	E1	.	.	.	.	.	.	.	.	.	2	+	+	+	.	.	1	.	.	1	+	.	+	8	36
	Maianthemum bifolium	E1	.	.	.	.	.	.	.	+	+	+	+	.	+	.	.	.	.	.	+	.	.	.	6	27
	Valeriana tripteris	E1	.	.	.	.	.	.	.	.	.	1	.	+	.	+	+	.	.	.	+	+	.	.	6	27
	Lonicera nigra	E2a	.	.	.	.	.	.	.	.	.	1	+	.	1	+	.	.	.	.	1	.	.	.	5	23
	Solidago virgaurea	E1	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	+	.	.	4	18
	Vaccinium vitis-idaea	E1	.	.	.	.	.	.	.	.	.	1	1	.	1	.	.	.	.	.	1	.	.	.	4	18
	Veronica urticifolia	E1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	1	+	4	18
	Abies alba	E2b	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	.	.	3	14
	Abies alba	E2a	.	.	.	.	.	.	.	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	3	14
	Gymnocarpium dryopteris	E1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	3	14
	Oxalis acetosella	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	.	.	.	.	.	+	.	3	14
	Calamagrostis villosa	E1	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Lycopodium annotinum	E1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	.	.	.	2	9
	Gentiana asclepiadea	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	.	.	.	.	2	9
	Saxifraga cuneifolia	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	2	9
	Huperzia selago	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	2	9
	Rosa pendulina	E2a	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Phegopteris connectilis	E1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Aposeris foetida	E1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1	5
	Hieracium murorum	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	5
	Luzula pilosa	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	5
	Dryopteris expansa	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	5
	Luzula sylvatica	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	5
EP	***Erico-Pinetea***																									
	Calamagrostis varia	E1	1	1	1	1	1	2	3	1	1	1	2	1	1	+	1	2	1	2	1	2	+	1	22	100
	Molinia arundinacea	E1	+	1	+	+	1	+	.	.	+	+	+	3	3	+	+	.	3	+	.	1	.	1	17	77
	Rubus saxatilis	E1	.	+	+	1	+	+	.	.	.	.	1	1	1	1	+	1	+	+	1	.	+	+	16	73
	Erica carnea	E1	.	.	.	.	.	2	.	+	.	2	2	3	2	3	1	2	.	.	.	+	+	3	12	55
	Peucedanum rablense	E1	.	1	+	.	1	1	.	+	+	.	.	r	.	.	.	1	.	.	.	.	+	.	9	41
	Amelanchier ovalis	E2b	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	3	14
	Amelanchier ovalis	E2a	.	.	.	.	.	r	.	.	.	.	+	1	+	+	.	.	.	.	.	+	.	.	6	27
	Polygala chamaebuxus	E1	.	+	.	.	.	.	.	.	+	.	.	1	+	+	.	.	.	.	.	.	.	.	5	23
	Cotoneaster tomentosus	E2a	.	.	+	.	.	.	.	.	.	.	+	1	.	+	.	.	.	.	.	.	.	.	4	18
	Euphrasia cuspidata	E1	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	4	18
	Asperula aristata	E1	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Rhamnus saxatilis	E1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Aquilegia nigricans	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	5
BA	***Betulo-Alnetea***																									
	Sorbus mougeotii	E3a	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Sorbus mougeotii	E2b	.	.	.	r	.	.	.	.	.	.	+	+	r	.	.	+	.	.	.	+	.	.	6	27
	Sorbus austriaca subsp. austriaca	E2b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	1	5

	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	Pr.	Fr.
MuA	***Mulgedio-Aconitetea***																									
	Aconitum degenii subsp. paniculatum	E1	.	.	.	.	.	.	.	.	.	2	1	.	.	.	.	.	+	+	.	.	.	.	4	18
	Chaerophyllum hirsutum	E1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	+	1	.	.	.	.	4	18
	Athyrium filix-femina	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	+	4	18
	Polygonatum verticillatum	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	3	14
	Agropyron caninum	E1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	2	9
	Veratrum album	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	2	9
	Viola biflora	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	2	9
	Senecio ovatus	E1	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Phyteuma ovatum	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	5
	Crepis paludosa	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	5
SSC	***Sambuco-Salicion capreae, Rhamno-Prunetea***																									
	Sorbus aucuparia	E3a	.	.	.	.	.	.	.	+	.	+	.	+	1	.	.	.	+	.	+	.	.	.	6	27
	Sorbus aucuparia	E2b	.	.	.	.	.	.	.	.	+	+	+	+	.	1	.	.	.	.	.	.	.	.	5	23
	Sorbus aucuparia	E2a	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	+	.	.	+	.	4	18
	Sorbus aucuparia	E1	.	.	.	.	.	+	.	.	+	.	+	.	.	+	+	+	.	.	.	+	.	+	8	36
RP	*Juniperus communis*	E2b	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
RP	*Juniperus communis*	E2a	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	r	.	.	2	9
	Betula pendula	E3a	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
EA	***Epilobietea angustifolii***																									
	Fragaria vesca	E1	1	.	.	.	.	.	+	1	+	+	+	+	.	.	+	1	.	.	+	.	.	+	11	50
	Rubus idaeus	E2a	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	2	9
TG	***Trifolio-Geranietea***																									
	Vincetoxicum hirundinaria	E1	+	+	+	.	.	+	+	2	2	.	+	.	.	.	.	+	.	.	.	+	+	.	11	50
	Viola hirta	E1	.	+	.	+	+	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	+	7	32
	Anthericum ramosum	E1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	3	14
	Clinopodium vulgare	E1	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Hypericum perforatum	E1	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Laserpitium siler	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Polygonatum odoratum	E1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Laserpitium latifolium	E1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Valeriana wallrothii (V. collina)	E1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
FB	***Festuco-Brometea***																									
	Buphthalmum salicifolium	E1	.	.	1	1	+	1	1	+	.	.	+	1	.	+	+	+	+	1	+	+	+	+	17	77
	Stachys recta agg,	E1	.	1	+	1	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	r	.	.	7	32
	Galium lucidum	E1	.	1	.	1	+	1	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	1	.	7	32
	Cirsium erisithales	E1	+	.	1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	5	23
	Brachypodium rupestre	E1	.	.	.	.	.	.	.	3	3	+	+	.	.	.	.	.	.	.	.	.	.	.	.	4	18
	Carex humilis	E1	.	.	.	.	.	.	2	.	.	.	+	.	.	.	.	.	.	.	.	.	1	1	.	4	18
	Prunella grandiflora	E1	.	+	+	.	.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	18
	Pimpinella saxifraga	E1	+	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	14
	Carlina acaulis	E1	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Euphorbia cyparissias	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	2	9
	Linum catharticum	E1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Gentianella ciliata	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5

	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	Pr.	Fr.
	Arabis hirsuta	E1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Hippocrepis comosa	E1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Teucrium montanum	E1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Gymnadenia conopsea	E1	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Briza media	E1	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
MA	***Molinio-Arrhenatheretea***																									
	Galium album	E1	.	.	.	.	.	.	1	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	5	23
PaT	*Ranunculus nemorosus agg.*	E1	.	.	.	.	.	.	.	+	+	.	+	.	+	.	.	.	.	.	.	.	.	.	4	18
	Achillea millefolium	E1	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Lathyrus pratensis	E1	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Trifolium pratense	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
CD	***Caricetalia davallianae***																									
	Parnassia palustris	E1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	2	9
	Tofieldia calyculata	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	5
ES	***Elyno-Seslerietea***																									
	Betonica alopecuros	E1	.	2	1	1	1	2	2	+	+	1	1	2	1	1	1	1	1	1	+	1	1	1	21	95
	Laserpitium peucedanoides	E1	+	+	+	.	.	1	1	+	+	+	.	+	.	+	+	.	.	+	.	+	+	+	15	68
	Sesleria caerulea	E1	.	1	+	+	.	2	+	.	.	.	+	1	.	+	+	1	+	.	.	+	.	+	13	59
	Scabiosa lucida subsp. stricta	E1	+	.	1	+	+	1	.	.	.	.	+	.	.	.	.	+	1	1	.	.	+	.	10	45
	Carduus crassifolius	E1	1	1	+	+	1	1	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	8	36
	Thymus praecox subsp. polytrichus	E1	.	1	+	.	+	+	+	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	8	36
	Linum julicum	E1	.	+	+	+	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	6	27
	Festuca calva	E1	.	.	.	.	.	+	.	+	+	.	.	.	+	.	.	.	.	.	+	.	.	.	5	23
	Rhinanthus glacialis	E1	.	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	18
	Lotus corniculatus s. lat. (L. alpinus ?)	E1	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	3	14
	Carex mucronata	E1	.	+	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	14
	Helianthemum nummularium subsp. grandiflorum	E1	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	3	14
	Phyteuma orbiculare	E1	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	3	14
	Aster bellidiastrum	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	2	9
	Thesium alpinum	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Dryas octopetala	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Achillea clavenae	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Acinos alpinus	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Alchemilla alpigena	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Carex sempervirens	E1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Euphrasia picta	E1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Juncus monanthos	E1	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Astrantia bavarica	E1	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Arabis vochinensis	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1	5
	Globularia nudicaulis	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1	5
	Selaginella selaginoides	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	1	5
TR	***Thlaspietea rotundifolii***																									
	Astrantia carniolica	E1	+	+	.	+	+	1	.	.	.	.	.	.	.	.	+	.	2	2	.	2	1	+	11	50
	Valeriana montana	E1	.	2	1	1	2	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	1	+	7	32
	Adenostyles glabra	E1	+	.	+	.	.	+	2	.	.	.	.	.	.	.	.	.	.	2	.	+	.	.	6	27

	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	Pr.	Fr.
	Achnatherum calamagrostis	E1	3	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.	5	23
	Biscutella laevigata	E1	.	+	.	+	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	5	23
	Campanula cespitosa	E1	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	5	23
	Festuca nitida	E1	.	.	1	+	.	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	5	23
	Aquilegia einseleana	E1	+	.	.	+	.	.	+	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	4	18
	Gypsophila repens	E1	+	+	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	18
	Hieracium bifidum	E1	+	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	4	18
	Rumex scutatus	E1	+	.	+	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	18
	Trisetum argenteum	E1	.	.	+	1	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	4	18
	Scrophularia juratensis	E1	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	3	14
	Asplenium fissum	E1	.	.	1	+	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	14
	Arabis alpina	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	2	9
	Hieracium porrifolium	E1	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Silene vulgaris subsp. glareosa	E1	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Viola pyrenaica	E1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	2	9
	Athamanta cretensis	E1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Petasites paradoxus	E1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Hieracium piloselloides	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Leontodon hyoseroides	E1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Heliosperma alpestre	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5
	Dianthus sternbergii	E1	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1	5
	Cerastium subtriflorum	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	5
	Cystopteris montana	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	5
	Soldanella alpina	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	5
AT	***Asplenietea trichomanis***																									
	Asplenium viride	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	+	+	+	7	32
	Paederota lutea	E1	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	.	5	23
	Asplenium trichomanes	E1	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	4	18
	Kernera saxatilis	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	2	9
	Moehringia muscosa	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2	9
	Asplenium ruta-muraria	E1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	2	9
	Cystopteris regia	E1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	2	9
	Cystopteris fragilis	E1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	2	9
ML	**Mosses and lichens (Mahovi in lišaji)**																									
	Ctenidium molluscum	E0	.	.	1	1	.	1	.	.	.	1	1	1	1	+	1	.	1	1	.	1	1	1	14	64
	Tortella tortuosa	E0	+	.	.	.	1	1	.	+	.	1	1	1	.	.	+	1	1	+	+	.	.	.	12	54,5
	Hylocomium splendens	E0	.	.	+	.	.	1	.	.	.	.	+	1	+	1	+	+	.	.	+	+	.	1	11	50
	Rhytidiadelphus triquetrus	E0	.	.	.	.	.	1	.	+	.	1	1	2	1	2	1	1	.	.	1	.	.	+	11	50
	Fissidens dubius	E0	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	1	1	.	.	.	1	5	23
	Dicranum scoparium	E0	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	.	.	.	.	.	3	14
	Peltigera canina	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	3	13,6
	Homalothecium lutescens	E0	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2	9
	Conocephalum conicum	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	2	9
	Schistidium apocarpum	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	2	9
	Mnium thomsonii	E0	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	5

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	Pr.	Fr.
Plagiochila porelloides	E0	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	5
Plagiomnium undulatum	E0	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1	5
Mnium sp.	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1	5
Polytrichum formosum	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	5
Neckera crispa	E0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1	5

Legend - Legenda

Pr. Presence (number of relevés in which the species is presented) - število popisov, v katerih se pojavlja vrsta
Fr. Frequency in % - frekvenca v %
Gr Gravel - prod
Sc Scree - grušč
Mo Moraine (Til) - morena (til)
Ta Talus - vršaj
Rs Rockslide - podorno skalovje
D Dolomite - dolomit
Co Colluvial soil - koluvialna tla
Li Lithosols - kamnišče
Re Rendzina - rendzina
QR *Quercetalia roboris*
AI *Alnion incanae*
PaT *Poo alpinae-Trisetetalia*

Table 2: Succession of vegetation on fluvial-glacial gravel sediments of the Kotarica in Klin (the Kot Valley), the Julian Alps
Preglednica 2: Sukcesijski razvoj rastja na rečno-ledeniških prodnatih nanosih Kotarice v Klinu v dolini Kot, Julijske Alpe

	Number of relevé (Zaporedna številka popisa)		1	2	3	4	5	6		
	Database number of relevé (Delovna številka popisa)		273197	273196	273194	273191	273190	273192		
	Elevation in m (Nadmorska višina v m)		990	990	990	980	990	980		
	Aspect (Lega)		NE	NE	NE	NE	NE	NE		
	Slope in degrees (Nagib v stopinjah)		1	1	1	1	1	1		
	Parent material (Matična podlaga)		Gr	Gr	Gr	Gr	Gr	Gr		
	Soil (Tla)		Li	Li	Re	Re	Re	Re		
	Stoniness in % (Kamnitost v %)		60	20	5	5	0	0		
	Cover in % (Zastiranje v %):									
	Upper tree layer (Zgornja drevesna plast)	E3b				60	60	60		
	Lower tree layer (Spodnja drevesna plast)	E3a			5	10	20	10		
	Shrub layer (Grmovna plast)	E2	20+60	70+20	80	30+30	20+20	40+60		
	Herb layer (Zeliščna plast)	E1	30	70	90	90	95	90		
	Moss layer (Mahovna plast)	E0	20	5		10	5	5		
	Maximum diameter of trees (Največji prsni premer dreves)	cm			20	35	35	35		
	Maximum height of trees (Največja drevesna višina)	m			15	22	20	19		
	Number of species (Število vrst)		50	73	69	54	60	47		
	Relevé area (Velikost popisne ploskve)	m^2	100	200	200	400	400	400		
	Date of taking relevé (Datum popisa)		9/19/2018	9/19/2018	9/19/2018	9/19/2018	9/19/2018	9/19/2018		
	Locality (Nahajališče)		Kot-Klin	Kot-Klin	Kot-Klin	Kot-Klin	Kot-Klin	Kot-Klin		
	Quadrant (Kvadrant)		9549/3	9549/3	9549/3	9549/3	9549/3	9549/3		
	Coordinate GK Y (D-48)	m	415054	415051	415090	415145	415070	415105		
	Coordinate GK X (D-48)	m	5140955	5140996	5141082	5141160	5141009	5141081		
	Diagnostic species of the associations (Diagnostične vrste asociacij)								Pr.	Fr.
SP	*Salix eleagnos*	E3a	.	1	+	.	.	.	2	33
SP	*Salix eleagnos*	E2b	1	+	.	.	.	.	2	33
SP	*Salix eleagnos*	E2a	4	.	+	.	.	.	2	33
SP	*Salix eleagnos*	E1	2	.	.	.	.	.	1	17
SP	*Salix purpurea*	E2b	+	.	.	.	.	.	1	17
TR	*Petasites paradoxus*	E1	3	+	+	1	+	+	6	100
EP	*Pinus mugo*	E2b	+	4	4	.	1	1	5	83
EP	*Pinus mugo*	E2a	+	1	1	+	+	.	5	83
EP	*Pinus mugo*	E1	+	.	+	.	.	.	2	33
EP	*Amelanchier ovalis*	E2b	.	+	.	.	.	.	1	17
EP	*Amelanchier ovalis*	E2a	.	+	r	.	r	.	3	50
TR	*Hieracium porrifolium*	E1	1	1	+	.	.	.	3	50
FS	*Fagus sylvatica*	E3b	.	.	.	3	3	4	3	50
FS	*Fagus sylvatica*	E3a	.	.	.	1	1	.	2	33
FS	*Fagus sylvatica*	E2b	.	+	.	+	1	1	4	67
FS	*Fagus sylvatica*	E2a	.	.	+	+	1	1	4	67
FS	*Fagus sylvatica*	E1	+	+	1	+	.	+	5	83
FS	*Laburnum alpinum*	E3a	.	.	+	+	1	r	4	67
FS	*Laburnum alpinum*	E2b	1	.	+	+	1	+	5	83
FS	*Laburnum alpinum*	E2a	.	+	.	+	1	+	4	67
EP	*Rhododendron hirsutum*	E2a	+	1	+	3	2	1	6	100
VP	*Clematis alpina*	E1	.	.	.	1	1	1	3	50
FB	*Brachypodium rupestre*	E1	.	.	.	1	1	+	3	50
VP	*Homogyne sylvestris*	E1	.	.	.	+	.	+	2	33
EP	***Erico-Pinetea***									
	Calamagrostis varia	E1	1	1	+	2	3	3	6	100
	Erica carnea	E1	+	4	4	4	4	4	6	100
	Molinia arundinacea	E1	1	2	4	+	1	1	6	100
	Carex alba	E1	.	+	+	1	2	1	5	83
	Euphrasia cuspidata	E1	+	1	1	.	.	.	3	50
	Rubus saxatilis	E1	.	.	.	1	1	1	3	50
	Allium ericetorum	E1	.	+	.	.	+	.	2	33
	Aquilegia nigricans	E1	.	+	.	.	+	.	2	33

	Number of relevé (Zaporedna številka popisa)		1	2	3	4	5	6	Pr.	Fr.
	Asperula aristata	E1	.	+	+	.	.	.	2	33
	Carex ornithopoda	E1	1	+	.	.	.	.	2	33
	Polygala chamaebuxus	E1	.	1	1	.	.	.	2	33
	Rhodothamnus chamaecistus	E1	.	+	1	.	.	.	2	33
	Crepis slovenica	E1	.	+	.	.	.	.	1	17
	Gymnadenia odoratissima	E1	.	.	r	.	.	.	1	17
	Cotoneaster tomentosus	E2a	.	.	.	.	r	.	1	17
AF	***Aremonio-Fagion***									
	Helleborus niger	E1	.	1	1	2	1	1	5	83
	Cyclamen purpurascens	E1	.	+	+	+	1	1	5	83
	Anemone trifolia	E1	.	+	+	+	+	1	5	83
	Rhamnus fallax	E2a	+	.	.	.	.	.	1	17
	Rhamnus fallax	E2b	r	.	.	.	.	.	1	17
TA	***Tilio-Acerion***									
	Acer pseudoplatanus	E3b	.	.	.	1	1	+	3	50
	Acer pseudoplatanus	E3a	.	.	.	+	1	+	3	50
	Acer pseudoplatanus	E2b	.	.	.	.	.	+	1	17
	Acer pseudoplatanus	E2a	.	+	.	.	.	.	1	17
	Acer pseudoplatanus	E1	+	+	+	+	1	1	6	100
FS	***Fagetalia sylvaticae***									
	Melica nutans	E1	.	.	+	1	1	+	4	67
	Daphne mezereum	E2a	.	.	.	1	1	1	3	50
	Lonicera alpigena	E2a	.	.	.	2	1	+	3	50
	Galium laevigatum	E1	.	.	.	+	+	+	3	50
	Euphorbia amygdaloides	E1	.	+	.	+	.	.	2	33
	Cypripedium calceolus	E1	.	.	r	+	.	.	2	33
	Mercurialis perennis	E1	.	.	.	+	.	+	2	33
	Prenanthes purpurea	E1	.	.	.	.	+	+	2	33
	Galeobdolon flavidum	E1	.	.	.	.	+	.	1	17
	Dryopteris filix-mas	E1	.	.	.	.	.	+	1	17
QP	***Quercetalia pubescenti-petraeae***									
	Sorbus aria (Aria edulis)	E3a	.	.	.	.	.	+	1	17
	Sorbus aria (Aria edulis)	E2b	.	.	.	1	1	.	2	33
	Sorbus aria (Aria edulis)	E2a	+	+	+	1	1	+	6	100
	Sorbus aria (Aria edulis)	E1	.	+	+	.	.	.	2	33
QF	***Querco-Fagetea***									
QR	*Potentilla erecta*	E1	.	.	1	1	+	1	4	67
	Hepatica nobilis	E1	.	+	+	1	.	.	3	50
	Viola riviniana	E1	.	+	.	r	.	.	2	33
AI	*Frangula alnus*	E2a	.	.	.	.	+	.	1	17
VP	***Vaccinio-Piceetea***									
	Picea abies	E3b	.	.	.	+	1	1	3	50
	Picea abies	E3a	.	.	+	+	r	+	4	67
	Picea abies	E2b	1	.	+	+	1	+	5	83
	Picea abies	E2a	.	.	+	+	+	+	4	67
	Picea abies	E1	+	.	.	.	.	.	1	17
	Pyrola rotundifolia	E1	.	+	+	2	1	1	5	83
	Larix decidua	E3b	.	.	.	r	+	+	3	50
	Larix decidua	E3a	.	1	+	.	.	.	2	33
	Larix decidua	E2b	1	+	+	.	+	.	4	67
	Larix decidua	E2a	.	+	+	+	+	.	4	67
	Larix decidua	E1	+	+	.	.	.	.	2	33
	Vaccinium myrtillus	E1	.	.	+	3	3	3	4	67
	Vaccinium vitis-idaea	E1	.	.	+	2	2	2	4	67
	Lonicera nigra	E2a	.	.	.	1	1	+	3	50
	Orthilia secunda	E1	.	.	.	1	+	+	3	50
	Lycopodium annotinum	E1	.	.	.	+	+	+	3	50
	Gentiana asclepiadea	E1	.	+	.	.	+	.	2	33
	Veronica urticifolia	E1	.	.	.	+	.	.	1	17
	Hieracium murorum	E1	.	.	.	+	.	.	1	17
	Lonicera caerulea	E2a	.	.	.	r	.	.	1	17
	Maianthemum bifolium	E1	.	.	.	.	+	.	1	17

	Number of relevé (Zaporedna številka popisa)		1	2	3	4	5	6	Pr.	Fr.
	Abies alba	E2a	.	.	.	.	+	.	1	17
	Aposeris foetida	E1	.	.	.	.	+	.	1	17
	Solidago virgaurea	E1	.	.	.	.	+	.	1	17
	Luzula pilosa	E1	.	.	.	.	.	+	1	17
BA	***Betulo-Alnetea***									
	Salix appendiculata	E2b	.	+	+	.	.	.	2	33
	Salix appendiculata	E2a	2	.	+	.	+	.	3	50
	Salix appendiculata	E1	1	.	.	.	.	.	1	17
	Juniperus sibirica	E2a	.	.	.	.	r	r	2	33
	Sorbus chamaemespilus	E2a	.	.	+	.	+	+	3	50
	Salix waldsteiniana	E2a	+	.	.	.	.	.	1	17
	Salix glabra	E2a	.	+	.	.	.	.	1	17
MuA	***Mulgedio-Aconitetea***									
	Polygonatum verticillatum	E1	.	.	.	.	+	.	1	17
	Athyrium filix-femina	E1	.	.	.	.	.	+	1	17
EA	***Epilobietea angustifolii***									
	Fragaria vesca	E1	.	.	.	+	+	+	3	50
SSC	***Sambuci-Salicion capreae, Rhamno-Prunetea***									
	Sorbus aucuparia	E3a	.	+	.	+	.	+	3	50
	Sorbus aucuparia	E2b	.	.	.	+	.	.	1	17
	Sorbus aucuparia	E1	.	.	+	+	+	+	4	67
RP	*Berberis vulgaris*	E2a	.	.	.	.	.	r	1	17
FB	***Festuco-Brometea***									
	Buphthalmum salicifolium	E1	+	+	1	+	+	.	5	83
	Galium lucidum	E1	+	+	+	.	+	.	4	67
	Carlina acaulis	E1	.	+	+	.	+	.	3	50
	Cirsium erisithales	E1	+	+	.	.	.	.	2	33
	Hippocrepis comosa	E1	.	1	+	.	.	.	2	33
	Prunella grandiflora	E1	.	+	1	.	.	.	2	33
	Gentianella ciliata	E1	.	1	.	.	+	.	2	33
	Festuca rupicola	E1	+	.	.	.	.	.	1	17
	Coronilla vaginalis	E1	.	+	.	.	.	.	1	17
	Stachys recta s. lat.	E1	.	+	.	.	.	.	1	17
	Gymnadenia conopsea	E1	.	.	+	.	.	.	1	17
TG	*Viola hirta*	E1	.	.	+	.	.	.	1	17
PaT	***Poo alpinae-Trisetetalia, Molinio-Arrhenatheretea***									
MA	*Angelica sylvestris*	E1	.	+	r	.	.	.	2	33
	Campanula scheuchzeri	E1	.	.	.	+	.	.	1	17
	Ranunculus nemorosus	E1	.	.	.	r	.	.	1	17
ES	***Elyno-Seslerietea***									
	Laserpitium peucedanoides	E1	.	+	1	+	1	+	5	83
	Dryas octopetala	E1	1	3	2	+	.	.	4	67
	Lotus corniculatus s. lat. (L. alpinus)	E1	.	+	1	+	+	.	4	67
	Betonica alopecuros	E1	.	+	1	.	1	+	4	67
	Aster bellidiastrum	E1	+	1	2	.	.	.	3	50
	Carex mucronata	E1	+	1	+	.	.	.	3	50
	Globularia cordifolia	E1	+	1	+	.	.	.	3	50
	Carex firma	E1	+	+	1	.	.	.	3	50
	Senecio abrotanifolius	E1	.	+	+	+	.	.	3	50
	Scabiosa lucida subsp. stricta	E1	.	+	1	.	+	.	3	50
	Carduus crassifolius	E1	+	+	.	.	.	.	2	33
	Sesleria caerulea	E1	+	.	+	.	.	.	2	33
NS	*Antennaria dioica*	E1	.	+	+	.	.	.	2	33
CD	*Tofieldia calyculata*	E1	.	+	+	.	.	.	2	33
	Achillea clavenae	E1	+	.	.	.	.	.	1	17
	Phyteuma orbiculare	E1	+	.	.	.	.	.	1	17
	Globularia nudicaulis	E1	.	+	.	.	.	.	1	17
	Thymus praecox subsp. polytrichus	E1	.	+	.	.	.	.	1	17
	Arctostaphylos alpinus	E1	.	.	+	.	.	.	1	17
	Gentiana clusii	E1	.	.	+	.	.	.	1	17
	Rhinanthus glacialis	E1	.	.	+	.	.	.	1	17
	Thesium alpinum	E1	.	.	+	.	.	.	1	17

	Number of relevé (Zaporedna številka popisa)		1	2	3	4	5	6	Pr.	Fr.
	Ranunculus carinthiacus	E1	.	.	.	.	.	+	1	17
TR	***Thlaspietea rotundifolii***									
	Campanula cespitosa	E1	1	1	+	.	+	.	4	67
	Astrantia carniolica	E1	+	+	+	.	+	.	4	67
	Heliosperma alpestre	E1	2	+	+	.	.	.	3	50
	Dianthus sternbergii	E1	+	+	+	.	.	.	3	50
	Hieracium bifidum	E1	+	+	+	.	.	.	3	50
	Adenostyles glabra	E1	.	+	+	+	.	.	3	50
	Gymnocarpium robertianum	E1	.	.	.	1	1	+	3	50
	Achnatherum calamagrostis	E1	+	+	.	.	.	.	2	33
	Biscutella laevigata	E1	+	+	.	.	.	.	2	33
	Hieracium piloselloides	E1	+	+	.	.	.	.	2	33
	Rumex scutatus	E1	+	+	.	.	.	.	2	33
	Trisetum argenteum	E1	+	+	.	.	.	.	2	33
	Valeriana montana	E1	+	.	.	1	.	.	2	33
	Silene vulgaris subsp. glareosa	E1	1	.	.	.	.	.	1	17
	Minuartia austriaca	E1	+	.	.	.	.	.	1	17
	Papaver alpinum subsp. ernesti-mayeri	E1	+	.	.	.	.	.	1	17
	Scrophularia juratensis	E1	+	.	.	.	.	.	1	17
	Linaria alpina	E1	.	+	.	.	.	.	1	17
AT	***Asplenietea trichomanis***									
	Potentilla clusiana	E1	+	.	.	.	.	.	1	17
	Campanula thyrsoides	E1	.	+	.	.	.	.	1	17
ML	**Mosses and lichens (Mahovi in lišaji)**									
	Tortella tortuosa	E0	2	+	1	.	+	.	4	67
	Hylocomium splendens	E0	.	.	+	1	.	+	3	50
	Rhytidiadelphus triquetrus	E0	.	.	+	1	.	.	2	33
	Dicranum scoparium	E0	.	.	.	+	.	+	2	33
	Cladonia rangiferina	E0	.	.	+	.	.	.	1	17

Legend - Legenda

Pr. Presence (number of relevés in which the species is presented) - število popisov, v katerih se pojavlja vrsta
Fr. Frequency in % - frekvenca v %
Gr Gravel - prod
Li Lithosols - kamnišče
Re Rendzina - rendzina
QR *Quercetalia roboris*
AI *Alnion incanae*
TG *Trifolio-Geranietea*
NS *Nardetea strictae*
CD *Caricetalia davallianae*