FLORA AND VEGETATION IN POKLJUKA GORGE (JULIAN ALPS, NW SLOVENIA)

FLORA IN VEGETACIJA POKLJUŠKE SOTESKE (JULIJSKE ALPE, SZ SLOVENIJA)

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ABSTRACT

Flora and vegetation in Pokljuka Gorge (Julian Alps, NW Slovenia)

The vascular flora and vegetation of Pokljuka Gorge are described. Five forest and one shrub community and 262 taxons of vascular flora were identified. Central European flora predominate, with 158 (60,3%), there are 11 (4,2%) species of Illyrian flora, 14 (5,3%) protected species and the subendemic species *Saxifraga burseriana* is also present. We classified the forest and shrub associations into Central European phytocenoses, although more widespread southeast European-Illyrian species are present in some.

Key words: flora, vegetation, Alpine region of Slovenia, Triglav National Park, Pokljuka Gorge.

IZVLEČEK

Flora in vegetacija Poklјuške soteske (Julijske Alpe, SZ Slovenija)

Opisana je vaskularna flora in vegetacija Poklјuške soteske. Določili smo 5 gozdnih in 1 grmiščno združbo ter 262 taksonov vaskularne flore. Prevladuje srednjeevropska flora s 158 taksoni (60,3 %), ilirske flore je 11 (4,2 %) vrst, zavarovanih vrst je 14 (5,3 %), prisoten je še subendemit *Saxifraga burseriana*. Gozdne in grmiščno združbo uvrščamo v srednjeevropske fitocenoze, vendar so v nekaterih prisotne širše razširjene jugovzhodnoevropsko-ilirske vrste.

Ključne besede: flora, vegetacija, alpsko območje Slovenije, Triglavski narodni park, Poklјuška soteska.

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INTRODUCTION

Pokljuka Gorge is among the most interesting natural features of Triglav National Park. It is cut into the steep northeast edge of Pokljuka plateau at an altitude of 670 to 800 m. It is the largest fossil gorge in Slovenia, created many millions of years ago by the waters of Triglav glacier. The gorge is for the most part dry today, only during heavy rain and the spring snow melt does water flow in the lower part of the gorge in Ribščica stream, which flows into the Rodovna (Smolej 1982, Ramovš 1986, Skumavec 1995, Skumavec & Skobrne 1995). The retreat of Bohinj glacier during the last glaciation in the Würm was important for the today's form of the area in question. The Radovna river with tributaries had a large amount of water, which had flowed from beneath Radovna glacier and the ice-bound Pokljuka plateau and had great erosive power (Šifrer 1983). Flowing along tectonic cracks it also created Pokljuka Gorge, with many interesting natural phenomena, such as Pokljuka Cave, a natural bridge and »vrtci« (garden plots) with flat bottoms in the form of sinkholes.

Pokljuka Gorge is traversable from Jela in the northeast of the gorge to the cliff above Srednji vrtec. There is no natural passage between the cliffs; this is only possible in the final, upper part in the fissure between the cliffs. Passage is possible via bridges and steps, called the Galleries. The Galleries were built in 1930 and at that time were known as the Galleries of

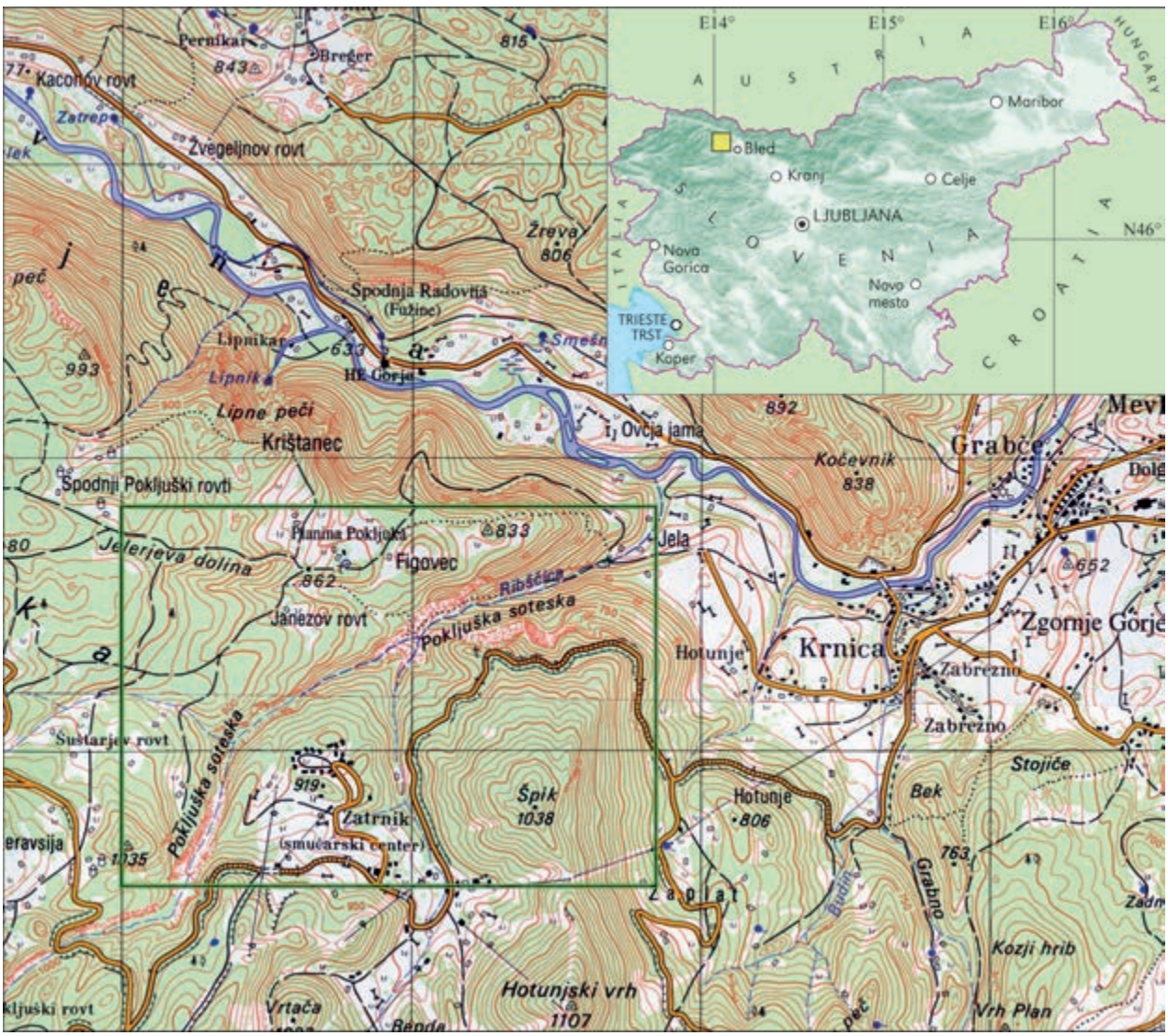

Figure 1: Location of the research area

Prince Andrew (Karadžordžević). The bridges collapsed during the Second World War and were renovated in 1982.

After the renovation of the Galleries, my colleague and friend Jože Skumavec took me to Pokljuka Gorge. We have visited the gorge many times since the nineteen eighties, where, more in an amateur than professional manner, we observed the nature of the gorge, above all the flora and vegetation. In the second half of the nineteen eighties, I began planned research of the vegetation of Pokljuka. M. Wraber, Tregubov and Piskernik had researched Pokljuka prior to me. Their studies were published in local scientific reports of Bled Forest Management and in two informative publications, M. Wraber (1960) and Tregubov (1957). At the time of my Pokljuka research, my colleague Skumavec had the idea of a planned study of the flora and vegetation of Pokljuka Gorge. We began the research, which with major breaks, lasted until today.

The research path led us along the gorge, from Jela, Kobalove rovte, Stranska soteska, Pokljuka cave, Srednji vrtec, Galerije, Veliki vrtec, below the path towards Zatrnik above the gorge, across the transitional or circular path towards Stara Pokljuka or below Pustovo polje, through Pokljuka cave and back to Jela. The area covers almost 2 km of the length of the gorge. We wanted to include and inventory the flora as completely as possible, although we probably did not fully succeed in this and we expect that it is or will be possible to find some species that we overlooked or that were not there at the time of our surveys due to growth or other natural reasons. The forest-shrub vegetation is represented by 5 phytocenological relevés and a phytocenological table with three relevés.

METHODS

The floristic research took place according to established standard methods, in which we used Mala flora Slovenia (Martinčič et al. 2007), Flora alpina (Aeschimann et al. 2004), Register flore Slovenije (Trpin & Vreš 1995) and the database FloVegSi (T. Seliškar, Vreš & A. Seliškar 2003) for identifying species. We treated the vegetation according to the standard Central European (Zurich-Montpellie) method (Braun-Blanquet 1964). We inventoried the flora and vegetation along the mountaineering-tourist path right up to the cliffs that confine the gorge, and in the area above the gorge, which geographically sensibly belongs to it. We visited the research area a number of times from spring to autumn.

ECOLOGICAL CHARACTERISTICS OF THE RESEARCH AREA

Climatic conditions in Pokljuka Gorge are more or less similar to those that prevail in the Alps. Pokljuka Gorge is a frost area, in which temperature inversions appear in spring and autumn, and the area is in general colder than the surroundings throughout the year. A humid climate prevails in the gorge, with fresh summers and cold winters. Average annual precipitation is from 1500 to 2000 mm and more. The majority of rainfall, around 60% and perhaps even more, falls during the vegetation period. On the floor of the gorge, in sheltered positions and rough ground, snow lies late into spring. We estimate average annual air temperature to be as in the Alps, between 3° and 6° C, depending on the configuration of the terrain.

Pokljuka Gorge has a uniform geological composition, with Upper Triassic limestone predominating. There is some dolomite of the same age at the start of the path into the gorge. Lithologically, there are several variants of limestone, from massive grey limestone, siliconised or almost solid limestone to dense grey limestone, which often contains 'bulbs' of greyer or black chert. (Ramovš 1986). The gorge was gauged out to a depth of 50m by glacial outflows along tectonic cracks. Traces of the action of the glacial water are visible on the overhanging cliffs, natural bridges, in smaller tunnels, Pokljuka cave and on the rubbly, collapse ground, from which the disappearing stream Ribščica originates, which flows out into the Radovna. (Ramovš 1986, Skumavec & Skobrne 1995).

The soils on this carbonate base are basic eutric brown carbonate soils (calcocambisols), shallow to medium deep, in places there are rendzinas. In soils in depressions there are mosaic soils between rendzinas, which are scattered with flint-chert, and lithosols on rocks and boulders. The soils scattered with chert are more or less acidic. There is also greater acidity beneath the lithosols on limestone rocks and blocks, where a thin layer of raw humus accumulates. In the

»garden plots« are distric brown soils with an abundant admixture of sandy flint created from the cherts, which are moderately acid to neutral.

The mezo- and microclimatic, geological-lithological and soil conditions enable the varied flora and vegetation in Pokljuka Gorge.

FLORA

The flora and vegetation of the research area are defined by their phytogeographic position. The majority of Slovenia belongs to the Euro-Siberian-North American floral region. A particularity here is the Illyrian floral province, in which Pokljuka Gorge is classified. There are some southeast European-Illyrian species with narrower or wider distribution in this area. These are: *Anemone* x *pitonii*, *A. trifolia*, *Aposeris foetida*, *Cardamine ennaphyllos*, *C. trifolia*, *Galium laevigatum*, *Helleborus niger*, *Homogyne sylvestris*, *Knautia drymeia* ssp. *drymeia* in *Lamium orvala*. Additional southeast European species are more frequent and more widespread in large numbers than elsewhere in Europe, some of which are in Pokljuka Gorge: *Cardamine pentaphyllos*, *Chaerophyllum hirsutum*, *Peucedanum austriacum*, *Primula vulgaris in Stellaria montana*. Irrespective of POLDINI's (1991) phytogeographic division of flora, it is more or less justified to classify as southeast European species, with a hint of Illyrian, the species *Aruncus dioicus*, *Fraxinus ornus*, *Helleborus odorus*, *Ostrya carpinifolia* and *Saxifraga rotundifolia*, which also denote the Illyrian floral province. Pokljuka Gorge is located on the edge of the Julian Alps, which are the eastern part of the southeast limestone Alps, so it is placed in the southeast Alpine floral sector and, because it lies below the Alps, in the subalpine floral subsector and in the Julian Alps-West Karavanke-Kamnik Alps district (Zupančič et al. 1987). The already mentioned species *Anemone trifolia, Helleborus niger* and *Larix decidua* are characteristic of this district. We did not find the characteristic–endemic species *Pedicularis elongata* ssp. *julica* in Pokljuka Gorge. The sub-endemic species *Saxifraga burseriana* is important in Pokljuka Gorge for the mentioned district, which is widespread in the southeast Alpine region. The large settlement of the species *Saxifraga burseriana* in the cliffs below the entrance to Pokljuka cave is interesting. Even recently we thought (Skumavec & Zupančič 2014) that it is almost the only preserved site. The most recent data according to the FloVegSi database of the Biological Institute ZRC SAZU (T. Seliškar et al. 2003) state a number of locations in the Julian and Savinja Alps and Karavanke. There are 13 protected species. These are: *Cephalanthera damasonium*, *C. rubra*, *Convallaria majalis*, *Cyclamen purpurascens*, *Dactylorchiza maculata* ssp. *fuchsii*, *Dianthus hyssopifolius*, *Epipactis helleborine*, *Helleborus niger*, *H. odorus*, *Huperzia selago*, *Lycopodium annotinum*, *Neottia nidus avis* in *Primula auricula*. Forest and shrub communities supplement or confirm the designation of southeast Alpine phytogeographic position of Pokljuka Gorge in the context of the Illyrian floral province.

If we add to the above diagnostically important analysis for the phytogeographic determination of the research area also an analysis of other species according to Poldini (1991), it can be seen that psychrophilic Circumboreal, Mediterranean-Montane, Eurosiberian, Paleotemperate, Arctic–Alpine and Eastern Alpine geoelements are present in Pokljuka Gorge, with more than two fifths participation. We conceive Poldini's definition of Mediterranean-Montane elements as mountain elements under specific Mediterranean climatic influences, to which the Julian Alps are subject. These are a quarter of all those recorded. The presence of the enumerated geoelements confirms the cold climatic conditions. The other major group, with slightly over a third share, are European and Euroasian geoelements, which are generally widespread in the European temperate zone. A more detailed analysis of geoelements in Pokljuka Gorge is shown in Table 1.

The biological form of plants according to Raunkiaer indicates how a plant adapts to the environment in which it lives (thrives) or what sort of life capacity it has to survive the most unfavourable seasons (e.g., winter cold or summer drought). The biological spectrum, which is the relation between the biological forms, shows the ecological conditions in the area in question (habitat) (M. Wraber 1946). The biological spectrum of Pokljuka Gorge confirms that ecological conditions predominate here that are normal in the temperate belt. (Table 2). Below are stated a list of plants of Pokljuka Gorge based on their affiliation to families. The 262 plant taxons belong to 61 families.

Lycopodiaceae
Huperzia selago (L.) Mart.
Lycopodium annotinum L.

Equisetaceae
Equisetum sylvaticum L.

Hypolepidaceae
Pteridium aquilinum (L.) Kuhn

Thelypteridaceae
Phegopteris connectilis (Michx.) Watt
Thelypteris limbosperma (AU.) H. P. Fuchs

Aspleniaceae
Asplenium ruta-muraria L.
Asplenium trichomanes L. ssp. *quadrivalens (?)*
Asplenium trichomanes L. s. lat.
Asplenium viride Huds.
Phyllitis scolopendrium (L.) Newman

Athyriaceae
Athyrium filix-femina (L.) Roth
Cystopteris fragilis (L.) Bernh.
Matteucia struthiopteris (L.) Tod.

Aspidiaceae
Dryopteris affinis (Löve) Fraser-Jenkis
Dryopteris expansa (Presl.) Fraser-Jenkis & Jermy
Dryopteris filix-mas (L.) Schott
Gymnocarpium dryopteris (L.) Newman
Polystichum aculeatum (L.) Roth
Polystichum braunii (Spenn.) Fee
Polystichum lonchitis (L.) Roth

Blechnaceae
Blechnum spicant (L.) Roth

Polypodiaceae
Polypodium vulgare L.

Pinaceae
Alies alba Miller
Larix decidua Miller
Picea abies (L.) Karsten
Pinus sylvestris L.

Aristolochiaceae
Asarum europaeum L. ssp. *caucasicum* (Ducharte) Soó
Asarum europaeum L. ssp. *europaeum*

Ranunculaceae
Aconitum degenii Gayer ssp. *paniculatum* (Archang.) Mucher
Aconitum lycoctonum L. em. Koelle ssp. *ranunculifolium* (Rchb.) Schinz & Keller
Actaea spicata L.
Anemone nemorosa L.
Anemone trifolia L.
Caltha palustris L.
Clematis alpina (L.) Mill.
Clematis vitalba L.
Helleborus niger L.
Helleborus odorus Waldst. & Kit.
Hepatica nobilis Mill.
Ranunculus acris L. ssp. *acris*
Ranunculus lanuginosus L.
Thalictrum aquilegiifolium L.
Trollius europaeus L.

Papaveraceae
Chelidonium majus L.

Fumariaceae
Corydalis cava (L.) Schweiger & Koerte
Corydalis solida (L.) Clairv.

Caryophyllaceae
Dianthus hyssopifolius L.
Moehringia muscosa L.
Silene dioica (L. em. Mill.) Clairv.
Silene nutans (L.) Wibel. s. lat.
Stellaria montana Perrat
Stellaria nemorum L.

Polygonaceae
Rumex acetosa L.
Rumex alpestris Jacq.

Fagaceae
Fagus sylvatica L.
Quercus petraea (Matt.) Liebl.
Quercus robur L.

Betulaceae
Betula pendula Roth

Corylaceae
Corylus avellana L.

Carpinaceae
Ostrya carpinifolia Scop.

Juglandaceae
Juglans regia L.

Ulmaceae
Ulmus glabra Huds.

Urticaceae
Parietaria officinalis L.
Urtica dioica L.

Grossulariaceae
Ribes alpinum L.
Ribes uva-crispa L. ssp. *laciocarpum* Gaud. ex. Monn.

Crassulaceae
Sedum album L.

Saxifragaceae
Chrysosplenium alternifolium L.
Saxifraga burseriana L.
Saxifraga cuneifolia L.
Saxifraga rotundifolia L.

Rosaceae
Alchemilla sp. (?)
Aremonia agrimonioides (L.) DC.
Aruncus dioicus (Walter) Fernald
*Filipendula ulmaria (*L.*)* Maxim. s. lat.
Fragaria vesca L.
Geum urbanum L.
Potentilla caulescens L.
*Potentilla erecta (*L.*)* Raeusch.
Rosa pendulia L.
Rubus idaeus L.
Rubus plicatus Weiche & Nees
Rubus saxatilis L.
*Sorbus aria (*L.*)* Crantz.
Sorbus aucuparia L. ssp. *aucuparia*

Fabaceae
Genista tinctoria L.
Laburnum alpinum (Mill.) Presl.
*Lathyrus vernus (*L.*)* Bernh. ssp. *vernus*
Lotus corniculatus L. s. lat.
Trifolium campestre Schreb
Vicia cracca L.
Vicia oroboides Wulfen

Onagraceae
Circaea alpina L.
Circea x intermedia Ehrh.
Circaea lutetiana L.
Epilobium montanum L.

Aceraceae
Acer campestre L.
Acer platanoides L.
Acer pseudoplatanus L.

Oxalidaceae
Oxalis acetosella L.

Geraniaceae
Geranium phaeum L. s. lat.
Geranium robertianum L.

Balsaminaceae
Impatiens noli-tangere. L.

Polygalaceae
Polygala chamaebuxus L.

Rhamnaceae
Rhamnus catharticus L.
Rhamnus pumilus Turra

Santalaceae
Thesium bavarum Schrank

Euphorbiaceae
Euphorbia amygdaloides L.
Euphorbia cyparissias L.
Euphorbia dulcis L. ssp. *incompta* (Cesati) Nyman
Mercurialis perennis L.

Thymeleaceae
Daphne mezereum L.

Apiaceae
Aegopodium podagraria L.
Angelica sylvestris L.
Astrantia major L. s. lat.
Chaerophyllum aureum L.
Chaerophyllum hirsutum L.
Laserpitium siler L.
*Myrrhis odorata (*L.*) Scop.*
Peucedanum austriacum (Jacq.) Koch ssp. *rablense* (Wulfen) Schrank
Peucedanum schottii Bess.
*Peucedanum verticillare (*L.*)* Koch
Pimpinella saxifraga L.
Sanicula europaea L.

Hypericaceae
Hypericum montanum L.

Violaceae
Viola biflora L.
Viola reichenbachiana Jord. ex. Bureau

Cistaceae
*Helianthemum nummularium (*L.*)* Mill. ssp. *grandiflorum* (Scop.) Schinz & Thell

Brassicaceae
Arabis turrita L.
*Cardamine bulbifera (*L.*)* Crantz
*Cardamine enneaphyllos (*L.*)* Crantz
Cardamine impatiens L.
*Cardamine pentaphyllos (*L.*).* Crantz
Cardamine trifolia L.
Kernera saxatilis (L.) Rchb.
Lunaria rediviva L.

Salicaceae
Popolus tremula L.
Salix appendiculata L.
Salix caprea L.

Tiliaceae
Tilia cordata Mill.

Primulaceae
Cyclamen purpurascens Miller
Lysimachia vulgaris L.
Primula auricula L.
Primula vulgaris Hudson

Ericaceae
*Calluna vulgaris (*L.*)* Hull
Erica carnea L.
Vaccinium myrtillus L.
Vaccinium vitis-idaea L.

Pyrolaceae
[Moneses uniflora (L.) A. Gray*]*
*Orthylia secunda (*L.*)* House

Monotropaceae
Montropa hypophagea Walls.

Adoxaceae
Adoxa moschatellina L.

Sambucaceae
Sambucus ebulus L.
Sambucus nigra L.
Sambucus racemosa L.

Caprifoliacae
Lonicera alpigena L.
Lonicera xylosteum L.
Lonicera nigra L.

Valerianaceae
Valeriana tripteris L.

Dipsacaceae
Knautia drymeia Heufel ssp. *drymeia*
Scabiosa lucida Vill. s. lat.

Oleaceae
Fraxinus excelsior L.
Fraxinus ornus L.

Gentianaceae
Gentiana asclepiadea L.

Ascplepidiaceae
Vincetoxicum hirundinaria Medic.

Rubiaceae
Galim laevigatum L.
Galium mollugo L.
*Galium odoratum (*L.*)* Scop.
Galium L. sp. (?)

Solanaceae
Atropa bella-donna L.
Solanum dulcamara L.

Boraginaceae
Myosotis sylvatica (Ehrh.) Hoffm.
Pulmonaria officinalis L.
Symphytum tuberosum L. ssp. *tuberosum*

Scrophulariaceae
Digitalis grandiflora Miller
Lathraea squamaria L.
Melampyrum pratense L. ssp. *vulgatum* (Pers.) Ronninger
Melampyrum sylvaticum L. ssp. *sylvaticum*
Scrophularia nodosa L.
Veronica montana L.
Veronica officinalis L.
Veronica urticifolia Jacq.

Plantaginaceae
Plantago major L.

Lamiaceae
Ajuga reptans L.
Calamintha menthifolia Host.

Galeobdolon flavidum (F. Herm.) Holub
Galeopsis speciosa Mill.
Galeopsis pubescens Besser
Lamium orvala L.
Lamium maculatum L.
Prunella vulgaris L.
Salvia glutinosa L.
Thymus praecox Opiz ssp. *polytrichus* (Berb.) Jalas

Campanulaceae
Campanula cochlaeriifolia Lam.
Campanula patula L.
Campanula rapunculoides L.
Campanula scheuchzeri Vill.
Campanula trachelium L.
Phyteuma ovatum Honck
Phyteuma spicatum L. s. lat.

Asteraceae
Adenostyles glabra (Miller) DC
Arctium lappa L.
Aster bellidiastrum (L.) Scop.
Buphthalmum salicifolium L.
Carduus personata (L.) Jacq.
Cirsium Miller s. lat.
Cirsium erisithales (Jacq.) Scop.
*Cirsium oleraceum (*L.*)* Scop.
Cirsium vulgare (Savi)Tenore
Doronicum austriacum Jacq.
*Erigeron annus (*L.*)* Pers.
Eupatorium cannabinum L.
Hieracium murorum L.
Homogyne sylvestris Cass.
*Petasites albus (*L.*)* Gaertner
Petasites paradoxus (Retz.) Baumg.
Senecio ovatus (Gaertn., Mey. & Scherb.) Willd.
Solidago virgaurea L. ssp. *virgaurea*
Tussilago farfara L.

Cichoriaceae
*Aposeris foetida (*L.*).* Less.
*Mycelis muralis (*L.*)* Dumort
Prenanthes purpurea L.
Taraxacum officinale agg.

Trilliaceae
Paris qudrifolia L.

Convallariaceae
Convallaria majalis L.
Majanthemum bifolium L.
*Polygonatum verticillatum (*L.*)* All.

Melanthiaceae
Veratrum album L. s. lat.

Orhidaceae
Cephalanthera damasonium (Mill.) Druce
*Cephalanthera rubra (*L.*)* L. C. Rich.
*Dactylorhiza maculata (*L.*)* Soó ssp. fuchsii (Druce) Hyl.
Epipactis atrorubens (Hoffm.ex Bernk.) Besser
*Epipactis helleborine (*L.*)* Crantz s. lat.
*Neottia nidus-avis (*L.*)* Rich.

Juncaceae
Luzula luzuloides (Lam.) Dandy & Wilmott s. lat.
*Luzula pilosa (*L.*)* Wild.

Cyperaceae
Carex alba Scop.
Carex branchystashys Schrank & Moll.
Carex digitata L.
Carex sylvatica Huds.

Poaceae
Brachypodium rupestre (Host.) Roem & Schult.
Brachypodium sylvaticum (Huds.) PB.
*Calamagrostis arundinacea (*L.*)* Roth
Calamagrostis varia (Schrad.) Host
Calamagrostis villosa (Chaixex ex VilL.) J. F. Gmel.
Dactylis glomerata L.
*Deschampsia flexuosa (*L.*)* Trin.
*Deschampsia caespitosa (*L.*)* P. Beauv.
Festuca altissima All.
*Festuca gigantea (*L.*)* Vill.
Melica nutans L.
Milium effusum L.
Sesleria caerulea (L.) Ard. ssp. *calcaria* (Opiz) Čelak ex Hegi

Table 1: Geoelements according to Poldini (1991)

Geoelement	Number	%
European	59	22,5
Circumboreal	38	14,5
Euroasian	38	14,5
Mediterranean-montane	34	13,0
Eurosiberian	22	8,4
Paleotemperate	15	5,7
Cosmopolitan	11	4,2
Northern Illyrian	7	2,7
Arctic-Alpine	5	1,9
Southern Illyrian	4	1,5
Southeast European	9	3,4
European-Mediterranean	4	1,5
Pontic	5	1,9
Mediterranean-Pontic	3	1,1
Endemic	2	0,8
Eastern Alpine	2	0,8
Mediterranean-Atlantic	2	0,8
Adventitious species	2	0,8
TOTAL	262	100,0

Table 2: Biological forms according to Raunkiaer (M. Wraber 1946)

Biological form	Number	%
Phanerophytes	42	16,0
Chamaephytes	19	7,3
Hemicryptophytes	132	50,4
Geophytes	61	23,2
Therophytes	8	3,1
TOTAL	262	100,0

VEGETATION

Despite the small area of Pokljuka Gorge, 5 forest and 1 shrub association thrive in it. The largest area is occupied by the associations *Anemono trifoliae-Fagetum* var. geogr. *Helleborus niger*; all other associations *Homogyno sylvestris-Fagetum*, *Mastigobryo-Piceetum* var. geogr. *Anemone trifolia*, *Corydalido cavae-Aceretum* var. geogr. *Dentaria enneaphyllos* and *Fraxino orni-Ostryetum carpinifoliae* grow on smaller areas. The association *Rhytidiadelpho lorei-Piceetum* is only fragmentarily developed. The association *Anemono-Fagetum* var. geogr. *Helleborus niger, Homogyno-Fagetum*, *Corydalido-Aceretum* var. geogr. *Dentaria enneaphyllos* and *Fraxino-Ostryetum* are placed into the class of mesophilous deciduous forests on eutric soils of the class *Querco-Fagetea*. We classify them variously into orders and alliances, the first three phytocenoses into

the order of mesophilous beech forests *Fagetalia sylvaticae* and the last *Fraxino-Ostryetum* into the order of thermophilous oak forests *Quercetalia pubescentis*. Classification into alliances is more complicated. We classify the associations *Anemono-Fagetum* var. geogr. *Helleborus niger, Homogyno-Fagetum* and *Corydalido--Aceretum* var. geogr. *Dentaria enneaphyllos* in the Illyrian alliance of beech forests *Aremonio-Fagion*. Southeast European-Illyrian, southeast European and southeast Alpine species are classified into them.

Šilc & Čarni (2012), on the example of some European associations, classify the phytocenosis *Corydalido-Aceretum* into the alliance *Tilio-Acerion* and order *Aceretalia pseudoplatani*. We are of the opinion that the mentioned alliance and order are not supported by diagnostically important species for them but only with generally widespread Central European species of beech forests from the order *Fagetalia sylvaticae* s. lat. (Zupančič 1996). We classify the shrub community *Fraxino-Ostryetum* into the Illyrian-Balkan alliance of thermophilous continental thermophilous forests of oak and hop hornbeam *Fraxino orni-Ostryion carpinifoliae*. We classify the spruce associations *Rhytidiadelpho lorei-Piceeetum* and *Mastigobryo-Piceeetum* into the class of Holarctic coniferous forests of the Eurosiberian-North American region, *Vaccinio-Piceetea*, the order of Euroasian boreo-montane coniferous forests *Vaccinio-Piceetalia* (*Piceetalia excelsae*) and the alliance of European boreo-montane coniferous forests *Vaccinio-Piceion* (*Piceion excelsae*).

ANEMONO TRIFOLIAE-FAGETUM Tregubov 1962 var. geogr. *HELLEBORUS NIGER* Marinček, Poldini & Zupančič 1989

The association *Anemono trifoliae-Fagetum* was first mentioned in print in 1957, without the publication of a phytocenological table (Tregubov 1957 a, b). It was reasoned with a phytocenological table in 1962 (Tregubov 1962). In both publications, Tregubov envisaged the following characteristic species for the association *Anemono-Fagetum*: *Anemone trifolia*, *Cyclamen purpurascens*, *Hepatica nobilis* and *Helleborus niger.* M. Wraber (1959) was of similar thinking about the association, but additionally articulated the phytocenosis into lower sinsystematic units – sub-associations. In a paper on the vegetation of Triglav National Park, the authors (Marinček et al. 1983) doubted the correctness of Tregubov's (1957 a, b, 1962) choice of characteristic species and designated them relative characteristic species. Marinček (1983), in his book Bukovi gozdovi na Slovenskem (Beech Forests in Slovenia), speaks in general about the phytocenosis *Anemono-Fagetum* but does not mention its possible characteristic or differential species. The findings of the phytocenologists Poldini from Italy and Zukrigle from Austria that the association *Anemono-Fagetum* or its similar in southern Austria probably thrives in northern Italy, dictated joint research, the result of which was published in Marinček et al. (1989). Comparisons showed that Trebugov's chosen characteristic species do not correspond. We have proposed the species *Anemone trifolia* as a relative characteristic species of the wider phytogeographic region and added the distinguishing species *Picea abies, Larix decidua, Vaccinium myrtillus, V. vitis--idaea* and *Carex alba* and, as further relative characteristic species, *Saxifraga rotundifolia*, *Ranunculus plantanifolius*, *Adenostyles glabra* and *Polygonatum verticillatum*, which are constants in altimontane and subalpine beech forests. In a paper (Marinček et al. 1989), we divided the association *Anemono-Fagetum* into two geographic variants. In the east of the area of distribution of the association is the geographic variant with the species *Helleborus niger*, and in the southwest that with the species *Luzula nivea*. Synthesis of altimontane beech forests of the alliance *Aremonio-Fagion* (Zupančič 2012) showed that the species *Polygala chamaebuxus* and *Orthilia secunda* and the distinguishing species *Picea abies* and *Larix decidua* must be considered as characteristics of the association *Anemono-Fagetum*.

A geographic variant *Anemono trifoliae-Fagetum* var. geogr. *Helleborus niger* is widespread in Pokljuka Gorge. In the associations are represented the relative characteristic species *Anemone trifolia*, the distinguishing species *Picea abies* and *Larix decidua* and the relative distinguishing species *Saxifraga rotundifolia* and *Polygonatum verticillatum*. The association grows over the majority of steep slopes of the gorge, where there are eutric shallow, skeletal carbonate brown soils or rendzinas on limestone or dolomite. The area on dolomite is more or less smooth, but on limestone broken, sometimes more rocky, so similar to ecological conditions that have already been described in previously mentioned papers (Tregubov 1957 a, b, 1962, M. Wraber 1960, Marinček et al. 1989). We add a phytocenological relevé »*in situ*«.

Relevé 1

Anemono-Fagetum var. geogr. *Helleborus niger cephalantheretosum*

Altitude: 660 m, exposure: N, inclination: 40 °, soil: brown carbonate soils, geological base: dolomite.

I: I = 80, II = 10, III = 50, IV = 10

I: *Fagus sylvatica* 4.3, *Picea abies* 3.2, *Larix decidua* +.

II*: Fagus sylvatica 2.3, Acer campestre* +, *A. platanoides* +, *Acer pseudoplatanus* +, *Clematis vitalba* +, *Corylus avellana* +, *Fraxinus excelsior* +, *Lonicera nigra* +, *Rubus idaeus* +, *Sambucus nigra* +, *Ulmus glabra* +.

III: *Anemone trifolia* 2.2, *Oxalis acetosella* 2.2, *Stellaria montana* 1.2, *Acer pseudoplatanus* 1.1, *Cardamine trifolia* 1.1, *Galeobdolon flavidum* 1.1, *Homogyne sylvestris* 1.1, *Prenanthes purpurea* 1.1, *Veronica urticifolia* 1.1, *Viola reichenbachiana* 1.1, *Actaea spicata* +.2, *Asarum europaeum* +.2, *Gymnocarpium dryopteris* +.2, *Hepatica nobilis* +.2, *Lunaria rediviva* +.2, *Mercurialis perennis* +.2, *Saxifraga cuneifolia* +.2, *S. rotundifolia* +.2, *Adoxa moschatellina* +, *Ajuga reptans* +, *Aremonia agrimonioides* +, *Aruncus dioicus* +, *Athyrium filix-femina* +, *Asplenium trihomanes* ssp. *trichomanes* +, *A. viride* +, *Campanula trachelium* +, *Cardamine bulbifera* +, *C. enneaphyllos* +, *Cephalanthera rubra* +, *Chaerophyllum hirsutum* +, *Cyclamen purpurascens* +, *Cystopteris fragilis* +, *Dactylorhiza maculata* ssp. *fuchsii* +, *Dryopteris filix-mas* +, *Epilobium montanum* +, *Euphorbia amygdaloides* +, *Euphorbia dulcis* ssp. *incompta* +, *Fagus sylvatica* +, *Geranium robertianum* +, *Geum urbanum* +, *Helleborus niger* +, *Lamium orvala* +, *Maianthemum bifolium* +, *Milium effusum* +, *Myosotis sylvatica* +, *Paris quadrifolia* +, *Petasites albus* +, *Phegopteris connectilis* +, *Phyllitis scolopendrium* +, *Picea abies* +, *Polygonatum verticillatum* +, *Polypodium vulgare* +, *Polystichum aculeatum* +, *Primula vulgaris* +, *Pulmonaria officinalis* +, *Ranunculus lanuginosus* +, *Salvia glutinosa* +, *Senecio ovatus* +, *Scrophularia nodosa* +, *Ulmus scabra* +, *Valeriana tripteris* +, *Vicia oroboides* +.

IV*: Isothecium mysuroides* 1.4, *Euhrynchium zetterstedtii* 1.3, *Neckera crispa* +.4, *Ctenidium molluscum* +.2, *Lobaria pulmonaria, Minum undulatum* +.

The relevé is defined by the lowland thermophilous sub-association of cephalanthera of the north-eastern geographic variant with black hellebore of alpine forest of beech and three-leaved anemone – *Anemono-Fagetum* Tregubov 1956 var. geogr. *Helleborus niger* Marinček, Poldini & Zupančič 1988 *cephalantheretosum* Marinček, Poldini & Zupančič 1988.

HOMOGYNO SYLVESTRIS-FAGETUM Marinček et al. 1993

The Dinarid phytocenosis of fir and beech was first described in Slovenia as the association *Abieti-Fagetum dinaricum* (Tregubov 1957 c), derived from the association of I. Horvat (1938) *Fagetum silvaticae croaticum australe abietetosum*. Tregubov (1957 a, b) later observed an individual smaller core of pre-alpine fir-beech forest on limestone in the Karavanke and designated it the phytocenosis *Abieti-Fagetum homogynetosum sylvestris*. M. Wraber (1960) describes a south-eastern Alpine forest of beech and fir – *Abieti-Fagetum austroalpinum* - in the pre-Alpine/Alpine region as a geographic variant of Central European fir-beech forest (J. & M. Bartsch 1940). Marinček (1987), in his monograph on beech forests, draws attention in the description of pre-Alpine forest of beech and fir – *Abieti-Fagetum praealpinum* – to »a fairly numerous group of Illyrian plant species, which indicate an Illyrian character of pre-Alpine beech forests with fir«. A year later, Marinček & Dakskobler (1988) in a paper on acidophilous beech forests of the pre-Alpine world of Slovenia demonstrate with phytocenological tables a new acidophilous fir-beech association *Luzulo-Abieti-Fagetum praealpinum* with three sub-associations: *typicum*, *galietosum rotundifolii* and *lamietosum orvalae*. According to adopted Codices (Barkman et al. 1976, 1986, Weber et al. 2000) the name of the association was invalid. On the basis of phytocenological tables, the authors determined distinguishing species for the association, to wit: *Abies alba*, *Adenostyles glabra*, *Anemone trifolia*, *Festuca altissima*, *Polygonatum verticillatum*, *Ranunculus platanifolius* and *Veronica urticifolia*. In a synthesis paper by Marinček et al. (1992, published 1993), the authors proposed that the pre-Alpine fir-beech forest be called after the southeast European-Illyrian species *Homogyne sylvestris*, namely *Homogyno-Fagetum*; for the nomenclature type they took relevé number 16 from Table 3 in the paper by Marinček & Dakskobler (1988), which is in accordance with the aforementioned Codices. In research of fir-beech forests of north-western Slovenia in the region of the southern Julian Alps, Dakskobler (2002 a, 2002 b, 2009) determined more exactly characteristic and distinguishing species of the association *Homogyno sylvestris-Fagetum*, which in the previous paper he had only defined as distinguishing species, although only three of them, i.e., the species *Abies alba*, *Adenostyles glabra* and *Veronica urticifolia*. Instead of the other previous ones, he added the species *Asplenium viride*, *Homogyne sylvestris* and *Saxifraga cuneifolia*, which are more acceptable for recognising the association *Homogyno-Fagetum*.

There are smaller areas of pre-Alpine fir-beech forest *Homogyne-Fagetum* in the area of Pokljuka Gorge, on its upper western edge, from whence it spreads towards Zatrnik and Stara Pokljuka and onwards to the Pokljuka plateau. Ecological conditions are similar to those described in the publications of Tregubov (1957), M. Wraber (1960), Marinček (1987), Marinček & Dakskobler (1988) and Dakskobler (2002 a, 2002 b, 2009). Upper Triassic limestone predominates

on the site of pre-Alpine fir-beech forest, where there are shallow to medium deep carbonate brown soils. The relief is broken, partially rocky, here and there level, where the humus horizon is slightly acidic because of the appearance of crumbled chert in the soils. Fir is rarer than in similar, more optimal conditions and a significant amount has been felled. Unfortunately, there is too much management in this part of the forest. In addition to fir, of other distinguishing species are also present *Veronica urticifolia*, *Asplenium viride*, *Homogyne sylvestris* and *Saxifraga cuneifoli*a. On the mixed silicaceous-limestone geological base, where there are acidic brown soils on cherts, an acidophilous variant of the association appears, *Homogyno-Fagetum* var. *Calamagrostis arundinacea* var. nova. We envisage the following distinguishing species for the variant: *Calamagrostis arundinacea*, *Lycopodium annotinum* and *Huperzia selago*. The holotype of the variant is the submitted phytocenological relevé 3. The edge of Pokljuka Gorge is part of a natural monument, in which management is restricted or even undesired. For illustration of the association *Homogyno-Fagetum* in Pokljuka Gorge, we add phytocenological relevés 2 and 3.

Relevé 2

Homogyno sylvestris-Fagetum

Altitude: 860 m, eksposure: N, inclination: 30 °, soil: brown carbonate soils, geological base: limestone, stoniness: 40 %.

I = 80, II = 0, III = 30, IV = 40

I: *Fagus sylvatica* 2.2, *Picea abies* 2.2, *Abies alba* 2.1, *Acer pseudoplatanus* 1.2, *Betula pendula* +, *Larix decidua* +, *Populus tremula* +.

II: *Abies alba* +, *Acer pseudoplatanus* +, *Corylus avellana* +, *Daphne mezereum* +, *Fagus sylvatica* +, *Fraxinus ornus* +, *Laburnum alpinum* +, *Lonicera alpigena* +, *Lonicera nigra* +, *Populus tremula* +, *Rosa pendulina* +, *Rubus idaeus* +, *Rubus saxatilis* +, *Sorbus aria* +, *Sorbus aucuparia* +, *Ulmus glabra* +.

III: *Anemone trifolia* 3.2, *Homogyne sylvestris* 1.2, *Oxalis acetosella* 1.2, *Polygonatum verticillatum* 1.2, *Abies alba* 1.1, *Calamagrostis varia* 1.1, *Veronica urticifolia* 1.2, *Cyclamen purpurascens* + .2, *Hieracium murorum* + .2, *Saxifraga cuneifolia* +, *Valeriana tripteris* +, *Acer pseudoplatanus* +, *Adoxa moschatellina* +, *Aruncus dioicus* +, *Asplenium trihomanes* +, *A. viride* +, *Athyrium filix-femina* +, *Campanula trachelium* +, *Carex digitata* +, *Cardamine trifolia* +, *Cirsium erisithales* +, *Digitalis grandiflora* +, *Dryopteris filix-mas* +, *Galium laevigatum* +, *Gentiana asclepiadea* +, *Huperzia selago* +, *Hypericum montanum* +, *Laburnum alpinum* +, *Maiantemum bifolium* +, *Mercurialis perennis* +, *Mycelis muralis* +, *Phegopteris connectilis* +, *Phyteuma ovatum* +, *Picea abies* +, *Polypodium vulgare* +, *Prenanthes purpurea* +, *Scrophularia nodosa* +, *Sorbus aucuparia* ssp. *aucuparia*, +, *Veronica montana* +, *Viola reichenbachiana* +.

IV: *Ctenidium molluscum* 5.3, *Isothecium mysuroides* 1.2, *Hylocomium splendens* +.3, *Bazzania trilobata* +.2, *Euhrynchium zetterstedtii* +.2, *Fissidens taxifolius* +.2, *Mnium s*p. (?)+.2, *Neckera crispa* +.2, *Peltigera leucophlebia* +.2, *Plagiochila asplenioides* +.2, *Polytrichum formosum* +.2, *Rhytidiadelphus triquetrus* +.2, *Cladonia pyxydata* +, *Dicranum scoparium* +.

Relevé 3

Homogyno sylvestris-Fagetum var. *Calamagrostis arundinacea*

Altitude: 850 m, exposure: N, inclination: 25 °, soil: acid brown soil on chert, geological base: limestone/chert, stoniness: 0 %,

I = 60, II = 20, III = 30, IV = 5

I: *Fagus sylvatica* 2.2, *Abies alba* 1.1, *Picea abies* +.2, *Laburnum alpinum* +

II: *Fagus sylvatica* 2.2, *Lonicera nigra* +.2, *Betula pendula* +, *Picea abies* +.2, *Corylus avellana* +, *Daphne mezereum* +, *Laburnum alpinum* +, *Picea abies* +, *Sorbus aria* +, *S. aucuparia* ssp. *aucuparia* +, *Rosa pendulina* +, *Rubus saxatilis* +.

III: *Calamagrostis arundinacea* 2.2, *Vaccinium myrtillus* 1.2, *Anemone trifolia* + .2, *Galium laevigatum* + .2, *Homogyne sylvestris* + .2, *Luzula luzuloides* + .2, *Lycopodium annotinum* + .2, *Phegopteris connectilis* +, .2, *Abies alba* +, *Acer pseudoplatanus* +, *Ajuga reptans* +, *Campanula trachelium* +, *Cyclamen purpurascens* +, *Dryopteris filix-mas* +, *D. expansa* (*D. assimilis*) +, *Fagus sylvatica* +, *Fragaria vesca* +, *Gentiana asclepiadea* +, *Hepatica nobilis* +, *Hieracium murorum* +, *Huperzia selago* +, *Oxalis acetosella* +, *Picea abies* +, *Polygonatum verticillatum* +, *Prenanthes purpurea* +, *Solidago virgaurea* +, *Valeriana tripteris* +, *Veronica urticifolia* +,

IV: *Ctenidium molluscum* 1.2, *Bazzania trilobata* +.3, *Hylocomium splendes* +.3, *Isothecium mysuroides* +.3, *Plagiochila asplenioides* +.2, *Polytrichum formosum* +.2, *Tortella tortuosa* +.2, *Cladonia pyxydata* +, *Cladonia squamosa* +, *Dicranum scoparium* +.

CORYDALIDO CAVAE-ACERETUM PSUEDOPLATANI Moor 1938 var. geogr. *DENTARIA ENNEAPHYLLOS* Zupančič 1996

The »garden plots« of Pokljuka Gorge are settled by an Illyrian variant of the Central European sycamore

maple forest *Corydalido cavae-Aceretum pseudoplatani* var. geogr. *Dentaria enneaphyllos*. Habitats are fragmentary, individual ones cover around 0.5 ha. Of characteristic species of Central European phytocenoses, *Corydalis cava*, *C. solida* and *Lathraea squamaria* are represented. Distinguishing species for the Illyrian variant are the south-eastern European-Illyrian species *Anemone trifolia*, *Cardamine ennephyllos, C. trifolia* and *Saxifraga rotundifolia*. A particularity of habitats of this geographic variant is the flourishing growth of the circumboreal species *Matteucia struthiopteris*, because of which we decided to form a sub-association according to it *Corydalido cavae-Aceretum psuedoplatani* Moor 1938 var. geogr. *Dentaria enneaphyllos matteucietosum* (Zupančič 1996). Because of ill-considered anthropogenic interventions in the »garden plots« and thus thinning of the tree layer, exposure to sun has affected the abundant growth of the shade loving species *Matteucia struthiopteris* and enabled the luxurious growth of ruderal species such as *Urtica dioica*, *Chaerophyllum hirsutum*, *Filipendula ulmaria*, *Lysimachia nemorum*, *Cirsium* sp. etc. (Skumavec & Zupančič 2014).

There are favourable conditions in Pokljuka Gorge for the growth of the sycamore maple association, since cold and humid air predominates here and there are slightly acid brown soils on limestone intermixed to a significant extent with chert. Under these ecological conditions, the semi-psychrophilic association of sycamore maple (Zupančič 1996), has become successfully established. In a paper by Zupančič (1996), the sycamore maple phytocenosis in two »garden plots« was described when the vegetation was in a more or less optimal state. For orientation, we add the diagnostically important species of the geographical variant *Corydalido-Aceretum* var. *Dentaria ennaphyllos*, which are: *Corydalis cava* 2^2, *C. solida* 2^2, *Lathraea squamaria* 1^+, *Cardamine ennephyllos* 2^+, *C. trifolia* 1^1, *Anemone trifolia* 1^+, *Saxifraga rotundifolia* 1^+, *Matteucia struthiopteris* 2^{2-3}.

FRAXINO ORNI-OSTRYETUM CARPINIFOLIAE Aichinger 1933

The shrub association *Fraxino-Ostryetum* was described by the Austrian phytocenologist Aichinger in the Austrian and partly also Slovene region of the Karavanke (Aichinger 1933). He originally called the association *Ostrya carpinifolia-Fraxinus ornus*. He classified it phytogeographically in the Illyrian floral province, although there is no trace in it of more than two southeast European-Illyrian species: *Anemone trifolia* and *Cyclamen purpurascens* – and some more widespread species that we formerly classified there, i.e., *Fraxinus ornus*, *Ostrya carpinifolia* and *Pinus nigra*. The association occupies extreme habitats on limestone, where the soils are skeletal rendzinas. In Slovenia the association was first recognised by the phytocenologists Tregubov (1957) and M. Wraber (1960) and they briefly described it in their contributions. Later there followed a further brief description by the authors of the report on the vegetation of Triglav National Park (Marinček et al. 1983). In the report are first described the characteristic and distinguishing species of the association, to wit *Erica carnea*, *Calamagrostis varia*, *Polygala chamaebuxus* and *Sesleria caerulea* s. lat. Aichinger (1933) in his monograph on the vegetation of the Karavanke did not explicitly state its characteristic and distinguishing species but only gave a wide choice of 18 types of plant combination.

Dakskobler (2015) recently performed a revision of associations of hop hornbeam and manna ash in the area of the Julian Alps and northern part of the Dinarid Massif (including the area of northern Italy). He compared them with similar associations in Austria and Croatia. He came to the conclusion that the associations differ among themselves and, on the basis of synthesis tables, showed that the following are diagnostic species of the association *Fraxino orni-Ostryetum* Aichinger 1933: *Campanula caespitosa, Primula auricula, Hieracium porrifolium, Asperula aristata, Allium ericetorum, Paederota lutea, Betonica alopecuros, Rhamnus fallax, Picea abies, Anemone trofolia, Valeriana tripteris, Salix glabra, S. appediculata, Rosa pendulina, Laburnum alpinum, Phyteuma orbiculare, Campanula carnica, Galium purpureum, Euphrasia cuspidata, Rhododendron hirsutum, Festuca calva, Saxifraga crustata, S. hostii, Potentilla caulescens, Aconitum angustifolium, Seslaria caerulea* ssp. *calcaria*. The following of the diagnostic species are present in our association: *Anemone trifolia*, *Laburnum alpinum*, *Pica abies*; *Sesleria caerulea* ssp. *calcaria*, (*Potentilla caulescens*). The cause of the impoverishment of diagnostic species is the smallness of the object, since the association is more or less fragmentarily developed.

The association *Fraxino-Ostryetum* appears in Pokljuka Gorge above Pokljuka cave. It occupies the steeply precipitous southeast slope that transitions into the cliff above Pokljuka Gorge. The soils on the limestone or dolomite base are shallow rendzinas, which become lithosols in the cliff. Hop hornbeam above manna ash predominates in the shrub layer. There are individual small shrubs of the mentioned shrub species on the cliff. Phytocenological relevé 4 provides the following image of this shrub vegetation.

Relevé 4

Fraxino orni-Ostryetum carpinifoliae

Altitude: 750 m, eksposure: E, inclination: 75 - 90 °, soil: rendzina, geological base: dolomitized limestone, stoniness: 10 %

I = 20, II = 100, III = 80, IV = 5,

I: *Ostrya carpinifolia* 1.2, *Fraxinus ornus* 1.1, *Betula pendula* +, *Fagus sylvatica* +, *Laburnum alpinum* +, *Picea abies* +, *Sorbus aria* +.

II: *Ostrya carpinifolia* 3.2, *Fraxinus ornus 2*.2, *Quercus petraea* 1.1, *Sorbus aria* 1.1, *Acer platanoides* +, *Daphne mezereum* +, *Fagus sylvatica* +, *Laburnum alpinum* +, *Picea abies* +, *Populus tremula* +, *Quercus robur* +, *Sorbus aucuparia* ssp. *aucuparia* +.

III: *Melampyrum pratense* ssp. *vulgatum* 3.4, *Calamagrostis varia* 2.2, *Peucedanum schottii* 1.1, *Carex alba* +, *Convallaria majalis* +, *Carex digitata* +, *Genista tinctoria* +.2, *Peucedanum austriacum* ssp. *rablense* +.-2 , *Polygala chamaebuxus* +, *Polypodium vulgare* +.2 +, *Sesleria caerulea* ssp. *calcaria* +.2, *Thymus praecox* s. lat. +.2, *Acer pseudoplatanus* +, *Anemone trifolia* +, *Arabis turrita, Asplenium ruta- muraria* +, *A. trichomanes* ssp. *trichomanes* +, *A. viride* +, *Buphthalmum salicifolium* +, *Campanul*a *persicifolia* +, *C. rapuncoloides* +, *Cirsium erisithales* +, *Conzya canadensis* +, *Cyclamen purpurascens* +, *Dianthus hyssopifolius* +, *Digitalis grandiflora* +, *Epipactis atrorubens* +, *Erica carnea* +, *Euphorbia amygdaloides* +, *E. cyparissias* +, *Fragaria vesca* +, *Galium laevigatum* +, *Hieracium murorum* +, *Knautia drymeia* ssp. *drymeia* +, *Laburnum alpinum* +, *Lathyrus pratensis* +, *Lotus corniculatus* +, *Melittis melysophyllum* +, *Moehringia muscosa* +, *Oryganum vulgare* +, *Picea abies* +, *Pimpinella saxifraga* +, *Primula vulgaris* +, *Pteridium aquilinum* +, *Scabiosa lucida* +, *Silene nutans* +, *Solidago virgaurea* +, *Sorbus aucuparia* ssp. *aucuparia* +, *Thesium bavarum* +, *Veronica urticifolia* +, *Vicia cracca* +, *Vincetoxicum hirundinaria* +, *Viola reichenbachiana* +, *Vaccinium myrtillus* +°.

IV: *Ctenidium molluscum* 1.2, *Homalothecium philippeanum* +.3, *Grimmia pulvinata* +.2, *Isothecium mysuroides* +.2, *Neckera crispa* +.2.

RHYTIDIADELPHO LOREI-PICEETUM Zupančič 1981 em. 1999

M. Wraber (1953) was the first to draw attention to the spruce association in question. His description was general, without evidentiary material – phytocenological tables. He also behaved similarly later (M. Wraber 1960). He was uncertain in his descriptions whether the spruce phytocenosis with the moss *Rhytidiadelphus loreus* was an independent association or only a sub-association of some other association with the species *Luzula sylvatica* subsp. *sylvatica*, which at that time had not been validly described (*Luzulo sylvaticae-Piceetum* M. Wraber 1963). Research of spruce forests of Slovenia by Zupančič showed that the spruce phytocenosis with the moss *Rhytidiadelphus loreus* is an independent association. Zupančič (1980) first presented it in a synthesis table comparatively with other European spruce association. It was validly presented for a second time in a paper by Culiberg, Šercelj & Zupančič (1981). Zupančič (1999) finally formed it in a monograph on spruce forests of Slovenia. The characteristic species of the association are *Dicranum polysetum*, *Rhytidiadelphus loreus* and *Thelypteris limbosperma*. In addition to characteristic species, we chose a further group of mosses and lichens that characteristically mark the phytocenosis *Rhytidiadelpho-Piceetum,* with an average 70 % cover of the habitat. These are: *Bazzania trilobata, Cetraria islandica, Cladonia pyxidata, C. rangiferina, Fissidens taxifilius, Hylocomium splendens, Leucobrium glaucum, Mylia taylori, Plagiochila aspleniodies* var. *major, Plagiothecium neglectum, P. undulatum, Pleurozium schreberi, Polytrichum formosum, Rhytidiadelphus triquetrus, Scapania nemorosa* and *Tortella tortuosa*. The association *Rhytidialpho-Piceetum* normally grows on distric acid brown soils on silicate, and on Pokljuka, unagglutinated moraine with chert of Quaternary age.

In Pokljuka Gorge there are moderately acid brown soils on a limestone base, intermixed with a considerable quantity of crumbled chert. The described soils, with boulders and rocks and with temperature inversion, are only suitable for the development of spruce forest. These ecological conditions enable the growth of beech, although on small areas of only a few are, or it appears only here or there, visibly feeble. There are two fragments of spruce forest in Pokljuka Gorge in which, of the characteristic species, there is only the moss *Rhytidialphus loreus* on very small areas. Other mosses achieve greater cover values, as is evident from phytocenological relevé 5, the majority being acidophilous which characteristically ecologically mark piceetal habitats. In addition to acidophilous mosses, tubulous flowers from the class *Vaccinio-Piceetea* are fairly numerous. The phytocenological relevé shows the selection of plants.

Relevé 5

Rhytidiadelpho lorei-Piceetum

Altitude: 680 m, exposure: N, slope: 35 °, stoniness: 80 % fallen boulders and rocks, soils: rendzinas, lithosols, geological base: limestone with chert

I = 60, II = 10, III = 50, IV = 80

I: *Picea abies* 3.3, *Fagus sylvatica* +, *Larix decidua* +

II: *Lonicera nigra* 2.2, *Clematis alpina* 1.2, *Picea abies* +.2, *Fagus sylvatica* +, *Fraxinus ornus* +, *Laburnum alpinum* +, *Lonicera alpigena* +, *Ostrya carpinifolia* +, *Rosa pendulina* +, *Rubus idaeus* +, *R. saxatilis* +, *Sorbus aucuparia* ssp. *aucuparia* +, *Ulmus glabra* +.

III: *Homogyne sylvestris* 2.2, *Gymnocaripium dryopteris* 1.2, *Oxalis acetosela* 1.2, *Polypodium vulgare* 1.2, *Valeriana tripteris* 1.2, *Veronica urticifolia* 1.2, *Lycopodium annotinum* +.3, *Adenostyleds glabra* +.2, *Asplenium trihomanes* ssp. *quadrivalens (?)* +.2, *Calamagrostis arundinacea* +.2, *C. villosa* +.2, *Carex digitata* +.2, *Cystopteris fragilis* +.2, *Dryopteris filix-mas* +.2, *Festuca altissima* +.2, *Luzula luzuloides* +.2, *Saxifraga cuneifolia* +.2, *Vaccinium myrtllus* +.2, *Acer platanoides* +, *A. pseudoplatanus* +, *Actea spicata* +, *Adoxa moschatellina* +, *Anemone trifolia* +, *Aruncus dioicus* +, *Athyrium filix-femina* +, *Campanula cochlaeriifolia* +, *Cardamine pentaphyllos* +, *C. trifolia* +, *Cephalanthera damasonium* +, *Circaea lutetiana* +, *Cirsium erisithales* +, *Cyclamen purpurascens* +, *Dryopteris expansa*, *Epilobium montanum* +, *Fagus sylvatica* +, *Galeobdolon flavidum* +, *Galium leavigatum* +, *Hieracium murorum* +, *Melampyrum sylvaticum* +, *Mercurialis perennis* +, *Myosotis sylvatica* +, *Petasites albus* +, *Phyllitis scolopendrium* +, *Phyteuma ovatum* +, *Picea abies* +, *Polystichum aculeatum* +, *Prenanthes purpurea* +, *Sanicula europaea* +, *Saxifraga cuneifolia* +, *Senecio ovatus* +, *Solidago virgaurea* +, *Sorbus aucuparia* s. lat. +, *Symphytum tuberosum* +., *Ulmus glabra* +, *Viola reichenbachiana*.

IV: *Isothecium mysuroides* 3.5, *Eurhynchium zetterstedtii* 2.4, *Hylocomium splendes* 2.4, *Minum undulatum* 1.4, *Plagiochila asplenioides* 1.3, *Rhytidiadelphus triquetrus* 1.3, *Ctenidium molluscum* +.3, *Fissdens taxifolius* +.3, *Mnium spinosum* (?)+.3, *M. punctatum* +.2, *Metzgeria furcata* +.2, *Neckera crispa* +.2, *Plagiothecium undulatum* +.2, *Polytrichum formosum* +.2, *Bazzania trilobata* +, *Cladonia rangiferina* +, *Dicranum scoparium* +, *Peltigera leucophlebia* +, *Rhytidiadelphus loreus* +.

A few years ago, we recorded some specimens of the north-eastern Eurasian-Circumpolar species *Moneses uniflora* on this habitat. We have no longer found this species recently. They were probably picked by visitors to whom we showed them on natural history excursions.

MASTIGOBRYO-PICEETUM (Schmidt & Gaisberg 1936) Br.-Bl. & Sissingh in Br.-Bl. et al. 1939 corr. Zupančič 1999 var. geogr. *ANEMONE TRIFOLIA* var. geogr. nova

German phytocenologists have for the most part been involved in research of the Central European acidophilous spruce association *Mastigobryo-Piceetum* (Schmidt, Gaisberg, R. Tüxen, Oberdorfer, J. & M. Bartsch, Jahn, Hartmann). In the vicinity of Slovenia in Koroška (Carinthia), it was already recognised at the start of the nineteen thirties by the Austrian phytocenologist Aichinger. His compatriot Smettan presented it in the Tyrol with 10 phytocenological relevés. The association was first described in Slovenia by Persoglio (in Tregubov 1957) under the name *Bazzanio-Piceetum,* in the Upper Sava Valley. Zupančič (1999), while studying spruce association checked Persoglio's research of the association *Mastigobryo-Piceetum* and compared his results with the results of the previously mentioned European phytocenologists; he came to the conclusion that the northwest European phytocenosis differs from ours, so he characterised it as a new geographic variant *Mastigobryo-Piceetum* var. geogr. *Trientalis europaea* Zupančič 1999, with distinguishing species the Arctic-Nordic boreal element *Trientalis europaea* and the acidophilous boreal moss *Ptilium crista-castrensis*. At the same time, on the basis of examples from 9 analytical tables of the association *Mastigobryo-Piceetum,* more or less reliably determined characteristic or distinguishing species of this association, from those previously very loosely envisaged by Braun-Blanquet (1939): these are *Blechnum spicant*, *Bazzania trilobata* and *Sphagnum nemoreum*.

Along the extreme northeast edge of Pokljuka Gorge appears the acidophilous forest association *Mastigobryo-Piceetum* var. geogr. *Anemone trifolia*. On the basis of the predominately acidophilous vegetation and the prevailing chert in the soils, we conclude that it grows on distric brown soils that are shallow to medium deep. Two characteristic species are present on the described surfaces, *Bazzania trilobata* and *Blechnum spicant*. In view of the mass appearance of the north-east-Euroasian-Suboceanic species *Melampyrum pratense* L. subsp. *vulgatum* (Pers.) Ronniger, we classified both described habitats of the association into a new sub-association *Mastigobryo-Piceetum melampyretosum vulgati* subass. nova. The holotype of the sub-association is relevé 1 (Phytocenological table). The species *Melampyrum pratense* subsp. *Vulgatum,* together with some other species, e.g., *Calluna vulgaris*, *Pteridium aquilinum*, *Potentilla ercta*, *Carex alba*, appears on drier or, rather, less damp habitats.

We classified the association *Mastigobryo-Piceetum* according to phytogeographic principles as a northwest geographic variant of the pre-Alpine-Alpine region of Slovenia, with the distinguishing species *Anemone trifolia* L., which for this region is an explicitly characteristic Alpine-southeast European-Illyrian species. We also ranked in the phytocenological table the relevé described in 1986 from the region of the Karavanke – Sava Caves (Zupančič 1999), which belongs in this geographic variant and shows similarities to the already known sub-association *lueucobrietosum* (Persoglio in Tregubov 1957). The phytocenological table shows the vegetation and floristic image more precisely.

MASTYGOBRYO-PICEETUM (Schmidt & Gaisberg 1936) Br.-Bl. & Sissingh in Br.-Bl. et al. 1939 corr. Zupančič 1999 var. geogr. ANEMONE TRIFOLIA var. geogr. nova

Sinsistematska pripadnost (Sinsistematical characteristic)						
	Zaporedna številka popisa (Number of relevé)		1	2	3	
	Delovna številka popisa (Working number of relevé)		7/14	8/14	38/86	
	Datum (Date)		18.8.2014	18.8.2014	27.8.1986	
	Nadmorska višina v m (Altitude in m)		841	862	1250	
	Nebesna lega (Aspect)		NE	E	E	
	Nagib v stopinjah (Slope in degrees)		20	20	25	
	Kamnitost v % (Stoniness in %)		0	0	0	
	Geološka podlaga (Bedrock)		r o ž e, a p n e		sili, skri	
	Tla (Soil)		kisla distrična rjava tla Acidophilous dystric cambisol			
	Pokrovnost (Cover) %: drevesna plast (Tree layer)	I	60	60	70	
	grmovna plast (Shrub layer)	II	5	5	30	
	zeliščna plast (Herb layer)	III	60	90	70	
	mahovna plast (Moss layer)	IV	15	15	30	
	Velikost popisne ploskve (Relevé) m2		400	400	400	
	Kraj popisov (Location)		Pokljuška soteska Julijske Alpe		Savske jame Karavanke	
	ZNAČILNICE ZA ASOCIACIJO (Characteristic species of association)					Presence (Prezenca)
			1	2	3	
VP	Bazzania trilobata	IV	1.3	+.3	2.3	3^{+-2}
VP	Blechnum spicant	III	+	+.3	2.2	3^{+-2}
	RAZLIKOVALNICA ZA GEOGRAFSKO VARIANTO (Diferential speecies of geographical variant)					
			1	2	3	
F	Anemone trifolia	III	+.2	+.2	+	3^{+}
	RAZLIKOVALNICA ZA SUBASOCIACIJO M.-P. var. geogr. ANEMONE TRIFOLIA MELAMPYRETOSUM subass. nova (Diferential species of subassociation)					
			1	2	3	
RP	Melampyrum pratense subsp. vulgatum	III	2.3	2.3	.	2^{2}
	RAZLIKOVALNICA ZA SUBASOCIACIJO M.-P. var. geogr. ANEMONE TRIFOLIA LEUCOBRYETOSUM Persoglio 1957 (Diferential species of subassociation)					
			1	2	3	
VP	Leucobryum glaucum	IV	+.2	1.2	2.3	3^{+-2}
VP	VACCINIO-PICEETEA Br.-Bl. in Br.-Bl. et al. 1939 em. Zupančič (1980) 2000 s. lat.					
			1	2	3	
		I	3.3	3.3	4.1	3^{3-4}
	Picea abies	II	.	+	2.3	2^{+-2} 3^{+-4}

		III	+	+	.	2^{+}
	Vaccinium myrtillus		3.3	3.3	$+^{0}$	3^{+-3}
	Calamagrostis arundinacea		2.3	1.3	2.4	3^{1-2}
	Polytrichum formosum	IV	1.3	1.2	2.3	3^{1-2}
	Bazzania trilobata		1.3	+.3	2.3	3^{+-2}
	Leucobryum glaucum		+.2	1.2	2.3	3^{+-2}
	Blechnum spicant	III	+	+.3	2.2	3^{+-2}
	Lycopodium annotinum		+	+.2	2.2	3^{+-2}
	Maianthemum bifolium		1.1	+	1.1	3^{+-1}
	Dicranum scoparium	IV	+.2	1.2	+.2	3^{+-1}
		I	.	.	+	1^{+}
	Abies alba	II	.	.	1.1	1^{1} 3^{+-1}
		III	+	+	.	2^{+}
	Dicranum polysetum	IV	+.2	+.3	+.2	3^{+}
	Plagiothecium undulatum		+.3	+.2	+.2	3^{+}
	Dryopteris expansa (D. assimilis)	III	+.2	+.2	+	3^{+}
	Phegopteris connectilis		+	+.2	+	3^{+}
	Oxalis acetosella		+	+	+.2	3^{+}
	Calluna vulgaris		+	+.2	+	3^{+}
	Hieracium murorum		+	+	+	3^{+}
	Hypnum cupressiforme	IV	1.2	1.2	.	2^{1}
	Thelypteris limbosperma	III	.	+	1.3	2^{+-1}
	Huperzia selago		+	.	1.2	2^{+-1}
	Luzula luzuloides		+.2	+.2	.	2^{+}
	Sphagnum girgensohnii	IV	+.2	.	+.2	2^{+}
	Luzula pilosa	III	.	+	+.2	2^{+}
	Gymnocarpium dryopteris		+	+	.	2^{+}
	Solidago virgaurea		+	+	.	2^{+}
	Gentiana asclepiadea		+	.	+	2^{+}
	Hylocomium splendens	IV	.	+.3	.	1^{+}
	Peltigera leucophlebia		.	+.3	.	1^{+}
	Dicranella heteromalla		+.2	.	.	1^{+}
	Homogyne alpina	III	.	.	+.2	1^{+}
	Aposeris foetida		.	.	+.2	1^{+}
	Cantharellus cibarius		+	.	.	1^{+}
	Larix decidua	II	.	+	.	1^{+}
	Lonicera nigra		+	.	.	1^{+}
	Monotropa hypophegea	III	.	+	.	1^{+}
	Plagiochila asplenioides var. major	IV	+	.	.	1^{+}
	Plagiothecium neglectum		+	.	.	1^{+}
	Rosa pendulina	II	.	+	.	1^{+}
	Rubus saxatilis		+	.	.	1^{+}
	Vaccinium vitis-idaea	III	+	.	.	1^{+}
	Veronica urticifolia		.	+	.	1^{+}
	Melampyrum sylvaticum		.	.	+	1^{+}
	Cetraria islandica	IV	.	.	+	1^{+}
	Rhytidiadelphus triquetrus		.	.	+	1^{+}
	Equisetum sylvaticum	III	.	.	+	1^{+}
RP	QUERCETALIA ROBORIS-PETRAEAE R. Tx. (1931) 1937 s. lat.					
			1	2	3	
	Melampyrum pratense subsp. vulgatum	III	2.3	2.3	.	2^{2}
	Populus tremula	I	.	+.3	.	1^{+}
		II	+	+	.	2^{+} 2^{+}
	Pteridium aquilinum	III	+	+.2	.	2^{+}
	Betula pendula	II	+	+	.	2^{+}

	Veronica officinalis	III	+	+	.	2^{+}
	Carex montana		.	.	+.2	1^{+}
	Potentilla erecta		.	+	.	1^{+}
EP	ERICO-PINETEA Ht. 1959 s. lat.					
			1	2	3	
	Carex alba	III	1.2	+.3	.	2^{+-1}
	Erica carnea		.	+	.	1^{+}
A	ADENOSTYLETALIA G. & J. Br.-Bl. 1931					
			1	2	3	
	Polygonatum verticillatum	III	+	+	.	2^{+}
	Rubus idaeus	II	+	+	.	2^{+}
	Veratrum album	III	+	.	.	1^{+}
F	QUERCO-FAGETEA Br.-Bl. & Vlieger in Vlieger 1937 s. lat.					
			1	2	3	
	Anemone trifolia	III	+.2	+.2	+	3^{+}
	Laburnum alpinum	II	+	1.1	.	2^{+-1} 2^{+-1}
		III	.	+	.	1^{+}
	Carex digitata		+	+.2	.	2^{+}
	Ctenidium molluscum	IV	+	+.2	.	2^{+}
	Fagus sylvatica	I	+	+	.	2^{+} 2^{+}
		II	+.2	+	.	2^{+}
	Acer pseudoplatanus		+	+	.	2^{+}
	Cirsium erisithales	III	+	+	.	2^{+}
	Prenanthes purpurea		+	+	.	2^{+}
	Eurhynchium zetterstedtii	IV	.	+.2	.	1^{+}
	Aruncus dioicus	III	+	.	.	1^{+}
	Corylus avellana	II	+	.	.	1^{+}
	Isothecium myosuroides	IV	.	+	.	1^{+}
	Mycelis muralis	III	.	+	.	1^{+}
	Sambucus racemosa	II	+	.	.	1^{+}
Q	QUERCETALIA PUBESCENTIS Br.-Bl. (1931 n. nud.) 1932 s. lat.					
			1	2	3	
	Sorbus aria	II	+	$+^{0}$	.	2^{+}
	Fraxinus ornus		.	$+^{0}$	.	1^{+0}
O	OSTALE VRSTE (Other Species)					
			1	2	3	
	Cladonia pyxidata	IV	+	.	+.2	2^{+}
	Cladonia rangiferina	IV	+	+	.	2^{+}
	Sorbus aucuparia subsp. aucuparia	II	+	+	.	2^{+} 2^{+}
		III	.	+	.	1^{+}
	Tortella tortuosa	IV	.	+.2	.	1^{+}
	Ajuga reptans	III	+	.	.	1^{+}
	Galeopsis pubescens		.	+	.	1^{+}

LEGENDA (Legend)
Geološka podlaga (Bedrock)
apne Apnenec (Limestone)
rože Roženec (Chert)
sili Silikat (Silikate)
skri Skriljavec (Schist)

CONCLUSIONS

Because of its natural features, Pokljuka Gorge is entitled to special treatment within the framework of Triglav National Park. Because of its botanical and geological features of interest, it should be protected on the same level as the protection of the central part of the park. Today it is protected according to the criteria of the outer zone of Triglav National Park. In the small area of Pokljuka Gorge – around 36 hectares – there are a large number of geological karst phenomena, such as sinkholes, natural bridges, Pokljuka Save, Stranska soteska, narrows, chert inserts in limestone etc., which is a rarity in the world. The flora is even more interesting, with the subendemic *Saxifraga burseriana*, alpine flora and mountain or high mountain vegetation because of air inversion, which causes plant inversion. Because of the specific colder micro- and mezoclimatic conditions in Pokljuka Gorge, which is located in the montane belt from 670 to 800 m asl, alpine plants appear: *Primula auricula*, *Potentilla caulescens*, *Viola biflora*, *Saxifraga cuneifolia*, *Lycopodium annotinum*, *Huperzia selago*, *Veronica urticifolia*, *Lonicera nigra,* (*Moneses uniflora*) and many others. Spruce communities occupies the coldest or acidic soil parts of the gorge, and sycamore maple thrives in the coldest »garden plots«. This region, with a relatively small area, is settled by 6 forest-shrub associations and 262 plant species, which gives the gorge a special seal because of the botanical and vegetational variety, which is supplemented by the Alpine-Karstic geological and soil variety. With our presentation of the flora and vegetation, we wished to show a part of these interesting features of Pokljuka Gorge. We would like this contribution to encourage zoologists to deal with the fauna of Pokljuka Gorge, because we do not doubt that the variety is even greater than the botanical.

The description of the vegetation gave us the opportunity to show the development path and problems of sintaxonomy, which required lengthy deliberation during the search for more or less final solutions. This seemed to us particularly necessary and important for an area in which there are not optimal but exceptional ecological conditions for the forest associations in question. Their development tends towards opposing conditions, i.e., to low altitudes with specific microclimatic influences. A continuous struggle for the dominance of one or another influence takes place among them, which enables the optimal development of one phytocenosis or another. The consequence of these conditions is that the plant cover of the phytocenoses is limited to the most adaptable plant species, which can withstand the daily or annual exchange of temperature influences. This is also reflected in the described forest phytocenoses, in which not all characteristic and distinguishing species are represented, lacking those that need optimal conditions for their development. Only characteristic and distinguishing species are present that are adapted to these unquiet (turbulent) ecological conditions.

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POVZETEK

Pokljuška soteska je med najzanimivejšimi naravnimi znamenitostmi Triglavskega narodnega parka. Vrezana je v strm severovzhodni rob Pokljuške planote na nadmorskih višinah od 670 do 800 m. Je največja fosilna soteska v Sloveniji, nastala pred mnogimi milijoni let, ko so jo izoblikovale vode Triglavskega ledenika. (Smolej 1982, Ramovš 1986, Skumavec 1995, Skumavec & Skobrne 1995).

Pokljuško sotesko so mnogokrat obiskovali naravoslovci, tudi midva. Predvsem sva opazovala floro in vegetacijo. V letu 1996 je bila natisnjena razprava o belojavorjevi združbi v Pokljuški soteski (Zupančič 1996). S tem v zvezi se je kolegu Skumavcu porodila zamisel o načrtnem pregledu vaskularne flore in vegetacije Pokljuške soteske. Rezultat je pričujoča razprava.

Raziskovana pot naju je vodila vzdolž soteske, od Jele, Kobalovega rovta, Stranske soteske, Pokljuške luknje, Srednjega vrtca, Galerij, Velikega vrtca, po poti proti Zatrniku nad sotesko, prek prehoda ali krožne poti proti Stari Pokljuki oziroma pod Pustovem polju,

skozi Pokljuško luknjo in nazaj do Jele. Območje soteske obsega skoraj 2 km dolžine. Želela sva zajeti in popisati čim več flore, verjetno se nama to ni povsem posrečilo in predvidevava, da je ali bo mogoče najti še kakšno vrsto, ki sva jo spregledala.

Gozdne združbe so predstavljene s 5 fitocenološkimi popisi in fitocenološko tabelo.

Floristične in vegetacijske raziskave so potekale po standardnih metodah.

Klimatske razmere v Pokljuški soteski so bolj ali manj podobne tistim, ki vladajo v alpskem svetu (1500–2000 m padavin, povprečna letna temperatura 3 do 6 °C). Pokljuška soteska je mraziščno območje.

Geološko sestavo večinoma predstavlja zgornjetriadni apnenec in nekaj enako starega dolomita. Na nekaterih mestih (npr. v »vrtcih«) je primešan roženec. Tla na apnencu in dolomitu so karbonatna bazična, evtrična rjava in rendzine. Tla, presuta z rožencem, so distrična, zmerno kisla rjava. Na balvanih in skalah se pojavlja litosol.

Zabeležili smo 262 taksonov vaskularne flore (Tabela 2). Posebnost je prisotnost 11 jugovzhodnoevropsko-ilirskih vrst: *Anemone* x *pitonii*, *A. trifolia*, *Asposeris foetida*, *Cardamine ennaphyllos*, C. *trifolia*, *Galium laevigatum*, *Helleborus niger*, *Homogyne sylvestris*, *Knautia drymeia* ssp. *drymeia* in *Lamium orvala* ter subendemit, *Saxifraga burseriana*, ki ga še s 5 vrstami: *Cardamine pentaphyllos*, *Chaerophyllum hirsutum*, *Peucedanum austriacum* ssp. *rablense*, *Primula vulgaris* in *Stellaria montana*, uvrščamo med jugovzhodnoevropsko floro. Več kot dve petini vrst je hladnoljubnih, to so cirkamborealni, mediteransko-montanski, evrosibirski, paleotemperatni, arktično-alpski in vzhodnoalpski geoelementi (po Poldiniju 1991 – Tabela 1). Analiza flore kaže, da območje Pokljuške soteske uvrščamo v ilirsko florno provinco, jugovzhodnoalpski florni sektor in v julijskoalpski-zahodnokaravanški-kamniškoalpski distrikt (Zupančič et al. 1987). Zavarovanih vrst je 14: *Cephalanthera damasonium*, *C. rubra*, *Convallaria majalis*, *Cyclamen purpurascens*, *Dactylorchiza maculata* ssp. *fuchsii*, *Dianthus hyssopifolius*, *Epipactis helleborine*, *Helleborus niger*, *H. odorus*, *Huperzia selago*, *Hypericum montanum*, *Lycopodium annotinum*, *Neottia nidus-avis* in *Primula acaulis*. Pomembna je prisotnost subendemita *Saxifruga burseriana*.

V Pokljuški soteski smo določili 5 gozdnih in 1 grmiščno združbo. Od listnatih gozdov je najbolj razširjena asociacija oziroma geografska varianta *Anemono trifoliae-Fagetum* var. geogr. *Helleborus niger*, ki poraša evtrična plitva, skeletna karbonatna rjava tla ali rendzine na apnencu in dolomitu. Na apnencu, kjer so plitva do srednje globoka karbonatna rjava tla, uspeva asociacija *Homogyno-Fagetum*. Kisla varianta asociacije *Homogyno-Fagetum* var. *Calamograstis arundinacea* var. nova. je na mešani silikatno-apnenčasti geološki podlagi, kjer so kisla rjava tla na rožencih. V »vrtcih« se pojavlja belojavorjeva asociacija oziroma geografska varianta *Corydalido cavae-Aceretum pseudoplatani* var. geogr. *Dentaria enneaphyllos*, ker tam prevladuje hladen in vlažen zrak. Tla so zakisana rjava na apnencu s primesjo roženca. Fragmentarno razvita smrekova združba *Rhytidiadelpho lorei-Piceetum* naseljuje razgiban apnenčast skalovit svet na balvanih, kjer so tla pomešana z rožencem. Na skalah (balvanih) pa je inicialni kisli litosol. Ta rastišča so pod vplivom temperaturne inverzije in hladnih tal, ki jih povzroča kroženje zraka med skalami, kjer dolgo časa ležita sneg in led. Drugi smrekov gozd oziroma geografska varianta *Mastigobryo-Piceetum* var. geogr. *Anemone trifolia* var. geogr. nova je na distričnih kislih rjavih plitvih do srednje globokih tleh z obilico roženca. Strmo apnenčasto-dolomitno pobočje in stene nad Pokljuško luknjo poraša toploljubno grmišče *Fraxino orni-Ostryetum*. Tla so rendzine, ki v prepadni steni prehajajo v bazični litosol.

Opisana gozdno-grmiščna vegetacija je utemeljena s fitocenološkimi popisi in fitocenološko tabelo »in situ« ter razpravo Zupančiča (1996).

Pri opisu vegetacije smo izkoristili priložnost, da prikažemo razvojno pot in probleme sintaksonomije, ki je zahtevala dolgotrajna razmišljanja ob iskanju bolj ali manj dokončnih rešitev. To se nam je zdelo še posebej potrebno in pomembno za območje, kjer za obravnavane gozdne združbe ni optimalnih ekoloških razmer, temveč so te izredne. Njihov razvoj poteka v nasprotujočih si razmerah, to je na nizkih nadmorskih višinah s posebnim mikroklimatskim vplivom. Med njimi se odvija neprestan boj za prevlado enega ali drugega vpliva, kar onemogoča optimalni razvoj te ali one fitocenoze. Posledica teh razmer je, da je rastlinska odeja fitocenoz omejena na najbolj prilagodljive rastlinske vrste, ki prenesejo vsakodnevno oziroma vsakoletno menjavanje temperaturnih vplivov. To se odraža tudi na opisanih gozdnih fitocenozah, kjer niso zastopane vse njihove značilnice in razlikovalnice, ki za svoj razvoj potrebujejo optimalne razmere. Prisotne so le tiste značilnice ali razlikovalnice, ki so prilagojene tem nemirnim (turbulentnim) ekološkim razmeram.

Pokljuška soteska je zaradi svoje naravoslovne znamenitosti upravičena do posebne obravnave v sklopu Triglavskega narodnega parka. Zaradi botaničnih in geoloških zanimivosti bi jo morali zavarovati na ravni varovanja osrednjega dela Triglavskega narodnega parka. Danes je zavarovana po kriterijih zunanjega pasu Triglavskega narodnega parka.

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Figure 2: Notice in Jela at the entrance to Pokljuka Gorge (Photo: J. Skumavec)

Figure 3: Burser's saxifrage - Saxifraga burseriana L. on the cliff in front of Pokljuka Cave (Photo: J. Skumavec)

Figure 4: Pre-Alpine beech forest - Anemono-Fagetum (Photo: J. Skumavec)

Figure 5: Ostrich fern - Matteuccia struthiopteris (L.) Tod. in sycamore-maple forest (Photo: J. Skumavec)

Figure 6: Sub-Alpine spruce forest - Rhytidiadelpho lorei-Piceetum (Photo: J. Skumavec)

Figure 7: Bridge, called the Galleries, in Pokljuka Gorge (Photo: J. Skumavec)

Figure 8: Cherts in Triassic limestone (Photo: J. Skumavec)

Figure 9: Pokljuka Gorge seen from Mežakla (Photo: J. Skumavec)