HACQUETIA 5/1 • 2006, 37–71

SYNTAXONOMY AND NOMENCLATURE OF THE ALPINE HEATHS (THE CLASS *LOISELEURIO-VACCINIETEA*) IN THE WESTERN CARPATHIANS

Jozef ŠIBÍK[1], Ján KLIMENT[2], Ivan JAROLÍMEK[1], Zuzana DÚBRAVCOVÁ[3], Radmila BĚLOHLÁVKOVÁ[4] & Libuše PACLOVÁ[5]

Abstract

The article refers to the syntaxonomical revision of plant communities of the class *Loiseleurio-Vaccinietea* from the territory of the Western Carpathians. This class relates to alpine and subalpine heathlands of Eurasia mountain systems dominated by ericaceous species. All available relevés were analysed using the numerical approach. The floristic and ecological characteristics of the associations are given, and the relationships with allied syntaxa are discussed. Analysed communities are divided into two alliances, the *Loiseleurio-Vaccinion,* and the *Vaccinion myrtilli.*

Within these alliances, a new association (*Sphagno capillifolii-Empetretum nigri*), and subassociations (*Cetrario islandicae-Vaccinietum vitis-idaeae typicum* and *empetretosum nigri*, *Cetrario nivalis-Vaccinietum gaultherioidis typicum* and *empetretosum nigri*, *Hylocomio splendentis-Vaccinietum vitis-idaeae vaccinietosum gaultherioidis* and *dianthetosum nitidi*, *Sphagno capillifolii-Empetretum nigri typicum* and *luzuletosum alpinopilosae*) are described. The authors also highlight far less known valid names of the associations *Cetrario islandicae-Vaccinietum vitis-idaeae* and *Avenastro versicoloris-Vaccinietum myrtilli* (incl. *Vaccinietum myrtilli*), validate the names of the associations *Cetrario nivalis-Vaccinietum gaultherioidis* and *Junco trifidi-Callunetum*, and propose a new name for the association *Vaccinio-Empetretum nigri* on calcareous bedrocks (*Hylocomio splendentis-Vaccinietum vitis-idaeae*).

Key words: heaths, numerical classification, Slovakia, syntaxonomy, Western Carpathians

Izvleček

V članku je predstavljena sintaksonomska revizija rastlinskih združb razreda *Loiseleurio-Vaccinietea* z območja Zahodnih Karpatov. Razred združuje alpinske in subalpinske resave evroazijskega gorskega sistema, v katerih dominirajo erikoidne vrste. Za analizo popisnega gradiva so avtorji uporabili numeričen pristop. Podali so floristične in ekološke značilnosti asociacij in obravnavali razmerje s sorodnimi sintaksoni. Obravnavane združbe so razdelili v dve zvezi *Loiseleurio-Vaccinion* in *Vaccinion myrtilli.*

Opisali so novo asociacijo (*Sphagno capillifolii-Empetretum nigri*) in subasociacije (*Cetrario islandicae-Vaccinietum vitis-idaeae typicum* and *empetretosum nigri*, *Cetrario nivalis-Vaccinietum gaultherioidis typicum* in *empetretosum nigri*, *Hylocomio splendentis-Vaccinietum vitis-idaeae vaccinietosum gaultherioidis* in *dianthetosum nitidi*, *Sphagno capillifolii-Empetretum nigri typicum* in *luzuletosum alpinopilosae*. Avtorji so opozorili na manj znana veljavna imena asociacij *Cetrario islandicae-Vaccinietum vitis-idaeae* in *Avenastro versicoloris-Vaccinietum myrtilli* (incl. *Vaccinietum myrtilli*), potrdili so veljavnost imen asociacij *Cetrario nivalis-Vaccinietum gaultherioidis* in *Junco trifidi-Callunetum* in predlagali novo ime za asociacijo *Vaccinio-Empetretum nigri* na apnenčastih skalah (*Hylocomio splendentis-Vaccinietum vitis-idaeae*).

Ključne besede: resave, numerična klasifikacija, Slovaška, sintaksonomija, zahodni Karpati

[1] Institute of Botany, Slovak Academy of Sciences, Dúbravská cesta 14, SK-845 23 Bratislava, Slovak Republic, e-mail: ivan.jarolimek@savba.sk, jozef.sibik@savba.sk

[2] Botanical Garden of Comenius University, SK-038 15 Blatnica, Slovak Republic, e-mail: kliment@rec.uniba.sk

[3] Department of Botany, Faculty of Natural Sciences, Comenius University, Révová 39, SK-811 02 Bratislava, Slovak Republic, e-mail: dubravcova@fns.uniba.sk

[4] Institute of Botany, Academy of Sciences of the Czech Republic, CZ-252 43 Průhonice, Czech Republic, e-mail: belohlavkova@ibot.cas.cz

[5] Červená Řečice no. 341, CZ-394 46, Czech Republic, e-mail: jpacl@sendme.cz

INTRODUCTION

Dwarf-shrub heathland communities of subalpine and alpine belts of the Western Carpathians were until now currently classified into a single alliance *Loiseleurio-Vaccinion* of the order *Caricetalia curvulae* and the class *Juncetea trifidi* (cf. Mucina & Maglocký 1985). They were first studied by the Polish phytosociologists on the Polish side of the Tatry Mts, where Szafer & al. (1923) described the association *Vaccinietum myrtilli*, which was included later (Pawłowski & al. 1928: 251) to the alliance *Calamagrostion villosae* Pawłowski in Pawłowski et al. 1928. Krajina (1933: 162–186) classified the similar community, the *Vaccinietum myrtilli tatricum subalpinum,* into a broadly defined alliance *Vaccinion myrtilli* (the order *Piceetalia abietis* Krajina 1933), including other dwarf-scrub communities [the associations *Salicetum retusae* (*kitaibelianae*), *Empetreto-Vaccinietum uliginosi tatricum, Callunetum vulgaris tatricum* and *Myrtilleto-Avenastretum*] into the alliance *Loiseleurieto-Vaccinion uliginosi* and the order *Caricetalia curvulae* Br.-Bl. in Br.-Bl. et Jenny 1926.

According to Sillinger (1933: 271), dwarf shrub dominated communities of subalpine and alpine belts belonging to the two alliances: the *Rhodoreto-Vaccinion* (that comprised communities in moderately wet and protected habitats, such as the *Vaccinietum myrtilli subalpinum* and *Calamagrostis villosa-Vaccinium myrtillus* Ass.) and the *Loiseleurieto-Vaccinion* (communities of more extreme habitats in less favourable climatic conditions, e.g. the *Vaccinieto-Empetretum*). The alliances had already been classified by Braun-Blanquet (in Br.-Bl. & Jenny 1926) who first distinguished them. Klika & Hadač (1944: 12–14) essentially used the same classification for Central European plant communities integrating these alliances into the order *Rhodoreto-Vaccinietalia* Br.-Bl. 1926 and the class *Juncetea trifidi* Hadač in Hadač et Klika 1944. Similarly to Hadač (1962: 50–51); they did not identify the alliance *Loiseleurieto-Vaccinion uliginosi* Krajina 1933 with the alliance *Loiseleurieto-Vaccinion* Br.-Bl. in Br.-Bl. et Jenny 1926, as Sillinger (1933) previously had.

Since the studies Hadač (1956) and Holub & al. (1967: 16), ericoid communities had only been classified within a single alliance *Loiseleurio-Vaccinion* Br.-Bl. in Br.-Bl. et Jenny 1926 and the order *Caricetalia curvulae* (Mucina & Maglocký 1985, Dúbravcová 1996). However, Šomšák & Maláriková (1983) disapproved of using this alliance in the Western Carpathians as baseless, due to its floristic similarity with grass communities of the alliance *Juncion trifidi* Krajina 1933. In the result of combined opinions of several older authors, some communities were left in the alliance *Loiseleurio-Vaccinion* and some were considered as a part of the alliance *Juncion trifidi* (Unar & al. 1984, 1985).

As we can see, the classification of dwarf-shrub communities to higher syntaxa was problematic from the very beginning. Probably this happened owing to the poor species composition and the monotony of their stands. Proceeding in this consideration, dwarf shrubs did not belong only to the class *Juncetea trifidi* but also to the class *Vaccinio-Piceetea* (cf. Braun-Blanquet & al. 1939). Eggler (1952) and later Schubert (1960) proposed a special class, the *Loiseleurio-Vaccinietea,* for these communities, trying to reflect not only their floristic composition but also physiognomy and functions in the country.

The same refer to the definition, classification and the nomenclature of individual associations, which was disunited. The Western Carpathians communities of dwarf scrubs, dominated by the species *Vaccinium gaultherioides* and *Empetrum nigrum* s. l., were most frequently incorporated to a broadly defined association, the *Empetro-Vaccinietum* (or *Vaccinio-Empetretum*).

The description of the same communities by different authors (often invalid or illegitimate), the unresolved taxonomy of the species *Empetrum nigrum* and *E. hermaphroditum* (at the level of species, subspecies or various cytotypes), and the complicated emendations and corrections of the association names have called for larger syntaxonomical revision. The article summarises the results of this revision.

MATERIAL AND METHODS

The syntaxonomical revision included 396 relevés of plant communities of alpine and boreal heaths in the altimontane, subalpine and alpine belts of the central part of the Western Carpathians. The evaluation was carried out from the data gained in the time span from 1923–2004. Consecutively, it relates to the recent reviews of the West Carpathian alpine communities (Petrík & al. 2004, Dúbravcová & al. 2005).

Although mainly relevés used in this study were collected by applying the sigmatistic phytosociological method (Braun-Blanquet 1964), different scales of abundance and dominance have been used by various authors: the five- or seven-degree scale by Braun-Blanquet, the 10-degree, or the com-

bined 11-degree scale by Hadač and Domin (cf. Sillinger 1933; Hadač & al. 1969) and a modified 9-degree scale by Barkman & al. (1964).

Therefore the standardisation of data for the numerical classification was needed, and the relevés were transformed into the nine-degree ordinal scale (van den Maarel 1979). The taxa determined only at the level of genus were excluded (except the genus *Sphagnum*). Some taxa were classified within the higher or more broadly defined taxa: *Anthoxanthum odoratum* agg. (*A. alpinum*), *Agrostis rupestris* (*A. pyrenaica*), *Carex sempervirens* [subsp. *silicicola* Holub, subsp. *tatrorum* (Zapał.) Pawł.], *Cladonia arbuscula* (subsp. *mitis*), *Cladonia coccifera* (*C. pleurota*), *Cladonia gracilis* [var. *elongata* (Jacq.) Fr.], *Cladonia pyxidata* s. l. (subsp. *chlorophaea*, subsp. *pyxidata*), *Dryopteris dilatata* s. l. (*D. carthusiana*), *Empetrum nigrum* s. l. (*E. hermaphroditum*), *Gentianella lutescens* (subsp. *carpatica*), *Helianthemum grandiflorum* (subsp. *grandiflorum*, subsp. *obscurum*), *Luzula luzuloides* (subsp. *rubella*), *Salix retusa* s. l. (*S. kitaibeliana*), *Senecio nemorensis* agg. (*S. ovatus*), *Sorbus aucuparia* (subsp. *glabrata*), *Sphagnum* sp. div. (*S. capillifolium*, *S. compactum*, *S. girgensohnii*, *S. magellanicum*, *S. quinquefarium*, *S. rubellum*, *S. russowii*), *Solidago virgaurea* (subsp. *minuta*), *Soldanella hungarica* (subsp. *major*), *Thamnolia vermicularis* (var. *subuliformis*), *Thymus pulcherrimus* (subsp. *sudeticus*).

The numerical classification was performed using the program HIERCLUS from the SYN-TAX 2000 package (Podani 2001). The β-flexible method (β = –0.25) and Ward's method with Euclidian distance, and Jaccard's, Ružička's and Wishart's similarity coefficients were used. The dendrograms obtained were evaluated by comparative analyses of phytocoenological tables processed over the FYTOPACK program (Jarolímek & Schlosser 1997).

The heads of each column of the synoptic table comprise the number of relevés used for the synthesis, and the average number of species in the relevant community. Each taxon is characterised by the frequency (in %; + = frequency < 0, 5 %) and the mean value of abundance (upper index, in ordinal scale) calculated over the FYTOPACK. Individual columns contain also the brief references (for unpublished data only the names of authors are given), the number of relevés and their position in the level of orographical units (according to the map from the Database of Fauna of Slovakia, scale 1 : 500000). Diagnostically important taxa of individual plant communities are given in bold.

The nomenclature of the taxa generally follows the Checklist of non-Vascular and Vascular Plants of Slovakia (Marhold & Hindák 1998). The author's names are included in few exceptions only. The subspecies (given without a species modifier) in the tables are marked with asterisks (*). Diagnostic taxa of the class *Loiseleurio-Vaccinietea* and the lower syntaxa are used in accordance with the synoptic table prepared for the new, fourth volume of the series Plant Communities of Slovakia; a brief version is given in the table (Table 1). Other syntaxa and their diagnostic taxa are defined following the newest publications (Kliment & al. 2004, Šibík & al. 2004, Petrík & al. 2005, Kliment & al. 2005a)

The names of syntaxa in the tables are abbreviated as follows: aa = *Adenostyletalia alliariae*, ac = *Arabidion caerulae*, as = *Astero-Seslerion calcariae*, AT = *Asplenietea trichomanis*, ca = *Calamagrostion arundinacae*, CC = *Caricetea curvulae*, cf = *Caricion firmae*, CK = *Carici rupestris-Kobresietea*, CU = *Calluno-Ulicetea*, Cv = *Calamagrostietalia villosae*, cv = *Calamagrostion villosae*, cy = *Cystopteridion*, ES = *Elyno-Seslerietea*, fv = *Festucion versicoloris*, LV = *Loiseleurio-Vaccinietea*, lv = *Loiseleurio-Vaccinion*, MU = *Mulgedio-Aconitetea*, NS = *Nardetea strictae*, ns = *Nardion strictae*, oe = *Oxytropido-Elynion*, OS = *Oxycocco-Sphagnetea*, pc = *Potentillion caulescentis*, pm = *Pinion mugo*, ss = *Salicion silesiacae*, st = *Seslerion tatrae*, VP = *Vaccinio-Piceetea*, vp = *Vaccinio-Piceion*.

In the descriptions of the communities the following abbreviations were used: art. = article of the Code of Phytocoenological Nomenclature (ICPN; Weber et al. 2000), char. = characteristic taxon (C – in tables, Cc = characteristic taxon of the class), cf. = confer (compare), const. = constant companion taxon (frequency higher than 60 %, cst – in tables), diff. = differential taxon (D – in tables), dom. = dominant species, incl. = inclusive, ined. = ineditus (unpublished data), nom. corr. = corrected name, nom. ined. = ineffectively published name, nom. nov. = nomen novum, nom. nud. = nomen nudum, p. p. = pro parte (partly), r. = relevé(s), sp. div. = species diversae (various species), subdom. = subdominant taxon, transgr. = transgressive taxon (T – in tables).

RESULTS AND DISCUSSION

***Loiseleurio-Vaccinietea* Eggler ex Schubert 1960**

Dwarf-shrub alpine and subalpine heathland of the mountains of Eurasia, dominated by ericaceous species.

Synonyms: *Juncetea trifidi* Hadač in Klika et Hadač 1944 p. p. (art. 8), *Loiseleurio-Vaccinietea* Eggler 1952 (art. 8)

Syntaxonomical synonyms: *Vaccinio-Piceetea* Br.-Bl. in Br.-Bl. et al. 1939 p. p. min., *Juncetea trifidi* Hadač 1946 p. p. (art. 36), *Loiseleurio-Cetrarietea* Suzuki-Tokio et Umezu in Suzuki-Tokio 1964 (art. 29c)

Characteristic taxa: *Empetrum nigrum* s. l., *Vaccinium myrtillus*, *V. vitis-idaea*

Some characteristic taxa of the class *Loiseleurio-Vaccinietea* mentioned by Grabherr (1993) from the Alps we consider as characteristic for the lower syntaxa (*Loiseleuria procumbens*, *Vaccinium gaultherioides*). Some of them we do not consider as characteristic because they do not occur in this type of vegetation, or they are very rare (*Arctous alpina*, *Lycopodium clavatum*).

***Rhododendro-Vaccinietalia* Br.-Bl. in Br.-Bl. et Jenny 1926**
Synonym: *Loiseleurio-Vaccinietalia* Eggler 1952 (art. 8, 29c)
Syntaxonomical synonyms: *Caricetalia curvulae* Br.-Bl. in Br.-Bl. et Jenny 1926 p. p. min., *Empetretalia hermaphroditae* Schubert 1960

***Loiseleurio-Vaccinion* Br.-Bl. in Br.-Bl. et Jenny 1926**
Table 1, Column 7
Cryophile, wind-exposed communities.

Original form of the name: *Loiseleurieto-Vaccinion*-Verband Br.-Bl. in Br.-Bl. et Jenny 1926
Synonyms: *Loiseleurieto-Vaccinion uliginosi* Krajina 1933 (art. 31), *Loiseleurio-Vaccinion* Br.-Bl. in Br.-Bl. et Jenny 1926 ex Krajina 1933 corr. Paclová in Kolektív 1985 (art. 1), *Loiseleurio-Vaccinion gaultherioidis* Krajina 1933 corr. Paclová in Dúbravcová et Paclová 1978 (art. 1, 31), *Loiseleurio-Vaccinion gaultherioidis* Br.-Bl. in Br.-Bl. et Jenny 1926 corr. Dúbravcová 1996 (art. 1)
Syntaxonomical synonym: *Juncion trifidi* Krajina 1933 p. p. min.
Phantom name: *Loiseleurio-Vaccinion* Br.-Bl. in Br.-Bl. et Jenny 1926 ex Krajina 1933 (in: Mucina et Maglocký 1985; Háberová et Šoltésová 1989)
Non: *Loiseleurio-Arctostaphylion* Kalliola 1939 (syn.: *Loiseleurio-Vaccinion* Nordhagen 1936)

Diagnostic taxa: *Loiseleuria procumbens* (char.), *Vaccinium gaultherioides* (char.), *Agrostis rupestris* (dif.), *Avenula versicolor* (dif.), *Campanula alpina* (dif.), *Carex sempervirens* subsp. *silicicola* Holub (dif.), *Festuca supina* (dif.), *Hieracium alpinum* (dif.), *Juncus trifidus* (dif.), *Oreochloa disticha* (dif.), *Primula minima* (dif.), *Pulsatilla scherfelii* (dif.), *Salix herbacea* (dif.), *Cladonia arbuscula* (dif.), *Cladonia gracilis* (dif.), *Cladonia rangiferina* (dif.), *Vaccinium myrtillus* (const.), *V. vitis-idaea* (const.), *Cetraria islandica* (const.)

Nomenclatural and taxonomical comment: Taxonomical studies on the genus *Vaccinium* proved that the alpine populations of the species *Vaccinium uliginosum* agg., growing in the extreme conditions of ridge climate have to be distinguished, as those carrying several important characters, into the separate species *Vaccinium gaultherioides* (cf. Unar & al. 1985: 22). The correction of the syntaxa names was necessary, as the species *Vaccinium uliginosum* s. str. does not occur in the communities of this alliance.

Syntaxonomical comment: Originally, the association *Salicetum kitaibelianae* was included to this alliance (cf. Krajina 1933; Mucina & Maglocký 1985; Dúbravcová 1996). Hadač (1956) considered this community as the closest to the alliance *Festucion versicoloris* Krajina 1933. General comparison of the West Carpathian alpine communities (Dúbravcová & al. 2005) proved this fact. The association represents a transitional link to the dwarf-shrub communities of the class *Loiseleurio-Vaccinietea* and the grass-dwarf shrub communities of the class *Carici rupestris-Kobresietea* Ohba 1974 (alliance *Festucion versicoloris*).

***Cetrario nivalis-Vaccinietum gaultherioidis* (Hadač 1956) Hadač ex Šibík et al. hoc loco**
Table 1, column 1
Nomenclatural type: Hadač 1956, Table 6, rel. 40, lectotypus hoc loco
Basionym: *Cetrario-Vaccinietum uliginosum tatricum* Hadač 1956 (art. 34)
Synonyms: *Empetreto-Vaccinietum uliginosi tatricum* Krajina 1933 (art. 34), *Empetro-Vaccinietum* Braun-Blanquet 1930 p. p. (art. 31), *Vaccinio-Empetretum hermaphroditi* (Krajina 1933) Hadač et al. 1969 (art. 31), *Vaccinieto-Empetretum* Sillinger 1933 (art. 31), *Empetreto-Vaccinietum uliginosi* Hadač 1956 (art. 31), *Cetrario islandici-Vaccinietum gaultherioidis* Hadač 1956 corr. Unar in Unar et al. 1984, 1985 (art. 31), *Cetrario-Vaccinietum gaultherioidis* Hadač 1956 corr. Dúbravcová et Hrabovcová in Mucina et Maglocký 1985 (art. 2b, 31), *Cetrario nivalis-Vaccinietum gaultherioidis* Hadač (1956) 1987 (art. 2b), *Vaccinio myrtilli-Empetretum hermaphroditi* Dúbravcová 1996 (art. 1, 3b)
Inclusive: *Junco trifidi-Seslerietum distichae vaccinietosum gaultherioides* Hrabovcová 1976 (art. 1)

Phantom name: *Cetrario-Vaccinietum gaultherioidis* (Hadač 1956) corr. Hrabovcová 1976 (in Šomšák & Maláriková 1983)
Non: Ass. *Vaccinium uliginosum-Cetraria islandica* Deyl 1940, *Vaccinio-Empetretum nigri* Hadač et al. 1969, *Empetro-Vaccinietum gaultherioidis* Br.-Bl. in Br.-Bl. et Jenny 1926 corr. Grabherr 1993

Diagnostic taxa: *Vaccinium gaultherioides* (transgr., dom.), *Bistorta vivipara* (dif.), *Campanula alpina* (dif.), *Carex sempervirens* subsp. *silicicola* Holub (dif.), *Doronicum stiriacum* (dif.), *Polytrichum alpinum* (dif.), *Salix herbacea* (dif.), *Avenula versicolor* (const.), *Hieracium alpinum* (const.), *Juncus trifidus* (const.), *Oreochloa disticha* (const.), *Vaccinium myrtillus* (const.), *V. vitis-idaea* (const.), *Cetraria islandica* (subdom., const.)

Physiognomy of a two-layer, floristically poor, and closed community is conditioned by the dominant species *Vaccinium gaultherioides* (or *Empetrum nigrum* s. l.) and several lichens, primarily by *Cetraria islandica* and the species of the genus *Cladonia* (*C. arbuscula*, *C. coccifera*, *C. gracilis*, *C. rangiferina*). A dense impenetrable carpet of lichens, chamaephytes and hemicryptophytes protects the stands of the association against oscilations of temperature, frost impacts and the drying influence of wind.

The phytocoenoses grow in the most extreme habitats on granite bedrock in subalpine and alpine belts at the altitudes (1600) 1700–2090 (2200) m a. s. l., occupying northward or westward edges of cragged crests, ribs, moraines, and slopes with inclination from 10 to 45 °. They are exposed to strong winds and protected in winter only by thin layer of snow or remain completely without snow cover. Soils are from very shallow to shallow (5–30 cm), rich in skeleton, oligotrophic, humous, from acid to strong acid (pH 3,5–4,6).

The community occurs in the Západné, Vysoké and Nízke Tatry Mts on siliceous bedrock. It represents the most common dwarf-shrub community frequently forming mosaic patterns with the grass communities of the class *Caricetea curvulae* Br.-Bl. 1948.

Based on differences in floristic composition and synecology of stands we distinguish two subassociations within the association:

***Cetrario nivalis-Vaccinietum gaultherioidis typicum* Paclová subass. nov. hoc loco**
Table 1, column 1a
Nomenclatural type: identical with the type of the association
Synonyms: *Empetreto-Vaccinietum uliginosi tatricum* Krajina 1933 p. p. (art. 34), *Cetrario-Vaccinietum gaultherioidis typicum* Paclová et al. in Mucina et Maglocký 1985 (art. 2b)

Differential taxa: *Festuca supina*, *Alectoria ochroleuca*, *Cladonia rangiferina*, *Cladonia stellaris*

Characteristic habitats of typical subassociation stands occur on the extreme windward places, often at the altitudes of about 2200 m a. s. l. Consequently, they are dried up by strong winds all year round. In winter, the snow cover is unstable, often completely blown away. Compared to the next association, the stands are characteristic by a higher proportion of lichens. Dwarf shrubs and other phanerogams grow being protected by them.

***Cetrario nivalis-Vaccinietum gaultherioidis empetretosum nigri* Paclová subass. nov. hoc loco**
Table 1, column 1b
Nomenclatural type: Krajina 1933, Table 50, rel. 5, lectotypus hoc loco
Synonyms: *Empetreto-Vaccinietum uliginosi tatricum* Krajina 1933 p. p. (art. 34), *Cetrario-Vaccinietum gaultherioidis empetretosum hermaphroditi* Paclová et al. in Mucina et Maglocký 1985 (art. 2b)

Differential taxa: *Empetrum nigrum* s. l., *Homogyne alpina*, *Huperzia selago*, *Trommsdorfia uniflora*, *Pleurozium schreberi*

In the association framework, the stands of the *C.-V. empetretosum nigri* represent a moderately hygrophilous wing, where *Empetrum nigrum* s. l. is dominant or co-dominant. The community occupies bottoms of valleys and under-crests, leeward, moderately inclined, usually northward or eastward slopes at the altitude from 1700 to 1900 (2000) m a. s. l. During the winter, the stands are covered with snow that persists at higher heights until May. Due to the deeper soils, the stands of the community are distinguished by a relatively hygrophilous nature.

Taxonomical comment: In the Flora of Slovakia (Futák & Bertová 1982), the two species within the genus *Empetrum* were distinguished: *E. nigrum* and *E. hermaphroditum*. The former is treated as a dioecious diploid taxon (2n=2x=26), whereas the latter is a bisexual and tetraploid taxon (2n=4x=52). Their taxonomical status is ambiguous and disput-

able. Some authors classify them at the level of subspecies – *E. nigrum* subsp. *nigrum* and subsp. *hermaphroditum* (cf. Li & al. 2002, Suda 2002). Although this conception (unisexual = diploid, bisexual = tetraploid) is widely accepted, it is clear, that tetraploids arose repeatedly and they cross with diploids. Also the preferences of different habitats (bisexual prefer exposed rocky summits and slopes, primarily in mountain areas, whereas unisexual mostly occur on peat bogs and coastal dunes) are not reliable enough to separate these taxa. The elucidation of their intragenus structure requires additional studies to correlate their morphological variability, levels of ploidy and the sex. Without addressing this, the taxonomical identification based on different sex and ploidy-levels is uncertain (Suda & al. 2004). In older geobotanical literature (e.g. Krajina 1933, Sillinger 1933), the only species – *Empetrum nigrum* was distinguished, later identified with the tetraploid taxon *E. hermaphroditum*. Hadač & al. (1969) separated different communities based on the sex of the population. Following the article 43a ICPN, we have decided to retain distinguishing of these taxa at the level of different cytotypes and to leave the name of broadly defined species *Empetrum nigrum* s. l. for the classification of (sub)associations until the taxonomical classification will be resolved.

Syntaxonomical comments: Deyl (1940) validly described the association "Ass. *Vaccinium uliginosum-Cetraria islandica*" from the territory of the Ukrainian Carpathians (Mt. Pop Ivan). It differs from the association *Cetrario-Vaccinietum uliginosi tatricum*, described by Hadač (1956), by several taxa, such as *Arnica montana* L., *Campanula abietina, Phyteuma wagnerii* Ker., *Rhododendron myrtifolium* Schott et Kotschy, *Soldanella hungarica* subsp. *major* and others. To distinguish the West Carpathian stands from the East Carpathian, Hadač (1987: 9) proposed the new name for the first one – *Cetrario nivalis-Vaccinietum gaultherioidis*. As the author did not quote the work of Hadač (1956) in references, where from the basionym was adopted, the name of the association was published invalidly.

Krajina (1933: 84) in his study described the association *Empetreto-Vaccinietum uliginosi tatricum*. Several authors (cf. Hadač 1956; Unar & al. 1985) considered this association as very heterogeneous. It was partly confirmed by the analyses of the West Carpathian data. Despite the extent of this heterogeneity, we regard it as an intra-association variability and do not separate the association into more units. We have classified the stands with *Empetrum nigrum* s. l. as *Cetrario nivalis-Vaccinietum gaultherioidis empetretosum nigri*. Some of Krajina's relevés (Krajina 1933, Table 50) also represent the typical subassociation.

Pawłowski & al. (1928, Table 6, rel. 23) were the first who distinguished dwarf-shrub stands with codominant presence of the species *Vaccinium gaultherioides* in the alpine belt of the Vysoké Tatry Mts and classified these stands in the association *Trifidi-Distichetum tatricum* as „Zwergstrauchreiche Fazies". The comprehensive comparison of the alpine communities of the Western Carpathians (Dúbravcová & al. 2005) indicated that their relevé was too heterogeneous and belonged to the communities of the alliance *Juncion trifidi* or it represented a transition between both types of vegetation. The relevé pointed out close syngenetic relations between the grass and dwarf-shrub phytocoenoses in the alpine belt.

***Junco trifidi-Callunetum vulgaris* (Krajina 1933) Hadač ex Šibík et al. hoc loco**

Table 1, column 2

Nomenclatural type: Krajina 1933, Table 51, rel. 4, lectotypus

Basionym: *Callunetum vulgaris tatricum* Krajina 1933 (art. 34)

Synonyms: *Junco trifidi-Callunetum vulgaris* (Krajina 1933) Hadač in Mucina et Maglocký 1985 (art. 2b), *Junco trifidi-Callunetum* (Krajina 1933) Hadač 1987 (art. 2b)

Diagnostic taxa: *Calluna vulgaris* (char., dom.), *Calamagrostis villosa* (dif.), *Juniperus sibirica* (dif.), *Luzula luzuloides* (dif.), *Pinus mugo* (dif.), *Solidago virgaurea* subsp. *minuta* (dif.), *Avenella flexuosa* (const.), *Hieracium alpinum* (const.), *Juncus trifidus* (const.), *Vaccinium myrtillus* (const.), *V. vitis-idaea* (const.), *Cetraria islandica* (const.), *Cladonia gracilis* (const.)

Physiognomy of a two-layer community is determined by chamaephytes *Calluna vulgaris*, *Vaccinium myrtillus* and *V. vitis-idaea*. Several hemicryptophytes (*Juncus trifidus*, *Avenella flexuosa*, *Hieracium alpinum*, *Campanula alpina*) participate in the formation of phytocoenoses. The moss layer is represented by various lichens where *Cetraria islandica* and *Cladonia gracilis* occur most frequently.

The stands of the association mostly occupy the tops of moraines, or the gaps in dwarf-pine stands in the habitats oriented to the south and east, at the altitude 1600–1800 m a. s. l. and the inclination 10–40 °. Shallow soils (5–35 cm) with fine skel-

eton are oligotrophic, from acid to strong acid (pH 4,1–4,9).

The community is rare and only fragmentarily developed in the subalpine and low alpine belt in the Západné, Vysoké and Belianske Tatry Mts. Some authors (Komárková 1964; Hadač & al. 1969; Dúbravcová 1974) consider it as a secondary one. At lower altitudes, its floristic composition indicates close dynamic relations to the dwarf-pine communities.

The association *Junco trifidi-Callunetum vulgaris* occupies only a peripheral position in the alliance *Loiseleurio-Vaccinion*. Compared to the former association, it is moderately mesophilous, developed in less extreme habitats, and consequently represents a transition to the next alliance. Its classification within the alliance *Loiseleurio-Vaccinion* is in harmony with the results of the numerical classification (Figure 1).

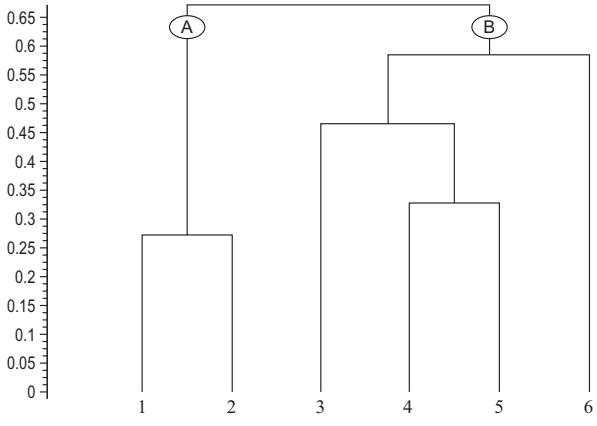

Figure 1: Dendrogram of the numerical classification of the plant communities of the class *Loiseleurio-Vaccinietea* in the Western Carpathians.
***Loiseleurio-Vaccinion* (A):** 1 – *Cetrario nivalis-Vaccinietum gaultherioidis*; 2 – *Junco trifidi-Callunetum vulgaris*; ***Vaccinion myrtilli* (B):** 3 – *Avenastro versicoloris-Vaccinietum myrtilli*, 4 – *Sphagno capillifolii-Empetretum nigri*, 5 – *Cetrario islandicae-Vaccinietum vitis-idaeae*, 6 – *Hylocomio-Vaccinietum vitis-idaea*
(used parameters: β-flexible method with Wishart's similarity coefficient).

Slika 1: Dendrogram numerične klasifikacije rastlinskih združb razreda *Loiseleurio-Vaccinietea* v Zahodnih Karpatih.
***Loiseleurio-Vaccinion* (A):** 1 – *Cetrario nivalis-Vaccinietum gaultherioidis*; 2 – *Junco trifidi-Callunetum vulgaris*; ***Vaccinion myrtilli* (B):** 3 – *Avenastro versicoloris-Vaccinietum myrtilli*, 4 – *Sphagno capillifolii-Empetretum nigri*, 5 – *Cetrario islandicae-Vaccinietum vitis-idaeae*, 6 – *Hylocomio-Vaccinietum vitis-idaea*
(uporabljeni parametri: β-flexibilna metoda z Wishartovim koeficientom podobnosti).

Syntaxonomical comment: Hadač (1987: 9) in the attempt to validate the name of the association *Callunetum vulgaris tatricum* Krajina 1933 proposed a new name, the *Junco trifidi-Callunetum vulgaris*. In references, however, similarly as in the previous study by Mucina & Maglocký (1985: 192), he did not quote the original work of Krajina (1933). Probably, this reference of Hadač (1987: 8) could be accepted as an indirect one, because the checklist of the communities in this study is according to Hadač & al. (1969) cited as well in the references, that is why the author used the same form of the name as it was proposed by Krajina (1933) – *Callunetum vulgaris tatricum*. In Hadač's work (Hadač & al. 1969), Krajina (1933) was cited correctly. However, strictly according to the ICPN (art. 2b), this ambiguous, second-step reference is rather disputable and does not represent a sufficient indirect reference, thus we suggest the new validation of the name.

***Vaccinion myrtilli* Krajina 1933**
Table 1, column 8

Acidophilous, mesophilous communities in subalpine belt of the Western Carpathians and Sudeten Mountains

Nomenclatural type: *Vaccinietum myrtilli tatricum subalpinum* Krajina 1933
Syntaxonomical synonyms: *Calamagrostion villosae* Pawłowski in Pawłowski et al. 1928 p. p. min., *Melampyro-Vaccinion* Jeník et al. 1980
Pseudonym: *Rhodoreto-Vaccinion* sensu Klika et Hadač 1944 non Br.-Bl. in Br.-Bl. et Jenny 1926
Phantom name: *Rhodoreto-Vaccinion myrtilli* (Br.-Bl. 1926) Krajina 1933 [in: Klika 1955; Unar & al. 1984, 1985]
Non: *Rhododendro-Vaccinion* Schnyder 1930, *Genisto pilosae-Vaccinion* Br.-Bl. 1926, *Vaccinion myrtilli* Böcher 1943 em. Bridgewater ex Shimwell 1973

Diagnostic taxa: *Luzula luzuloides* (dif.), *Luzula sylvatica* (dif.), *Sorbus aucuparia* subsp. *glabrata* (dif.), *Salix alpina* (dif.), *Dicranum scoparium* (dif.), *Hylocomium splendens* (dif.), *Polytrichum strictum* (dif.), *Sphagnum* sp. div. (dif.), *Avenella flexuosa* (const.), *Homogyne alpina* (const.), V*accinium myrtillus* (const.), *V. vitis-idaea* (const.), *Cetraria islandica* (const.)

Syntaxonomical comments: In comparison with the original content of the alliance *Vaccinion myrtilli*, described by Krajina (1933: 162) in his study on

the Mlynická dolina Valley in the Vysoké Tatry Mts, we restricted the alliance only to acid mesophilous dwarf-shrub communities of the subalpine belt of the Western Carpathians and the High Sudeten. Originally, the author included communities of dwarf pine (recently *Pinion mugo* Pawłowski in Pawłowski et al. 1928) and mountain spruce forests (*Piceion excelsae* Pawłowski et al. 1928 [syn.: *Vaccinio-Piceion* Br.-Bl. in Br.-Bl. et al. 1939]) to this alliance. He emphasized the phytosociological and ecological integrity of various stands along the upper forest line, but fully neglected their different physiognomy, thus bringing the syntaxonomical system – based predominantly on the floristic composition – to the extreme.

Similarly, a widely comprehended alliance, the *Vaccinio-Piceion* with the suballiance *Rhodoreto-Vaccinion* was described by Braun-Blanquet (in Braun-Blanquet & al. 1939). These syntaxa also included both forest and non-forest communities.

A narrowly defined alliance *Vaccinion myrtilli*, as we suggest here, represents a vicariant syntaxon to the alliance *Rhododendro-Vaccinion* Schnyder 1930 (syn.: *Rhodoreto-Vaccinion* Br.-Bl. in Br.-Bl. et Jenny 1926, *Rhododendro-Vaccinion* J. Br.-Bl. ex G. Br.-Bl. et J. Br.-Bl. 1931), which includes stands from similar habitats in the Alps with the occurrence of specific Alpine taxa, mainly the species of the genus *Rhododendron* (see also Grabherr 1993).

The name of the alliance *Vaccinion myrtilli* Böcher 1943 em. Bridgewater ex Shimwell 1973, which incorporates North European hemi-boreal and sub-boreal dwarf-shrub communities, represents a younger homonym of the name *Vaccinion myrtilli* Krajina 1933 and therefore is illegitimate. The other authors (Rivas-Martínez & al. 2001, 2002) also identify its content with the alliance *Genisto-Vaccinion* Br.-Bl. 1926. On the comprehensive evaluation of these dwarf-shrub communities, Geringoff & Daniels (2003) and Dierßen (1993, 1996) incorporated this alliance to the class *Calluno-Ulicetea* Br.-Bl. et Tüxen ex Klika et Hadač 1944.

The subalpine bilberry-vegetation (association *Festuco supinae-Vaccinietum myrtilli* Šmarda 1950) from the territory of the tree line in the Sudeten mountains was also included into this alliance (*Genisto-Vaccinion*) and the class (*Calluno-Ulicetea*) [cf. Krahulec et al. 2006]. The Sudeten and Carpathian communities are very similar (see below), so their classification into this alliance seems to be groundless. Problematic classification of these communities may cause the overlapping margins of areas of oceanic and continental species in Sudeten (Hercynian) region. The *Genisto-Vaccinion* is widespread in low mountain ranges of Western Europe, where many characteristic species have subatlantic distribution and disappear eastward, e.g.: *Arnica montana*, *Galium saxatile*, *Genista pilosa*, *Gentiana lutea* L., *Leontodon pyrenaicus* Gouan, *Meum athamanticum* Jacq. etc., in comparison with the *Rhododendro-Vaccinion* (that have close relationship with the West Carpathian alliance *Vaccinion myrtilli*) mainly distributed in the subalpine zone of the high mountains (Alps, Pyrenees). The later alliance is characterised by the species like *Calamagrostis villosa*, *Empetrum nigrum* s. l., *Homogyne alpina*, *Huperzia selago*, *Melampyrum sylvaticum* etc. (cf. Schaminée & al. 1993).

Sillinger (1933: 274) and to certain degree also Krajina (1933: 163), classified grass communities dominated by the species *Calamagrostis villosa*, where *Vaccinium myrtillus* reaches no more than a subdominant position, to the communities dominated by dwarf shrubs on non-limy soils. These tall-grass communities are closely related to more hygrophilous stands of the association *Vaccinietum myrtilli*. Due to their different physiognomy and sharp differences in constancy of some species (cf. Kliment & al. 2004), we cannot either leave these stands with *Calamagrostis villosa* in the alliance *Vaccinion myrtilli* or accept the classification of the communities dominated by *Vaccinium myrtillus* to the alliance *Calamagrostion villosae*, where they were attached by the Polish authors Pawłowski & al. (1928).

Jeník & al. (1980) described the new alliance *Melampyro-Vaccinion* from the Veľká Kotlina Cirque (the Sudeten Mountains), classifying it into the order *Vaccinio-Piceetalia* and the class *Vaccinio-Piceetea* and including there dwarf-shrub communities dominated by bilberry (*Vaccinium myrtillus*) from the subalpine belt of the Hrubý Jeseník Mts, pointing out *Melampyrum pratense* s. l., *Vaccinium myrtillus* and *V. vitis-idaea* as characteristic species. Considering floristic composition of stands and similarity in syngenesis of some Carpathian and Sudeten communities (cf. Kliment & al. 2004), we identify this alliance with the alliance described by Krajina (1933).

The same method we have applied to the association *Festuco supinae-Vaccinietum myrtilli* Šmarda 1950 (the original form of the name: As. *Vaccinium myrtillus-Festuca supina*), which was used by Jeník & al. (1980) to describe this alliance. We have identified it with the next association *Avenastro versicoloris-Vaccinietum myrtilli*.

***Avenastro versicoloris-Vaccinietum myrtilli* Krajina 1933 nom. invers. propos.**
Table 1, column 3
Original form of the name: *Myrtilleto-Avenastretum versicoloris* Krajina 1933
Nomenclatural type: Krajina 1933: Table 52, rel. 4, lectotypus hoc loco
Synonyms: *Vaccinietum myrtilli* Szafer et al. 1923 (art. 31), *Vaccinietum myrtilli* Klika 1926 (art. 31), *Vaccinietum myrtilli tatricum* Szafer et al. 1927 (art. 34), *Vaccinietum myrtilli tatricum* Pawłowski 1928 (art. 2b), *Vaccinietum myrtilli tatricum* Pawłowski in Pawłowski et al. 1928 (art. 31, 34), *Vaccinietum myrtilli subalpinum* Sillinger 1933 (art. 34), *Vaccinietum myrtilli* Walas 1933 p. p. maj. (art. 31), *Empetreto-Vaccinietum* Klika 1934 (art. 31)
Syntaxonomical synonym: *Festuco supinae-Vaccinietum myrtilli* Šmarda 1950
Inclusive: *Vaccinietum myrtilli tatricum subalpinum* Krajina 1933 (art. 34)
Phantom name: *Vaccinietum myrtilli subalpinum* (Szafer et al. 1923) Sillinger 1933 [in Unar & al. 1984, 1985]
Non: *Vaccinietum myrtilli* Rübel 1922, *Empetreto-Vaccinietum* Br.-Bl. in Br.-Bl. & Jenny 1926; *Myrtilleto-Avenastretum versicoloris* Krajina 1933 sensu Hadač 1956; *Myrtillo-Avenastretum versicoloris* Krajina 1933 sensu Hadač & al. 1969; *Myrtillo-Avenastretum versicoloris* Krajina 1934 sensu Unar & al. 1984, 1985

Diagnostic taxa: *Acetosa alpestris* (dif.), *Athyrium distentifolium* (dif.), *Calamagrostis arundinacea* (dif.), *C. villosa* (dif.), *Deschampsia cespitosa* (dif.), *Dryopteris dilatata* s. l. (dif.), *Festuca picturata* (dif.), *Gentiana asclepiadea* (dif.), *Hypericum maculatum* (dif.), *Ligusticum mutellina* (dif.), *Oreogeum montanum* (dif.), *Oxalis acetosella* (dif.), *Potentilla aurea* (dif.), *Veratrum album* subsp. *lobelianum* (dif.), *Avenella flexuosa* (const.), *Homogyne alpina* (const.), *Luzula luzuloides* (const.), *Vaccinium myrtillus* (dom., const.), *V. vitis-idaea* (const.)

The phytocoenoses are not species rich, where the community edificator – *Vaccinium myrtillus* predetermines a specific physiognomy of closed stands. Such herbs and grasses as *Avenella flexuosa*, *Homogyne alpina*, *Ligusticum mutellina*, *Luzula luzuloides* and *Vaccinium vitis-idaea* occur more frequently. The abundance of mosses and lichens varies more largerly; *Cetraria islandica*, *Dicranum scoparium* and *Hylocomium splendens* occur most frequently.

The community occurs on differently oriented slopes in protected under-ridge positions in the subalpine belt at the altitude from (1200) 1300 to 1800 m a. s. l.

The depth of the soil profile varies from 10 to more than 35 cm. The soil surface is usually covered with a thick layer of litter and raw humus that selectively influences the floristic composition of the stands. Acidophilous and oligotrophic species prevail, basiphilous and euthrophic, however, are absent. Soils are strongly acid (pH 3,5); differently developed ranker represents the soil type.

The association *Avenastro-Vaccinietum myrtilli* is a typical community of the subalpine belt of the West Carpathian high ranges (Lúčanská and Krivánska Malá Fatra, Veľká Fatra, Chočské vrchy, Západné, Vysoké, Belianske and Nízke Tatry, Volovské vrchy, the massif of the Babia hora and Pilsko, Kubínska hoľa) occurring primarily on the acid bedrock. Outside the Tatry Mts, the community stands are poorer in species, some taxa typical for this region are missing (*Avenula versicolor*, *Juncus trifidus*, *Oreogeum montanum* etc.), and the community composition is more similar to the Sudeten stands. These phytocoenoses were less distributed in the past occurring predominantly in differently large enclaves between dwarf pine and grass stands. After the Walachian colonisation, concerned with the massive and widespread removal of dwarf pine stands and mountain spruce forests along the upper tree line boundary, they secondarily spread in free habitats occupying today even far larger areas. Several authors, such as Svoboda (1939: 128–133), Šmarda (1950: 35) and Jeník (1958: 33), also regard the community as the secondary to a certain extent.

Based on the moisture gradient, two variants could be distinguished in the association. The first, relatively drier **variant with *Festuca supina*** characterised by the higher abundance of cranberry (*Vaccinium vitis-idaea*), is differentiated by *Avenula versicolor*, *Juncus trifidus*, *Juniperus sibirica*, *Festuca supina*, *Rubus idaeus*, and by juvenile or dwarf individuals of *Sorbus aucuparia* subsp. *glabrata* and *Pinus mugo*.

Higher constancy of mosses (*Dicranum scoparium*, *Hylocomium splendens*, *Pleurozium schreberi*, *Rhytidiadelphus triquetrus* and *Sphagnum* sp. div.) and some hygrophilous hemicryptophytes (*Festuca picturata*, *Ligusticum mutellina*) or therophytes (*Melampyrum sylvaticum*) are typical for the second **variant with *Oreogeum montanum***. The latest, more grassy variant, indicates close syngenetic relations with the *Festuco picturatae-Calamagrostietum villosae* Pawłowski in Pawłowski et al. 1928 corr. Kliment et al. 2004 and the *Vaccinio myrtilli-Calamagrostietum villosae* Sillinger 1933. Under certain conditions,

some stands manage to keep a greater amount of water in the thick layer of raw humus supporting development of mosses (e. g. *Polytrichum* sp. div., *Sphagnum* sp. div.). Subsequently, such a community may transform to the next association.

Syntaxonomical comments: The association *Vaccinietum myrtilli* from the Western Carpathians was described for the first time by the Polish authors Szafer & al. (1923). This name, however, represents a younger homonym of the vicariant community from the Alps, which was described by Rübel (1922: 224) under the same name. The results of numerical classification show that the community described by Krajina (1933: 94–100) as the *Myrtilleto-Avenastretum versicoloris* may be classified within the variability of the association the *Vaccinietum myrtilli* and can be identified with other communities dominated by *Vaccinium myrtillus,* despite the fact that Krajina (1933: 94) rejected this solution.

The comparison of the Western Carpathian alpine communities (Dúbravcová & al. 2005) suggests that the stands with the dominant or subdominant position of the species *Avenula versicolor* (syn. *Avenastrum versicolor*) belong to the association *Vaccinietum myrtilli,* or to the grass communities of the alliance *Juncion trifidi* (the association *Myrtillo-Avenastretum versicoloris* sensu Hadač 1956; Hadač & al. 1969; Unar & al. 1984, 1985). We consider both associations (the *Vaccinietum myrtilli* and the *Myrtilleto-Avenastretum versicoloris*) as syntaxonomical synonyms, so their distinguishing into two types is superfluous. The name of the Polish authors is therefore illegitimate (art. 31). The closest validly published name is the *Myrtilleto-Avenastretum versicoloris* Krajina 1933. In accordance with the articles 10b, 41 and 42 of ICPN, we propose reversed orthographic correction of the name to the *Avenastro versicoloris-Vaccinietum myrtilli*.

Krahulec & al. (2006) included the association *Festuco supinae-Vaccinietum myrtilli* Šmarda 1950, which in this paper is regarded as a syntaxonomical synonym of this community, to the order *Genisto pilosae-Vaccinion* and the class *Calluno-Ulicetea*. As we mentioned above, the classification of Hercynian stands into this alliance is disputable as the Carpathian phytocoenoses are much more similar to the arctic-alpine dwarf-shrub vegetation of the class *Loiseleurio-Vaccinietea*.

The comparison of native stands from the subalpine belt, secondarily frequently spread in the large area, with real secondary stands on the clearings after the cutting of spruce forests in the montane belt (cf. Miadok 1983, Šomšák 1971) indicates that these two types of phytocoenoses cannot be identified despite common dominant species. Secondary stands in the montane belt are primarily differentiated from the association *Vaccinietum myrtilli* by the absence of the mountain taxa, such as *Anthoxanthum alpinum*, *Athyrium distentifolium*, *Calamagrostis villosa*, *Cetraria islandica*, *Festuca picturata*, *Gentiana punctata*, *Hieracium alpinum*, *Hypericum maculatum*, *Ligusticum mutellina*, *Oreogeum montanum*, *Potentilla aurea*, *Soldanella carpatica* and *Veratrum album* subsp. *lobelianum*. They are positively differentiated by the high constancy of the species *Nardus stricta*, *Soldanella hungarica* and *Rhytidiadelphus triquetrus* and spruce juveniles (*Picea abies*). We propose to classify these communities to the class *Epilobietea angustifolii* R. Tx. et Preising in R. Tx. ex von Rochow 1951, namely to the alliance *Carici piluliferae-Epilobion angustifolii* R. Tx. 1950, which comprises secondary communities on oligotrophic clearings, or to the class *Calluno-Ulicetea* and the alliance *Genisto-Vaccinion*.

***Sphagno capillifolii-Empetretum nigri* Bělohlávková ass. nov. hoc loco**
Table 1, column 4; Table 2
Nomenclatural type: Table 2, rel. 30, holotypus
Synonyms: *Sphagno nemorei-Empetretum hermaphroditi* Bělohlávková 1980 (art. 1), *Sphagno-Empetretum hermaphroditi* Unar in Unar et al. 1985 (art. 3g)
Inclusive: *Empetreto-Vaccinietum muscosum* Sillinger 1933 (nom. nud., art. 7)
Non: *Sphagno robusti-Empetretum hermaphroditi* Hadač et Váňa 1967

Diagnostic taxa: *Sphagnum* sp. div. (dom.) [*S. capillifolium*, *S. girgensohnii*, *S. magellanicum*, *S. quinquefarium*, *S. rubellum*, *S. russowii*], *Polytrichum strictum* (dif.), *Empetrum nigrum* s. l. (subdom., const.), *Avenella flexuosa* (const.), *Homogyne alpina* (const.), *Vaccinium myrtillus* (const.), *V. vitis-idaea* (const.)

Typical physiognomy of a two-layer community is determined by thick cushions of mosses (primarily *Sphagnum* species) and creeping dwarf shrubs. The sizes of stands vary from several square metres to several hundred square metres. *Empetrum nigrum* s. l. dominates among dwarf shrubs, *Vaccinium myrtillus* and *V. vitis-idaea* occur constantly. *Avenella flexuosa* and *Homogyne alpina* are the most frequent hemicryptophytes. Peat mosses dominate the moss layer. They are mainly represented by *Sphagnum capillifolium* (syn.: *S. nemoreum*, *S. acutifolium*), less

frequently, though with similar abundance, by *S. girgensohnii*, *S. magellanicum*, *S. quinquefarium*, *S. rubellum* and *S. russowii*. Due to similar ecological demands, they can easily compensate each other, with no effect on the overall floristic composition. Cushions of peat mosses vivify monotonous and species poor phytocoenoses (16 taxa per relevé in average) by mosaic alternation of red and green colour. The moss species *Polytrichum strictum* occurs with high constancy. Typical bog-mosses hummocks represent an example of the phytogenous hummocks formed mostly by symbiotic relations inside the vegetation cover (Jeník 1958: 35, 37).

The community occurs in sheltered, wet (due to frequent precipitation and long duration of snow) north to west oriented habitats with the inclination from 10 ° to 60 °(in average 20–40 °) at the altitude 1500–1900 m a. s. l. It occupies calcareous or siliceous bedrock without visible varieties in floristic composition. The development of this chionophilous community is limited by the shortened vegetation period. Deeper layer of thick cushions of bog mosses (serving as the isolator) does not defrost in daytime after the first strong night frosts (approximately from the second half of October). Only the top layer of mosses thaws. The same peculiarity repeatedly occurs in early spring. The main source of moisture for the intensive turf production and the raise of hummocks is in a thick snow cover, which persists in relatively covert places until the end of May. Favourably exposed stands are protected from being directly isolated, and thereby – from major losses of water due to evaporation from the soil surface. Atmospheric moisture near the ground is permanently higher because it is cooled by air streams.

In the soil profile, there have been found regular alternations of thicker layers, mainly from the rests of bog mosses, with thinner layers containing almost exclusively crowberries (*Empetrum nigrum* s. l.) rests, thus reflecting some periodical cycles where these dominants alternated in the vegetation cover. These layers apparently refer to the climatically damp and drier periods. The depth of the soil profile varied from (0.6) 1 to 1.5 m. Soil acidity varied depending on the geological substratum the community was developed on: pH in the upper layers was always near 3.1; closely to the bedrock – up to 6.8 (depending on the bedrock type).

The native community is usually developed on siliceous bedrock from the open pioneer stands with *Avenella flexuosa*, *Vaccinium myrtillus* and *Cetraria islandica* (quite often on a scree partially covered with vegetation), or out of the association *Vaccinietum myrtilli*, under conditions described by Jeník (1958: 33–34). Further development (e.g. successful succession of woods, which, however, is not so common) could lead under specific circumstances to a dwarf-pine community. It is very likely that extended stands that cover large areas, mainly in the higher altitudes, are stable by themselves. The opinions on the secondary origin of the community after the destruction of dwarf-pine stands (Horák 1971) are baseless for most localities on acid substratum, as neither roots nor branches or needles of dwarf pine were found in the soil profile (cf. Unar & al. 1985: 27).

On basic bedrock, in respond to greater accumulation of raw humus, consequent relative isolation from the bedrock and increased amount of moisture in the soil, a succession develops from the communities of the association *Hylocomio-Vaccinietum vitis-idaeae* to the association *Sphagno capillifolii-Empetretum nigri* (Figure 2). However, in some areas (e.g. on northern slopes of the Veľký Rozsutec Mt. in Krivánska Malá Fatra Mts) the secondary origin of stands might be supposed due to remnants of burnt dwarf pine occurring there.

Syntaxonomical comments: Already Sillinger (1933: 277) had noticed that in some stands of the association *Vaccinieto-Empetretum* in the Nízke Tatry Mts, in more sheltered habitats, the peat mosses were abundant and formed a thick layer of acid humus. He named them the variant *Empetreto-Vaccinietum muscosum*. Braun-Blanquet (1930: 116) also mentioned the moist variant of the association *Empetreto-Vaccinietum*, with admixed peat mosses naming it „*Sphagnum acutifolium*-Fazies". Hadač (1956: 26) described similar stands from the Temnosmrečinová dolina Valley that could be identical with this association. Jeník (1958) referred to the interesting phytocoenoses with the species of the genus *Vaccinium* and *Sphagnum acutifolium* (syn. *S. capillifolium*) on a steep northern slope in the Západné Tatry Mts. Dúbravcová & al. (1976: 54, Table 9, rel. 15–20) recorded this community from the same mountains as a part of the association *Empetro-Vaccinietum* Sillinger 1933, the variant with *Sphagnum nemoreum* (syn. *S. capillifolium*). Bělohlávková (1980) proposed to classify these stands at the association level as a separate association, the *Sphagno nemorei-Empetretum hermaphroditi*. Unfortunately, the name remained unpublished. Later Unar (in Unar & al. 1984, 1985) published the name of the similar association *Sphagno-Empetretum hermaphroditi*, though invalidly, because he did not mention

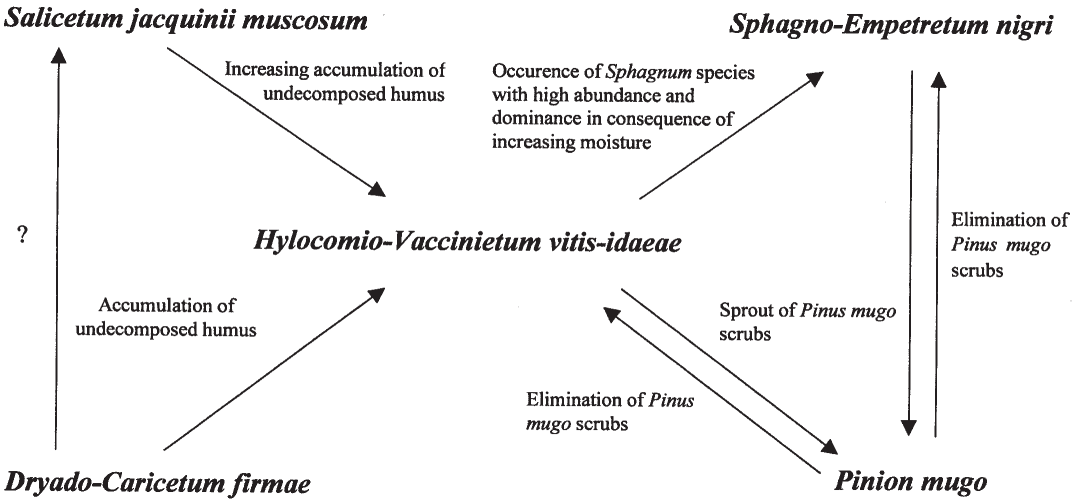

Figure 2: Dynamics of the selected types of the vegetation on basic substratum in the subalpine belt of some West Carpathian mountains.

Slika 2: Dinamika izbranih vegetacijskih tipov na bazičnem substratu v subalpinskem pasu na nekaterih gorah Zahodnih Karpatov.

clearly the taxon the name was derived from [in the original diagnosis, the reference on three taxa of peat mosses – *Sphagnum girgensohnii*, *S. magellanicum* and *S. russowii* (syn. *S. robustum*) is present].

The community occupies the interface position between the two alliances: *Vaccinion myrtilli* and *Oxycocco-Empetrion hermaphroditi* Nordhagen ex Hadač & Váňa 1967. It differs from the last one by the absence of typical species of raised bogs, such as *Drosera rotundifolia*, *Eriophorum vaginatum*, *Ledum palustre* and *Oxycoccus palustris*.

***Sphagno capillifolii-Empetretum nigri typicum* Bělohlávková subass. nov. hoc loco**
Table 2
Nomenclatural type: identical with the type of the association
Synonym: *Sphagno nemorei-Empetretum hermaphroditi salicetosum alpinae* Šibík 2003 p. p. min. (art. 1, art. 4a)

Differential taxa: *Calamagrostis villosa*, *Festuca versicolor*, *Melampyrum sylvaticum*, *Salix alpina*, *Sorbus aucuparia* subsp. *glabrata*

The stands of typical subassociation occur in the Krivánska Malá Fatra, Chočské vrchy, Nízke Tatry Mts, and in the group of the Sivý vrch Mt. in the Západné Tatry Mts. The similarity of these mountains and a transitional position of the Sivý vrch Mt. are evident here again, being referred to similar development of vegetation in the postglacial, distinguished though from the Tatra Mts (cf. Šibík & al. 2004, Kliment & al. 2005b).

The two variants could be identified: a **typical** one, which is species poor, rather wet and oligotrophic, which is differentiated mostly negatively, and a moderately drier **variant with *Cetraria islandica***, which occurs in less sheltered habitats and is differentiated by higher constancy of *Cetraria islandica, Dicranum scoparium, Hylocomium splendens, Pleurozium schreberi, Huperzia selago, Soldanella carpatica* and juvenile or dwarf individuals of *Picea abies* and *Pinus mugo* (see Table 2).

***Sphagno capillifolii-Empetretum nigri luzuletosum alpinopilosae* Bělohlávková subass. nov. hoc loco**
Table 2
Nomenclatural type: Unar & al. 1984, Table 10, rel. 3, holotypus

Differential taxa: *Agrostis rupestris*, *Bistorta major*, *Campanula alpina*, *Doronicum stiriacum*, *Festuca supina*, *Gentiana punctata*, *Hieracium alpinum*, *Juncus trifidus*, *Ligusticum mutellina*, *Luzula alpinopilosa*, *Oreochloa disticha*, *Pulsatilla scherfelii*, *Vaccinium gaultherioides*, *Alectoria ochroleuca*, *Cephalozia bicuspidata*, *Cladonia rangiferina*, *Lophozia guttulata*, *Polytrichum alpinum*

In the subalpine and alpine belt of the Západné and Vysoké Tatry Mts, the stands with species typical for the Tatra Mts occur, that seem to be differen-

tial regarding the former subassociation. *Empetrum nigrum* s. l. does not reach the dominant position, with the species of the genus *Vaccinium* (*V. myrtillus* and *V. gaultherioides*) developed instead.

***Cetrario islandicae-Vaccinietum vitis-idaeae* Hadač et al. ex Hadač 1987**
Table 1, column 5; Table 3
Nomenclatural type: Hadač et al. 1969, p. 47, rel. 147, lectotypus Hadač 1987: 9
Synonyms: *Cetrario islandicae-Vaccinietum vitis-idaeae* Hadač et al. 1969 prov. (art. 3b), *Cetrario islandicae-Vaccinietum vitis-idaeae* Hadač et al. ex Hadač in Mucina et Maglocký 1985 (art. 2b), *Vaccinietum myrtilli* Walas 1933 p. p. min. (art. 31),
Non: *Vaccinietum myrtilli* Szafer et al. 1923

Diagnostic taxa: *V. vitis-idaea* (dom., const.), *Cetraria islandica* (subdom., const.), *Avenella flexuosa* (const.), *Vaccinium myrtillus* (const.)

The association belongs to the most poor dwarf-shrub communities (16 taxa per relevé in average). Dominating *Vaccinium vitis-idaea*, together with the other chamaephytes (*Empetrum nigrum* s. l., *Vaccinium myrtillus*), hemicryptophytes (*Avenella flexuosa*, *Festuca supina*, *Huperzia selago*), lichens (*Cetraria islandica*, *Cladonia* sp. div.) and mosses (*Pleurozium schreberi*, *Polytrichum strictum*) determine the monotonous aspect of the community, being vivified, however, by conspicuous red-coloured leaves of bilberry and red berries of cranberry in late summer.

The community finds optimal ecological conditions in the subalpine belt at the altitude 1350–1720 m a. s. l. It occupies the edges of rock crests, steep slopes with inclination 20–40 °, or windward top parts of the relief, and boulder screes. During the winter, these small patches of coenoses are covered with thin snow, thawing very early in spring. Although the association occurs also on basic bedrock (from which it was described), its influence in these extreme conditions is suppressed. Not very deep, skeleton soils of the ranker or Rendzi-Lithic Leptosol type are only developed with the layer of dark brown-black humus.

The stands of the community are native, equally well developed on basic and acid bedrock. In lower mountains or on siliceous bedrock they represent a vicariant community of the association *Cetrario nivalis-Vaccinietum gaultherioides*. In the Tatry Mts (Západné, Vysoké and Nízke), the communities of both associations can fuse and overlap each other. Generally, the association *Cetrario-Vaccinietum vitis-idaeae* occurs in relatively less extreme stands. The community is well founded by phytocoenological relevés from the Lúčanská and Krivánska Malá Fatra Mts, Babia hora and the Tatry Mts.

Even though the community is not distinctively differentiated internally, we have distinguished the two subassociations on the ground of different geological substratum, dominant species, and the moisture gradient:

***Cetrario islandicae-Vaccinietum vitis-idaeae typicum* subass. nov. hoc loco**
Table 3
Nomenclatural type: identical with the type of the association

Differential taxa: *Avenula versicolor*, *Campanula alpina*, *Hieracium alpinum*, *Juncus trifidus*, *Oreochloa disticha*, *Soldanella carpatica*, *Polytrichum alpinum*

The stands of the typical subassociation are richer in species (18 taxa per relevé); overall physiognomy is determined by dominating cranberry (*Vaccinium vitis-idaea*). The phytocoenoses are mostly fixed to the basic substratum (extremely species poor stands), occurring less on the acidic substratum. Based on the rate of basic substratum isolation, we have distinguished the **typical variant,** where the influence of basic bedrock is extremely restricted (therefore, the stands have similar species composition as stands on acid bedrock); and the **variant with *Sesleria albicans***, which represents floristically richer community, where the influence of basic bedrock is less suppressed, with higher participation of calciphilous species (see Table 3).

***Cetrario islandicae-Vaccinietum vitis-idaeae empetretosum nigri* subass. nov. hoc loco**
Table 3
Nomenclatural type: Table 3, rel. 10, holotypus
Synonym: *Vaccinio myrtilli-Empetretum hermaphroditi polytrichetosum stricti* Šibík 2003 p. p. maj. (art. 1, art. 4a)

Differential taxa: *Empetrum nigrum* s. l., *Homogyne alpina*, *Sorbus aucuparia* subsp. *glabrata*

Physiognomy of this subassociation is determined by the dominant species *Empetrum nigrum* s. l. In comparison with the former subassociation the stands are more hygrophilous and poorer in species (12 species per relevé in average). They occur on acidic bedrock and often on sizeable boulder Pleistocene quartzite screes or slates (Figure 3).

Figure 3: *Empetrum nigrum* s. l. determined physiognomy of the subassociation *Cetrario-Vacciniteum vitis-idaeae empetretosum nigri*. It prefers acidic bedrock and often occurs on boulder Pleistocene quartzite screes or slates (top of the bouldered Pleistocene quartzite scree near the spot height "Hrana Veľkého Kriváňa", altitude 1618 m a. s. l., August 2nd 2005).

Slika 3: Vrsta *Empetrum nigrum* s. l. določa fiziognomijo subasociacije *Cetrario-Vacciniteum vitis-idaeae empetretosum nigri*. Pojavlja se na kisli matični podlagi in na plistocenskem grušču in skrilavcih (na vrhu pleistocenskega balvana v bližini vrha "Hrana Veľkého Kriváňa", nadmorska višina 1618 m, 2. avgust 2005).

***Hylocomio splendentis-Vaccinietum vitis-idaeae* (Hadač et al. 1969) nom. nov. hoc loco**
Table 1, column 6; Table 4
Nomenclatural type: Hadač & al. 1969: 44, rel. 12, lectotypus hoc loco
Basionym: *Vaccinio-Empetretum nigri* Hadač et al. 1969 (art. 31)
Synonyms: *Empetreto-Vaccinietum* Br.-Bl. 1930 p. p. (art. 31), *Sphagno nemorei-Empetretum hermaphroditi salicetosum alpinae* Šibík 2003 p. p. maj. (art. 1, art. 4a), *Vaccinio myrtilli-Empetretum hermaphroditi polytrichetosum stricti* Šibík 2003 p. p. min. (art. 1, art. 4a)
Pseudonym: *Cetrario-Vaccinietum uliginosi tatricum* sensu Hadač & al. 1969 non Hadač 1956, *Empetreto-Vaccinietum uliginosi tatricum* sensu Šmarda & al. 1971 non Krajina 1933
Non: *Empetreto-Vaccinietum* Br.-Bl. in Br.-Bl. et Jenny 1926, *Empetreto-Vaccinietum uliginosi tatricum* Krajina 1933, *Cetrario-Vaccinietum uliginosi tatricum* Hadač 1956

Diagnostic taxa: *Bartsia alpina* (dif.), *Bistorta major* (dif.), *Bistorta vivipara* (dif.), *Dryas octopetala* (dif.), *Festuca versicolor* (dif.), *Hedysarum hedysaroides* (dif.), *Phyteuma orbiculare* (dif.), *Ranunculus breyninus* (dif.), *Salix reticulata* (dif.), *Empetrum nigrum* s. l. (subdom., const.), *V. vitis-idaea* (subdom., const.), *Hylocomium splendens* (subdom., const.), *Festuca supina* (const.), *Luzula luzuloides* (const.), *Cetraria islandica* (const.), *Dicranum scoparium* (const.), *Pleurozium schreberi* (const.)

This closed, two-layer community is characterised by almost equal participation of chamaephytes *Empetrum nigrum* s. l., *Vaccinium gaultherioides*, *V. myrtillus* and *V. vitis-idaea* in the vegetation cover. *Dryas octopetala* occurs less in the cover. Numerous hemicryptophytes, such as *Anthoxanthum alpinum*, *Avenella flexuosa*, *Bartsia alpina*, *Bistorta major*, *Luzula luzuloides*, *Festuca supina* and *F. versicolor* are presented by high constancy, however, they do

Figure 4: The stands of the association *Hylocomio splendentis-Vaccinietum vitis-idaea* probably develop from some moss-rich stands of the association *Dryado octopetalae-Caricetum firmae* in the moist under-ridge zone, which are not favourable for the fast decomposition of organic remains. In suitable places, both associations form a mosaic pattern (northern slope of the Malý Kriváň Mt., altitude 1570 m a. s. l., August 19th 2002; both photos were taken by J. Šibík).

Slika 4: Sestoji asociacije *Hylocomio splendentis-Vaccinietum vitis-idaea* se verjetno razvijejo iz sestojev asociacije *Dryado octopetalae-Caricetum firmae* v vlažnem območju pod slemenom, kjer je razgradnja organskih ostankov počasna. Na primernih mestih se sestoji mozaično prepletajo (severno pobočje gore Malý Kriváň, nadmorska višina 1570 m, 19. avgust 2002; obe fotografiji J. Šibík).

not affect significantly the physiognomy of stands. In the moss layer *Hylocomium splendens*, *Dicranum scoparium* and *Pleurozium schreberi* create nearly closed carpet. *Cetraria islandica* represents the most frequent lichen. Currently observed typical hummocks (30 –) 50 (– 60) cm in height are typical for more developed stands in later succession stages, with added *Vaccinium vitis-idaea* and *Empetrum nigrum* s. l. on their tops. On the steep side of these hummocks (with inclination up to 90 °) diverted from the slope, the moss, *Polytrichum strictum*, frequently occurs. In depressions under steep slopes, bog mosses may occur commonly.

The phytocoenoses occupy north or north-west oriented steep slopes and rocky ridges with inclination from 20 ° to 60 ° on limestone and dolomite bedrock at the altitude 1500–1650 m a. s. l. Community stands are moist, compared to the former association relatively sheltered and situated lower from exposed crests. A thick layer (10–40 and more cm) of undecomposed raw humus (often also peat) isolates them well from basic bedrock; therefore, the soil has slightly acid-to-acid reaction (pH 4, 1–6, 4). Despite the increased acidity of soil due to the accumulation of raw humus, in places where this layer is not so thick and plant roots could maintain the contact with the limestone bedrock, the calciphilous species occur. Just the abundant occurrence of calciphytes and thinner layer of undecomposed humus differ this community from some stands of the association *Sphagno capillifolii-Empetretum nigri* on basic mineral bedrock.

The stands of the association *Hylocomio-Vaccinietum* are probably developing out of some moss-rich stands of the association *Dryado octopetalae-Caricetum firmae* Sillinger 1933 (cf. Šibík & al. 2004: 196–197)

in the moist under-ridge zone, not favourable for fast decomposition of organic remains. In suitable places, both associations form mosaic patterns (Figure 2, 4). Equally, these stands may develop though the succession of the association *Salicetum jacquinii muscosum* Sillinger 1933, when a layer of raw mould from moss cushions, defoliated leaves of willows, and partially from semi-decomposed remains of lichens evolves on rock tables above the black mull humus. This layer is then occupied by *Empetrum nigrum* s. l. (Sillinger 1933: 237). Later on, with progressing succession, several species of bog mosses may develop. In consequence of the increasing accumulation of raw humus and developing thicker turf layer, the calciphilous species retreat and the association may transform into the association *Sphagno capillifolii-Empetretum nigri*. The community may also develop in enclaves sheltered by dwarf pine (*Pinus mugo*) or dwarf spruces (*Picea abies*).

The association is documented by phytocoenological relevés from the Krivánska Malá Fatra Mts and the Belianske Tatry Mts. Sillinger (1933) mentioned it from the Nízke Tatry Mts.

Syntaxonomical comments: Dwarf-shrub communities on the basic substratum in subalpine belt of the Belianske Tatry Mts were recorded by Braun-Blanquet (1930: 117). He considered them as a part of the broadly defined association *Empetreto-Vaccinietum*. Sillinger (1933: 226, 237) analysed the dynamics of mosaic stands of grasslands and *Empetrum nigrum* s. l. in detail. Hadač & al. (1969) described a new association, the *Vaccinio-Empetretum nigri*, not only on the ground of a geological substratum, but owing to the occurrence of *Empetrum nigrum* s. str. instead of *E. hermaphroditum*. This classification appeared to be partly correct: really, there are differences between the stands on limestone and on silicate substratum and between more and less extreme habitats. However, the name proposed by Hadač (in Hadač & al. 1969: 40) is illegitimate as it represents a younger homonym of the validly described association *Empetreto-Vaccinietum* Br.-Bl. in Br.-Bl. et Jenny 1926. The latter association occurs in the Alps and has different floristic composition. Moreover, with regard to previously discussed taxonomic obscurity of the genus *Empetrum* and especially due to the different content of syntaxa, the name is unusable. Similarly, in case of the association *Empetreto-Vaccinietum uliginosi tatricum* Krajina 1933, the described association was differentiated from (Hadač & al. 1969: 41), the species *Vaccinium uliginosum* (syn. *V. gaultherioides*) and *Empetrum nigrum* were used as a basis for the association name. Above all, based on the taxonomical knowledge of that time, the name of *Empetrum nigrum* was proposed by the authors as *E. hermaphroditum*.

As a basionym, we have selected the name proposed by Hadač & al. (1969), which for the first time notified differences comparing stands on silicate bedrock.

Based on the results of syntaxonomical revision, we have included stands classified by Hadač & al. (1969) within the *Cetrario-Vaccinietum uliginosi tatricum* Hadač 1956, and by Šmarda & al. (1971) within the *Empetreto-Vaccinietum uliginosi tatricum* Krajina 1933 to the association *Hylocomio-Vaccinietum*

The *Salicetum jacquinii muscosum* (*Salix jacquinii* = *S. alpina*), as it was described by Sillinger (1933: 237) from the north slopes, rock tables and small terraces of the Králička Mt. in the Nízke Tatry Mts, represents either a younger community in a succession that have a transitional position between the phytoceonoses of the alliance *Caricion firmae* Gams 1936 and the dwarf-shrub communities, or it is only a succession stage of the *Hylocomio-Vaccinietum*. Bělohlávková (1980) described similar phytocoenoses from the Krivánska Malá Fatra Mts as the association *Salici alpini-Salicetum reticulatae*, which differs from the stands in the Nízke Tatry Mts by the presence of *Salix reticulata*. Due to the deficiency of phytocoenological data, it is not discussed in this paper.

***Hylocomio splendentis-Vaccinietum vitis-idaeae vaccinietosum gaultherioidis* subass. nov. hoc loco**
Table 4
Nomenclatural type: identical with the type of the association

Differential taxa: *Allium senescens* subsp. *montanum*, *Androsace chamaejasme*, *Anemone narcissiflora*, *Campanula alpina*, *Campanula tatrae*, *Crepis jacquinii*, *Helianthemum grandiflorum*, *Hieracium alpinum*, *Trommsdorfia uniflora*, *Juncus trifidus*, *Linum extraaxillare*, *Oreochloa disticha*, *Pedicularis oederi*, *Pedicularis verticillata*, *Potentilla aurea*, *Silene acaulis*, *Vaccinium gaultherioides* (dom.), *Polytrichum piliferum*, *Rhytidiadelphus triquetrus*, *Rhytidium rugosum*, *Cladonia arbuscula*, *Cladonia rangiferina*, *Cetraria nivalis*, *Thamnolia vermicularis*.

The stands of the subassociation *H.-V. vaccinietosum gaultherioidis* occur in the interface be-

tween the altimontane and subalpine belt in the Belianske Tatry Mts. The dominant position of the species *Vaccinium gaultherioides* is typical for these stands.

***Hylocomio splendentis-Vaccinietum vitis-idaeae dianthetosum nitidi* subass. nov. hoc loco**
Table 4
Nomenclatural type: Table 4, rel. 16, holotypus.

Differential taxa: *Dianthus nitidus*, *Homogyne alpina*, *Huperzia selago*, *Ranunculus alpestris*, *Salix alpina*, *Saxifraga aizoides*, *Saxifraga paniculata*, *Soldanella carpatica*, *Vaccinium myrtillus*, *Polytrichum commune*, *Polytrichum strictum*, *Sphagnum capillifolium*, *S. magellanicum*, *S. russowii*.

Phytocoenological relevés of the subassociation *H.-V. dianthetosum nitidi* were , however, obtained exclusively from the subalpine belt of the Kriváńska Malá Fatra Mts. We suppose that the stands from the Nízke Tatry Mts mentioned by Sillinger (1933: 279) can also be included here. The phytocoenoses of this subassociation are typified by the dominant or subdominant position of some dwarf shrubs (*Empetrum nigrum* s. l., *Vaccinium myrtillus* and *V. vitis-idaea*) and the constant presence of the West Carpathian endemic species *Dianthus nitidus*. The absence of some specific taxa, which do not occur in the Kriváńska Malá Fatra Mts or are very rare (*Androsace chamaejasme*, *Campanula alpina*, *Juncus trifidus*, *Oreochloa disticha*, *Pedicularis oederi*, *Vaccinium gaultherioides*) , also separates this subassociation from the former one.

Acknowledgements. The authors are grateful to Iveta Gažiová and Zuzana Rozbrojová for providing publications difficult to access, as well as to Peter Kučera, Ladislav Mucina and Milan Valachovič for their valuable comments and suggestions on this paper and Jan Suda for taxonomical comments. For determination of moss specimens we are grateful to Katarína Mišíková, Katarína Kresáňová, Anna Kubínska, †Zdeněk Pilous and Rudolf Šoltés; lichens were kindly identified by Anna Guttová, Eva Lisická and Ivan Pišút. Our thanks go also to Anna Šoltésová for providing their unpublished phytocoenological relevés and Anna Dobošová, Peter Kučera and Ivana Šibíková for the fieldwork collaboration. For English improvement we are indebted to Natália Yehorová. This work was supported by the grant agency VEGA grant no. 4041 and 6057.

REFERENCES

Altmannová, M. 1983: Subalpínska a alpínska vegetácia Nízkych Tatier a jej hodnotenie pre potreby LANDEP. Ph.D. Thesis, Institute of Landscape Ecology Slovak Academy of Sciences, Bratislava.

Barkman, J. J., Doing, H. & Segal, S. 1964: Kritische Bemerkungen und Vorschläge zur quantitativen Vegetationsanalyse. Acta Bot. Neerl. 13: 394–419.

Bělohlávková, R. 1980: Rostlinná společenstva alpínského stupně Kriváňské Malé Fatry. Mscr.

Braun-Blanquet J. (1926): Le "Climax complexe" des landes alpines. (*Genisteto-Vaccinion* du Cantal). Arvernia 2: 29–48.

Braun-Blanquet, J. & Jenny, J. 1926: Vegetationsentwicklung und Bodenbildung in der alpinen Stufe der Zentralalpen. Denkschr. Schweiz. Naturforsch. Ges. Zürich 63: 183–349.

Braun-Blanquet, G., Braun-Blanquet, J. 1931: Recherches phytogéographiques sur le Massif du Gross Glockner (Hohe Tauern). Revue de Géographie alpine 19: 1–65.

Braun-Blanquet, J., Sissingh, G. & Vlieger, J. 1939: Klasse der *Vaccinio-Piceetea*. Prodr. Groupements Vég. 6. Comité Int. Prodr. Phytosociol., Montpellier.

Braun-Blanquet, J. 1964: Pflanzensoziologie. Grundzüge der Vegetationskunde. 3. Aufl. – Springer Verlag, Wien, 865 pp.

Braun-Blanquet, J. 1930: Zentralalpen und Tatra, eine pflanzensoziologische Paralelle. Veröff. Geobot. Inst. Rübel Zürich 6: 81–123.

Deyl, M. 1940: Plants, soil and climate of Pop Ivan. Synecological study from Carpathian Ukraina. Opera Bot. Čech. 2: 1–290

Dierßen, K. 1993: Binnenländische und küstengebundene Heiden im Vergleich. Ber. d. Reinh.-Tüxen-Ges. 5: 183–197.

Dierßen, K. 1996: Vegetation Nordeuropas. Ulmer, Stuttgart, 838 pp.

Dúbravcová, Z. 1974: Subalpínska a alpínskeho vegetácia Kamenistej doliny (Západné Tatry). M.Sc. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Dúbravcová, Z. 1996: Spoločenstvá triedy *Juncetea trifidi* v Západných Karpatoch. Ph.D. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Dúbravcová, Z. & Paclová, L. 1978: Alpínska vegetácia Tatier. 1. časť. Partial report, no. VI-1-4/4, mscr., Faculty of Natural Sciences, Comenius University, Bratislava.

Dúbravcová, Z., Foltínová, J., Paclová, L. & Turečková, J. 1976: Vegetácia subalpínskeho a alpínskeho stupňa Západných Tatier. Final report, no. VI-1-4-18b, mscr., Faculty of Natural Sciences, Comenius University, Bratislava.

Dúbravcová, Z., Jarolímek, I., Kliment, J., Petrík, A., Šibík, J. & Valachovič, M. 2005: Alpine heaths in the Western Carpathians – a new approach to the classification. Ann. Bot. 5: 41–48.

Eggler, J. 1952: Übersicht der höheren Vegetationseinheiten der Ostalepen. Mitt. Naturwiss. Ver. Steiermark 81/82: 28–41.

Futák, J. & Bertová, L. (eds) 1982: Flóra Slovenska 3. Veda, Bratislava, 608 pp.

Geringoff, H. & Daniëls, F. J. A. 2003: Zur syntaxonomie des *Vaccinio-Callunetum* Büker 1942 unter besonderer Berücksichtigung der Bestände im Rothaargebirge. Abh. Westf. Mus. Naturk, 65 (3): 1–80.

Grabherr, G. 1993: *Loiseleurio-Vaccinietea*. In: Grabherr, G. & Mucina, L. (eds): Die Pflanzengesellschaften Österreichs. Teil 2. Natürliche Waldfreie Vegetation. Gustav Fischer Verlag Jena, Stuttgart, New York, pp. 447–467.

Háberová, I. & Šoltésová, A. 1989: Alpínska vegetácia Batizovskej doliny vo Vysokých Tatrách (*Juncetea trifidi*). Biológia (Bratislava) 44(5): 441–449.

Hadač, E. 1956: Rostlinná společenstva Temnosmrečinové doliny ve Vysokých Tatrách. Biol. Práce Slov. Akad. Vied 2(1): 1–78.

Hadač, E. 1962: Übersich der höheren Vegetationseinheiten des Tatragebirges. Vegetatio 11: 46–54.

Hadač, E. 1987: Plant ecological notes from the Belianske Tatry Mts. Biol. Práce Slov. Akad. Vied 23(3): 1–96.

Hadač, E., Březina, P., Ježek, V., Kubička, J., Hadačová, V., Vondráček, M. & al. 1969: Die Pflanzengesellschaften des Tales „Dolina Siedmich prameňov" in der Belauer Tatra. Vegetácia ČSSR B2: 5–343.

Holub, J., Hejný S., Moravec, J. & Neuhäusl, R. 1967: Übersicht der höheren Vegetationseinheiten der Tschechoslowakei. Rozpr. Československ. Akad. Věd 77: 3–75.

Horák, J. 1971: Westliche Tatra – Geobiozönosen der oberen Wald- und Krummholzgrenze. Přír. Práce Úst. Československ. Akad. Věd v Brně 5(5): 1–47.

Hrabovcová, J. 1976: Vegetácia subalpínskeho a alpínskeho stupňa Jamnickej doliny (Západné Tatry). R.N.Dr. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Humeňanský, Š. 1966: Prieskum subalpínskeho a alpínskeho pásma v masíve Skalka a Kotliská, v závere dolinového celku Lomnistá, LZ Predajná. M.Sc. Thesis, Faculty of Forestry, University of Forestry and Wood Technology, Zvolen.

Jarolímek, I. & Schlosser, G. 1997: FYTOPACK – a system of programs to process phytocoenological tables. Biologia (Bratislava) 52: 53–59.

Jeník, J. 1958: Rašelinové kopčeky v oblasti Veľkej Kopy (2053 m) vo Vysokých Tatrách. Zborn. Prác. Tatransk. Nár. Parku 2: 30–40.

Jeník, J., Bureš, L. & Burešová, Z. 1980: Syntaxonomic study of vegetation in Velká Kotlina Cirque, the Sudeten Mountains. Folia Geobot. Phytotax. 15: 1–28.

Klika, J. 1926: Poznámky ke geobotanickému výzkumu Velké Fatry. Sborn. Přír. Společn. v Moravské Ostravě 3 (1924–1925): 38–85.

Klika, J. 1934: Borstgraswiesen in den Westkarpathen. Věstn. Král. České. Společn. Nauk. Tř. Mat.-Přír. 1934/15: 1–31.

Klika, J. 1955: Nauka o rostlinných společenstvech. (Fytocenologie). Nakladatelství ČSAV, Praha, 361 pp.

Klika, J. & Hadač, E. 1944: Rostlinná společenstva střední Evropy. Příroda 36: 281–295.

Kliment, J., Jarolímek, I., Šibík, J. & Valachovič, M. 2004: Syntaxonomy and nomenclature of the communities of the orders *Calamagrostietalia villosae* and *Adenostyletalia* in Slovakia. Thaiszia-J. Bot. 14(2): 93–157.

Kliment, J., Bělohlávková, R., Bernátová, D., Jarolímek, I., Petrík, A., Šibík, J., Uhlířová J. & Valachovič, M. 2005a: Syntaxonomy and nomenclature of the communities of the alliances *Astero alpini-Seslerion calcariae* and *Seslerion tatrae* in Slovakia. Hacquetia 4(2): 121–149.

Kliment, J., Bernátová, D., Jarolímek, I. & Uhlířová, J. 2005b: Floristic composition and syntaxonomy of the communities with *Carex sempervirens* subsp. *tatrorum* in the West Carpathians. Biologia (Bratislava) 60/1: 37–56.

Kolektív, 1985: Prehľad vegetačných jednotiek SSR (charakteristika vyšších syntaxónov). Partial report, no. VI-1-5/01, mscr., Institute of Botany Slovak Academy of Sciences, Bratislava.

Komárková, V. 1964: Alpinská vegetace Roháčů. M.Sc. Thesis, Faculty of Natural Sciences, Charles University, Prague.

Koreň, M., Šoltés, R., Školek, J., Kyselová Z. & Celer, S. 2004: Abiotic and biotic environmental change indicators above timberline. Final report, mscr.

Krahulec, F., Chytrý, M. & Härtel, H. (2006): Smilkové trávníky a vřesoviště (*Calluno-Ulicetea*). In: Chytrý, M. (ed.): Vegetace České republiky. 1. Travinná a keříčková vegetace. Academia, Praha, in press.

Krajina, V. 1933: Die Pflanzengesellschaften des Mlynica-Tales in den Vysoké Tatry (Hohe Tatra). 2. Teil. Beih. Bot. Centralbl. 51: 1–224.

Králik, T. 1979: Rastlinné spoločenstvá dolín: Salatínska, Zadná Spálená a Spálená (Západné Tatry). M.Sc. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Kubíková, J. 1973: Vegetační a ekologické gradienty nad alpinskou hranicí lesa v Kříváňské Malé Fatře. Preslia 45: 327–337.

Li, J.-H., Alexander III, J., Ward, T., Del Tredici, P. & Nicholson, R. 2002: Phylogenetic relationships of Empetraceae inferred from sequences of chloroplast gene *matK* and nuclear ribosomal DNA ITS region. Molecular Phylogenetics and Evolution 25: 306 – 315.

Lišková, M. 1960: Rostlinná společenstva Tomanovy doliny v Západných Tatrách. M.Sc. Thesis, Faculty of Science, Masaryk University, Brno.

Maláriková, M. 1978: Rastlinné spoločenstvá Trnoveckej doliny (Západné Tatry). M.Sc. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Marhold, K. & Hindák, F. (eds) 1998: Zoznam nižších a vyšších rastlín Slovenska. Veda, Bratislava, 687 pp.

Miadok, D. 1983: Kräutige Ersatzgesellschaften des Gebirges Fabová hoľa II. Acta Fac. Rer. Natur. Univ. Comen., Bot. 30: 33–45.

Miadok, D. 1995: Vegetácia ŠPR Ďumbier. Univerzita Komenského, Bratislava, 72 pp.

Milová, M. & Removčíková, O. 1986: Nelesné rastlinné spoločenstvá Štátnej prírodnej rezervácie Šrámková. Ochr. Prír. 7: 255–263.

Milová, M. & Urbanová, V. 1989: Nelesné rastlinné spoločenstvá štátnej prírodnej rezervácie Prípor. Ochr. Prír. 10: 289–309.

Mucina, L. & Maglocký, Š. (eds) 1985: A list of vegetation units of Slovakia. Docum. Phytosociol. N. S. 9: 175–220.

Nordhagen, R. 1936: Versuch einer neuen Einteilung der subalpinen-alpinen Vegetation Norwegens. Bergens Mus. Arb., Ser. Natur. 7: 3–88.

Pawłowski, B. & Stecki, K. 1927: Die Pflanzenassoziationen des Tatra-Gebirges. IV. Teil: Die Pflanzenassoziationen des Miętusia-Tales und des Hauptmassivs der Czerwone Wierchy. Bull. Int. Acad. Polon. Sci., Cl. Sci. Math., Ser. B., Suppl. 2: 79–121.

Pawłowski, B. 1928: Guide des excursions en Pologne. 1. partie. Guide de l'excursion botanique dans les monts Tatras. Cinquième excursion phytogéographique internationale 1928: 1–61.

Pawłowski, B., Sokolowski, M. & Wallisch, K. 1928: Die Pflanzenassoziationen des Tatra-Gebirges. Teil 7. Die Pflanzenassoziationen und die Flora des Morskie Oko Tales. Bull. Int. Acad. Polon. Sci., Cl. Sci. Math., Ser. B., Suppl. 2: 205–272.

Petrík, A., Šibík, J. & Valachovič, M. 2005: The class *Carici rupestris-Kobresietea bellardii* Ohba 1974 also in the Western Carpathians**.** Hacquetia 4(1): 33–51.

Pietorová, E. 1977: Alpínska vegetácia Račkovej doliny (Západné Tatry). M.Sc. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Podani, J. 2001: SYN-TAX 2000. Computer Program for Data Analysis in Ecology and Systematics for Windows 95, 98 & NT. User's manual. Scientia Publ., Budapest, 53 pp.

Rivas-Martínez, S., Díaz, E. T., Fernández-González, F., Izco, J., Loidi, J., Lousã, M. & Penas, Á. 2002: Vascular plant communities of Spain and Portugal. Addenda to the syntaxonomical checklist of 2001. Part 1, 2. Itinera Geobotanica 15(1,2): 5–922.

Rivas-Martínez, S., Fernández-González, F., Loidi, J., Lousã, M. & Penas, A. 2001: Syntaxonomical checklist of vascular plant communities of Spain and Portugal to association level. Itinera Geobotanica 14: 5–341.

Rübel, E. 1911: Pflanzengeographische Monographie des Berninagebietes. Botan. Jahrbuch 47: 1–646.

Rübel, E. 1922: Geobotanische Untersuchungsmethoden. Verlag von Gebrüder Borntraeger, Berlin, 290 pp.

Schaminée, J. H. J., Hennekens, S. M. & Thébaud, G. 1993: A syntaxonomical study of subalpine heathland communities in West European low mountain ranges. J. Veget. Sci, 4: 125–134.

Schubert, R. 1960: Die zwergstrauchreichen azidiphilen Pflanzengesellschaften Mitteldeutschlands. Pflanzensoziol., Band. 11, Jena, 235 pp.

Sillinger, P. 1933: Monografická studie o vegetaci Nízkých Tater. Orbis, Praha, 339 pp.

Suda, J. 2002: New DNA ploidy level in *Empetrum* (Empetraceae) revealed by flow cytometry. Ann. Bot. Fennici 39: 133–141.

Suda, J., Malcová, R., Abazid, D., Banaš, M., Procházka, F., Šída, O. & Štech, M. 2004: Cytotype distribution in *Empetrum* (Ericaceae) at various spatial scales in the Czech republic. Folia Geobot. Phytotax. 39(2): 161–171.

Suzuki-Tokio, T. 1964: Übersicht auf die alpinen und subalpinen Pflanzengesellschaften im inneren Kurobe-Gebiet. Synthetic Science Research Organization of the Toyama University, Toyama.

Svoboda, P. 1939: Lesy Liptovských Tater. Studie o dřevinách a lesních společenstvech se zvláštním zřetelem k vlivům antropozooickým. Opera Bot. Čech. 1: 1–164.

Szafer, W., Pawłowski, B. & Kulczyński, S. 1923: Die Pflanzenassoziationen des Tatra-Gebirges. I. Teil: Die Pflanzenassoziationen des Chochołowska-Tales. Bull. Int. Acad. Polon. Sci., Cl. Sci. Math., Ser. B, Sci. Nath., Suppl. 1–66.

Szafer, W., Pawłowski, B. & Kulczyński, S. 1927: Die Pflanzenassoziationen des Tatra-Gebirges. III. Teil: Die Pflanzenassoziationen des Kościeliska-Tales. Bull. Int. Acad. Polon. Sci., Cl. Sci. Math., Ser. B, Sci. Nath., Suppl 2 (1926): 13–78.

Šibík, J. 2003: Nelesné spoločenstvá subalpínskeho stupňa Kriváskej Malej Fatry. M.Sc. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Šibík, J., Kliment, J. & Krajčiová, I. 2004: Zaujímavejšie floristické nálezy z Kriváskej Malej Fatry. Bull. Slov. Bot. Spoločn. 26: 61–69.

Šibík, J., Petrík, A. & Kliment, J. 2004: Syntaxonomical revision of plant communities with *Carex firma* and *Dryas octopetala* (alliance *Caricion firmae*) in the Western Carpathians. Polish Bot. J. 49(2): 181–202.

Šomšák, L. 1971: Vegetationsverhältnisse des Zipser Teiles des Slowakischen Erzgebirges -Slovenské rudohorie II. Acta Fac. Rer. Natur. Univ. Comen., Bot. 17: 61–97.

Šomšák, L. & Maláriková, M. 1983: Klassifikationsprobleme des Verbandes J*uncion trifidi* Krajina 1933 in der West-Tatra. Acta Fac. Rer. Natur. Univ. Comen., Bot. 30: 17–31.

Šomšák, L. & al. 1981: Vplyv zošľapovania na vegetáciu okolia Skalnatého plesa a Hrebienka vo Vysokých Tatrách. Zborn. Prác. Tatransk. Nár. Parku 22: 145–292.

Šmarda, J. 1950: Květena Hrubého Jeseníku. (Část sociologická). Čas. Morav. Mus. 35: 78–156. [Sep. pp. 1–87].

Šmarda, J., Lazebníček, J., Matoušová, L., Netopil, R., Paclová, L. & Pikula, J. 1971: K ekologii rostlinných společenstev Doliny Sedmi pramenů v Belanských Tatrách. Práce a štúdie Československej ochrany prírody pri SÚPSOP v Bratislave 3/4: 5–204.

Treskoňová, M. 1972: Hole strednej a západnej časti Nízkych Tatier. M.Sc. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Turečková, J. 1974: Subalpínska a alpínska vegetácia Jamnickej doliny (Západné Tatry). M.Sc. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Turis, P. 1997: Skalienka ležatá (*Loiseleuria procumbens* (L.) Desv.) na Slovensku. Ochr. Prír. 15: 63–66.

Unar, J., Unarová, M. & Šmarda, J. 1984: Vegetační poměry Tomanovy doliny a Žlebu spod Diery v Západních Tatrách. 1. Fytocenologické tabulky. Folia Fac. Sci. Nat. Univ. Purkynianae Brun., Ser. Biol. 25/10: 5–101.

Unar, J., Unarová, M. & Šmarda, J. 1985: Vegetační poměry Tomanovy doliny a Žlebu spod Diery v Západních Tatrách. 2. Charakteristika přírodních poměrů a rostlinných společenstev. Folia Fac. Sci. Nat. Univ. Purkynianae Brun., Ser. Biol. 26/14: 5–78.

van den Maarel, E. 1979: Transformation of cover-abundance values in phytosociology and its effect on community similarity. Vegetatio 39: 97–114.

Varečková, B. 1979: Subalpínska a alpínska vegetácia doliny Hliná (Západné Tatry). M.Sc. Thesis, Faculty of Natural Sciences, Comenius University, Bratislava.

Vaverčák, J. 1967: Prieskum spoločenstiev subalpínskeho a alpínskeho pásma v dolinovom celku Vajskovská, LZ Predajná, časť pod Skalkou. M. Sc. Thesis, Faculty of Forestry, University of Forestry and Wood Technology, Zvolen.

Walas, J. 1933: Roślinność Babiej Góry (Vegetation des Babia Góra-Gebietes in den Karpaten). Państwowa rada ochrony przyrody 2: 1–68.

Weber, H. E., Moravec, J. & Theurillat, J.-P. 2000: International Code of Phytosociological Nomenclature. Ed. 3. J. Veget. Sci. 11: 739–768.

APPENDIX:

Sources to the Table 1:

1a: ***Cetrario nivalis-Vaccinietum gaultherioidis typicum*:** 4 – Dúbravcová 1974: 67–68, r. 6, 27, 49, 124, Západné Tatry Mts; 6 – Dúbravcová & al. 1976, Table 9, r. 4, 5, 8–11, Západné Tatry Mts; 5 – Hadač 1956, Table 6, r. 12, 21, 40, 41, 43, Vysoké Tatry Mts; 2 – Hrabovcová 1976, Table 1, r. 12, 15, Západné Tatry Mts; 6 – Komárková 1964, Table 18, r. 1–4, 9, 10; Západné Tatry Mts; 1 – Koreň & al. 2004: 16–18, r. 5, Vysoké Tatry Mts; 2 – Krajina 1933, Table 50, r. 2, 3, Vysoké Tatry Mts; 7 – Maláriková 1978, Table 8, r. 1–7, Západné Tatry Mts; 2 – Miadok 1995: 23–24, r. 1, 3, Nízke Tatry Mts; 4 – Pietorová 1977, Table 7, r. 1–4, Západné Tatry Mts; 4 – Turečková 1974, Table 12, r. 1, 3–5, Západné Tatry Mts; 4 – Varečková 1979, Table 8, r. 14, 18, 29, 30, Západné Tatry Mts; 15 – Dúbravcová, ined., Západné Tatry Mts (7), Vysoké Tatry Mts (8); 1 – Šoltésová, ined., Vysoké Tatry Mts.

1b: ***Cetrario nivalis-Vaccinietum gaultherioidis empetretosum nigri*:** 6 – Altmannová 1983, Table 10, r. 1–6, Nízke Tatry Mts; 1 – Bělohlávková 1980, Table 20, r. 20, Západné Tatry Mts; 1 – Braun-Blanquet 1930: 115, Západné Tatry Mts; 5 – Dúbravcová 1974: 67–68, r. 60, 61, 223, 224, 234, Západné Tatry Mts; 5 – Dúbravcová & al. 1976, Table 9, r. 6, 7, 12–14, Západné Tatry Mts; 5 – Háberová & Šoltésová 1989, Table 4, r. 3–7, Vysoké Tatry Mts; 1 – Hadač 1956: 26, r. 57, Vysoké Tatry Mts; 3 – Hrabovcová 1976, Table 1, r. 18–20, Západné Tatry Mts; 3 – Humeňanský 1966: 18–19, r. 1–3, Nízke Tatry Mts; 2 – Komárková 1964, Table 18, r. 11; p. 66, Západné Tatry Mts; 9 – Koreň & al. 2004: 16–18, r. 1–4, p. 22–23, r. 1–5, Vysoké Tatry Mts; 7 – Krajina 1933, Table 50, r. 1, 4–9, Vysoké Tatry Mts; 6 – Králik 1979, Table 8, r. 117, 107, 78, 83, 79, 53, Západné Tatry Mts; 4 – Lišková 1960: 33–34, r. 1, 2, 4, 5, Západné Tatry Mts; 2 – Miadok 1995: 23–24, r. 2; p. 27–28, r. 2, Nízke Tatry Mts; 1 – Pietorová 1977, Table 7, r. 6, Západné Tatry Mts; 3 – Sillinger 1933: 278, r. 1–3, Nízke Tatry Mts; 5 – Šomšák & al. 1981, Table 6, r. 1–5, Vysoké Tatry Mts; 2 – Turečková 1974, Table 12, r. 8, 9, Západné Tatry Mts; 1 – Turis 1997: 64, r. 2, Nízke Tatry Mts; 5 – Unar & al. 1984, Table 7, r. 1–5, Západné Tatry Mts; 2 – Vaverčák 1967: 17–18, r. 1, 2, Nízke Tatry Mts; 14 – Dúbravcová, ined., Západné Tatry Mts (7), Vysoké Tatry Mts (2), Nízke Tatry Mts (5); 1 – Šibík & Šibíková, ined., Nízke Tatry Mts; 10 – Šoltésová, ined., Vysoké Tatry Mts.

2: ***Junco trifidi-Callunetum vulgaris*:** 5 – Dúbravcová 1974: 70–71, r. 5, 21, 229, 230, 231, Západné Tatry Mts; 2 – Hadač & al. 1969: 49–50, r. 125, 234, Belianske Tatry Mts; 4 – Komárková 1964, Table 18, r. 5–8, Západné Tatry Mts; 3 – Koreň & al. 2004: 18–19, r. 5; 19–20, r. 1, 2, Vysoké Tatry Mts; 6 – Krajina 1933, Table 51, r. 1–6, Vysoké Tatry Mts; 5 –Šomšák & al. 1981, Table 7, r. 1–5, Vysoké Tatry Mts.

3: ***Avenastro versicoloris-Vaccinietum myrtilli*:** 3 – Altmannová 1983, Table 12., rel. 1–3, Nízke Tatry Mts; 25 – Bělohlávková 1980, Table 18, r. 1–25, Krivánska Malá Fatra Mts; 1 – Dúbravcová & al. 1976, Table 9, r. 2, Západné Tatry Mts; 2 – Klika 1926: 69–70, Veľká Fatra Mts; 2 – Klika 1934: 23–24, Krivánska Malá Fatra Mts; 9 – Krajina 1933, Table 52, r. 1–4, Table 65, r. 1–5, Vysoké Tatry Mts; 5 – Králik 1979, Table 13, r. 74, 75, 82, 57, 45, Západné Tatry Mts; 3 – Kubíková 1973, Table 1, r. 9, 17, 11, Krivánska Malá Fatra Mts; 2 – Miadok 1995: 25, r. 1–2, Nízke Tatry Mts; 1 – Milová & Removčíková 1986: 257, r. 2, Krivánska Malá Fatra Mts; 3 – Sillinger 1933: 273, r. 1–3, Nízke Tatry Mts; 8 – Szafer & al. 1923, Table 7, rel. 1–8, Západné Tatry Mts; 2 – Szafer & al. 1927, Table 4, rel. 1–2, Západné Tatry Mts; 1 – Šibík 2003, Table 2, r. 1, Krivánska Malá Fatra Mts; 7 – Treskoňová 1972: 45, r. 2, 7, 8, 11, 23, 18, 15, Nízke Tatry Mts; 10 – Unar & al. 1984, Table 9, rel. 1–10, Západné Tatry Mts; 6 – Walas 1933, Table 8, r. 1–6, Mt. Babia hora; 4 – Kliment, ined., Lúčanská Malá Fatra Mts (1), Kubínska hoľa Mt. (1), Volovské vrchy Mts (2); 1 – Kliment & Kučera, ined., Lúčanská Malá Fatra Mts; 1 – Kliment & Mráz, ined., Volovské vrchy Mts.

4: ***Sphagno capillifolii-Empetretum nigri*:** 42 – Šibík & al., Table 2.

5: ***Cetrario islandicae-Vaccinietum vitis-idaeae*:** 41 – Šibík & al., Table 3.

6: ***Hylocomio splendentis-Vaccinietum vitis-idaeae*:** 25 – Šibík & al., Table 4.

Localities of the phytocoenological relevés:

The data on unpublished relevés or relevés from the manuscripts are arranged as follows: the name and description of a locality; the altitude; geographical coordinates; exposition, inclination, geological bedrock, relevé area, total cover, cover of individual layers, date, author(s) of relevé (RB =

Radmila Bělohlávková, AD = Anna Dobošová, ZD = Zuzana Dúbravcová, JK = Ján Kliment, PK = Peter Kučera, IŠ = Ivana Šibíková, JŠ = Jozef Šibík). Published relevés are documented by the abbreviated citation and localisation.

Table 2:

1. Unar & al. 1984, Table 10, r. 1, Západné Tatry Mts.
2. Unar & al. 1984, Table 10, r. 3, Západné Tatry Mts.
3. Unar & al. 1984, Table 10, r. 4, Západné Tatry Mts.
4. Unar & al. 1984, Table 10, r. 5, Západné Tatry Mts.
5. Unar & al. 1984, Table 10, r. 2, Západné Tatry Mts.
6. Západné Tatry Mts, Jalovecká dolina Valley (Bobrovecká dolina Valley), the rocky rib of a glen below the ground elevation 1807,7 m; 1730 m; N, 20 °, 12 m², E_1: 95 %, E_0: 60 %, 30. 8. 1974, ZD, (see also Dúbravcová & al. 1976, Table 9, r. 15).
7. Západné Tatry Mts, Jalovecká dolina Valley, Parichvost saddle, the slope below the saddle between the Jalovecká dolina Valley andRáztoka; 1800 m; WNW, 30 °, 50 m², E_1: 45 %, E_0: 85 %, 3. 9. 1975, ZD, (see also Dúbravcová & al. 1976, Table 9, r. 16).
8. Koreň & al. 2004: 18–19, r. 6, Vysoké Tatry Mts (ut *Cetrario-Vaccinietum vitis-idaeae*).
9. Západné Tatry Mts, Jalovecká dolina Valley (Bobrovecká dolina Valley), Grapy; NW, 15 °, 15 m², E_1: 80 %, E_0: 100 %, 27. 8. 1974, ZD, (see also Dúbravcová & al. 1976, Table 9, r. 17).
10. Západné Tatry Mts, Jalovecká dolina Valley (Bobrovecká dolina Valley), the enclave in dwarf-pine stands between the ground elevations 1807,7 m and 1687,3 m; 1670 m; W, 15 °, 12 m², E_1: 80 %, E_0: 100 %, 30. 8. 1974, ZD, (see also Dúbravcová & al. 1976, Table 9, r. 18).
11. Západné Tatry Mts, Jamnická dolina Valley, Ostrý Roháč Mt., the south-eastern fork; 1820 m; N, 45 °, 20 m², E_1: 65 %, E_0: 90 %, 14. 9. 1974, ZD, (see also Dúbravcová & al. 1976, Table 9, r. 19).
12. Západné Tatry Mts, Račková dolina Valley, the north-eastern slopes below Jakubina; 1700 m; NE, 45 °, 18 m², E_1: 85 %, E_0: 100 %, 12. 8. 1975, ZD, (see also Dúbravcová & al. 1976, Table 9, r. 20).
13. Miadok 1995: 27–28, r. 1, Nízke Tatry Mts (ut *Vaccinio-Empetretum*).
14. Západné Tatry Mts, Sivý vrch Mt., the north slope ca. 60 – 80 m below the top; about 1730 m; N, 30 °, limestone, 12 m², E_1: 50 %, E_0: 70 %, 12. 8. 1976, RB (see also Bělohlávková 1980, Table 20, r. 14).
15. Krivánska Malá Fatra Mts (KMF), Veľký Kriváň Mt., behind the quartzite scree near the ground elevation "Hrana Veľkého Kriváňa"; 1605 m; 49°11'26,6"; 19°01'39,8"; N, 5 °, quartzite, 25 m², total cover: 95 %, E_1: 70 %, E_0: 85 %, 22. 6. 2001; JŠ & AD (see also Šibík 2003, Table 1, r. 11).
16. KMF, Malý Kriváň Mt., the western slope, near the quartzite scree, optically opposite to the top of Meškalka Mt.; 1580 m; WSW, 25 °, quartzite, 25 m², total cover: 100 %, E_1: 95 %, E_0: 30 %, 18. 7. 2001; JŠ & IŠ (see also Šibík 2003, Table 1, r. 10).
17. KMF, Chleb Mt., the lateral quartzite ridge declining to the Révayovská dolina Valley, below the tourist path from the Snilovské sedlo Saddle to the tourist chalet below the Chleb Mt.; 1500 m; 49°11'14,7", 19°02'35,5"; NW, 25 °, quartzite, 25 m², total cover: 100 %, E_1: 80 %, E_0: 70 %, 1. 8. 2002; JŠ (see also Šibík 2003, Table 1, r. 15).
18. KMF, Chleb Mt., southern slopes, silicate ridge; 1525 m; NW, 5 °, 25 m², E_1: 70 %, E_0: 40 %, 15. 8. 1975; RB (see also Bělohlávková 1980, Table 2, r. 17).
19. KMF, Veľký Rozsutec Mt., northern slopes, the last jags of rocks towards the Poludňové skaly Mt.; 1520 m; N, 60 °, dolomites, 25 m², E_2: 10 %, E_1: 80 %, E_0: 50 %, 12. 8. 1975; RB (see also Bělohlávková 1980, Table 2, r. 15).
20. KMF, Veľký Rozsutec Mt., the northern slope below the top rocks; 1575 m; NW, 45 °, dolomites, 25 m², E_2: 2 %, E_1: 85 %, E_0: 10 %, 12. 8. 1975; RB (see also Bělohlávková 1980, Table 2, r. 18).
21. KMF, Veľký Rozsutec Mt., below the tourist path, near the crossroad point to the top and to the Medzirozsutce Saddle; 1573 m; 49°13'54,9"; 19°05'59,2"; NNW, 20 °, dolomites, 20 m², total cover: 100 %, E_1: 70 %, E_0: 85 %, 24. 8. 2002; JŠ & IŠ (see also Šibík 2003, Table 1, r. 5).
22. KMF, Veľký Rozsutec Mt., above the tourist path in the direction towards the Medzirozsutce Saddle, close to the top; 1598 m; 49°13'55,1"; 19°06'00,2"; NNE, 30 °, dolomites, 15 m², total cover: 100 %, E_2: 15 %, E_1: 75 %, E_0: 70 %, 30. 6. 2002; JŠ & IŠ (see also Šibík 2003, Table 1, r. 6).

23. KMF, Malý Kriváň Mt., above the avalanche glen descending to the Belianska dolina Valley, a smaller glen joining the big Markušov žľab Glen; 1500 m; NNW, 35 °, dolomitic limestone, 25 m², total cover: 100 %, E_1: 95 %, E_0: 60 %, 2. 9. 2002; JŠ (see also Šibík 2003, Table 1, r. 7).
24. KMF, Malý Kriváň Mt., the north-western slope below the rock mound on the top; 1640 m; NNW, 30 °, quartzite, 25 m², total cover: 100 %, E_1: 90 %, E_0: 85 %, 18. 7. 2001; JŠ & IŠ (see also Šibík 2003, Table 1, r. 12).
25. KMF, Malý Kriváň Mt., the north-western slope, the lower part near a depression dividing the Malý Kriváň Mt. from the main ridge; 1625 m; 49°10'53,6"; 18°59'27,0"; NW, 30 °, quartzite, 25 m², total cover: 99 %, E_1: 75 %, E_0: 80 %, 24. 7. 2002; JŠ & IŠ (see also Šibík 2003, Table 1, r. 13).
26. KMF, Veľký Kriváň, the northern slope below a quartzite scree near the ground elevation "Hrana Veľkého Kriváňa", the low part to the left from the quartzite scree (towards the Vrátna dolina Valley); 1600 m; N, 30 °, quartzite, 25 m², total cover: 100 %, E_1: 75 %, E_0: 95 %, 11. 7. 2001; JŠ (see also Šibík 2003, Table 1, r. 16).
27. KMF, Veľký Kriváň Mt., the lateral quartzite crest above the end of the Studenec Valley, above the chalet "Chata Voliarka", the enclave in dwarf-pine stands; 1407 m; 49°11'03,5"; 19°01'22,8"; N, 20 °, quartzite, 25 m², total cover: 100 %, E_1: 85 %, E_0: 60 %, 17. 6. 2004, JŠ.
28. KMF, Snilovské sedlo Saddle, northern slopes under the uppermost station of the cableway; 1490 m; 49°11'38,8"; 19°02'19,0"; NNE, 15 °, quartzite, 25 m², total cover: 100 %, E_1: 95 %, E_0: 60 %, 9. 7. 2002; JŠ & IŠ (see also Šibík 2003, Table 1, r. 9).
29. KMF, Malý Kriváň Mt., the western slope near the avalanche glen; 1600 m; W, 30 °, quartzite, 25 m², E_1: 80 %, E_0: 20 %, 20. 7. 1973, RB (see also Bělohlávková 1980, Table 20, r. 1).
30. KMF, Chleb Mt., the western slope of the lateral quartzite crest jutting to the tourist chalet "Chata pod Chlebom"; 1525 m; WNW, 10 °, quartzite, 20 m², E_1: 65 %, E_0: 30 %, 15. 8. 1975, RB (see also Bělohlávková 1980, Table 20, r. 3).
31. Západné Tatry Mts, Brestová Mt., the plateau below the top (in the direction of the tourist path to Zverovka); about 1850 m; 0 °, quartzite, 4 m², E_1: 70 %, E_0: 45 %, 12. 8. 1976, RB (see also Bělohlávková 1980, Table 20, r. 15).
32. KMF, Suchý – Biele skaly Mt., northern slopes, the enclave in dwarf-pine stands below the ridge rocks; 1425 m; N, 70 °, limestone, 12 m², E_1: 70 %, E_0: 40 %, 14. 8. 1975, RB (see also Bělohlávková 1980, Table 20, r. 2).
33. KMF, Suchý – Biele skaly Mt., northern slopes, the rocky slope ca. 20 m below the top, the enclave in dwarf-pine stands; 1400 m; N, 50 °, limestone, 8 m², E_1: 40 %, E_0: 90 %, 14. 8. 1975, RB (see also Bělohlávková 1980, Table 20, r. 11).
34. KMF, Malý Kriváň Mt., the shoulder northern slopes near the top from the Priehyb Saddle, about 50 m below the ridge; 1475 m; NE, 50 °, dolomites, 25 m², E_1: 60 %, E_0: 30 %, 1. 4. 1974, RB (see also Bělohlávková 1980, Table 20, r. 4).
35. KMF, Malý Kriváň Mt., northern slopes, the crest in glen between the top and the Priehyb Saddle; 1480 m; NW, 50 °, dolomites, 25 m², E_1: 60 %, E_0: 60 %, 16. 8. 1975, RB (see also Bělohlávková 1980, Table 20, r. 7).
36. KMF, Malý Kriváň Mt., northern slopes, the lateral crest between the first (smaller) and second (bigger) avalanche glens in the direction from Priehyb Saddle; 1450 m; W, 35 °, dolomites, 25 m², E_1: 70 %, E_0: 45 %, 21. 9. 1976, RB (see also Bělohlávková 1980, Table 20, r. 12).
37. KMF, Malý Kriváň Mt., the western slope; **1630 m; W, 30 °, quartzite, 25 m², E_1**: 60 %, E_0: 50 %, 17. **8. 1975, RB (see also B**ělohlávková 1980, Table 20, r. 5).
38. KMF, Malý Kriváň Mt., northern slopes, below the crest silicate rocks (about 30 m below the ridge) towards the Koniarky Saddle; 1560 m; NNW, 25 °, quartzite, 6 m², E_1: 45 %, E_0: 65 %, 21. 8. 1975, RB (see also Bělohlávková 1980, Table 20, r. 8).
39. KMF, Malý Kriváň Mt., the west-south-western slope; 1620 m; WSW, 40 °, quartzite, 25 m², E_1: 60 %, E_0: 50 %, 17. 8. 1975, RB (see also Bělohlávková 1980, Table 20, r. 6).
40. KMF, Malý Kriváň Mt., the western slope near the ridge; 1650 m; W, 25 °, quartzite, 25 m², E_1: 40 %, E_0: 80 %, 17. 8. 1975, RB (see also Bělohlávková 1980, Table 20, r. 10).
41. Chočské vrchy Mts, Veľký Choč Mt., the enclave in dwarf-pine stands below the top on the north-western slope; about 1550 m; NE, 20 °, dolomites, 2 m², E_1: 70 %, E_0: 50 %, 16. 7. 1976, RB (see also Bělohlávková 1980, Table 20, r. 13).
42. KMF, Biele skaly Mt., the north-western slope, the enclave in dwarf-pine stands below the crest

rocks; 1400 m; NW, 50 °, limestone, 15 m², E_1: 50 %, E_0: 80 %, 14. 8. 1975, RB (see also Bělohlávková 1980, Table 20, r. 9).

Table 3:

1. Západné Tatry Mts, Kamenistá dolina Valley, the slope of the rocky glen with flowing water below the Bystrá Mt.; 1670 m; NE, 50 °, 15 m², E_1: 95 %, E_0: 60 %, 29. 8. 1973, ZD.
2. Krivánska Malá Fatra Mts (KMF), Koniarky Mt., near the obscure saddle between the Hole Mt. and the Koniarky Mt., where a non-marked tourist path from Chrapáky comes to; 1470 m; 49°11'43,0"; 19°00'22,8"; NNW, 10 °, coloured slate of keuper, 12 m², total cover: 95 %, E_2: 5 %, E_1: 95 %, E_0: 35 %, 11. 7. 2002; JŠ & IŠ (see also Šibík 2003, Table 2, r. 3).
3. KMF, Malý Kriváň Mt., the south-western slope, near the Pleistocene quartzite boulders; 1607 m; 49°10'46,8"; 18°59'31,3"; W, 30 °, quartzite, 25 m², total cover: 85 %, E_1: 70 %, E_0: 55 %, 24. 7. 2002; JŠ & IŠ (see also Šibík 2003, Table 2, r. 4).
4. Milová & Urbanová 1989: 302, r. 1, Krivánska Malá Fatra Mts (ut *Cetrario-Vaccinietum gaultherioidis empetretosum*).
5. Walas 1933, Table 8, r. 7, Babia hora Mt. (ut *Vaccinietum myrtilli*).
6. Šibík & al. 2004: 64, Krivánska Malá Fatra Mts.
7. KMF, Malý Kriváň Mt., northern slopes, the ridge of lateral rock crest towards the Koniarky Mt.; 1475 m; N, 20 °, dolomites, 15 m², E_1: 98 %, E_0: 5 %, 17. 7. 1978, RB (see also Bělohlávková 1980, Table 20, r. 17).
8. KMF, Malý Kriváň Mt., northern slopes, the north-western ridge of a slightly convex crest in the end of the first avalanche glen from the Priehyb Saddle; 1500 m; NW, 30 °, dolomites, 25 m², E_1: 90 %, E_0: 20 %, 17. 7. 1978, RB (see also Bělohlávková 1980, Table 20, r. 19).
9. KMF, Malý Kriváň Mt., the west-north-western slope, a moderately convex part; 1600 m; WNW, 30 °, quartzite, 25 m², E_1: 50 %, E_0: 60 %, 20. 7. 1973, RB (see also Bělohlávková 1980, Table 20, r. 18).
10. KMF, Veľký Kriváň Mt., near the ground elevation "Hrana Veľkého Kriváňa", the top of the boulder Pleistocene quartzite scree; 1618 m; 49°11'25,5"; 19°01'40,3"; NW, 25 °, quartzite, 15 m², total cover: 75 %, E_1: 65 %, E_0: 30 %, 4. 8. 2001; JŠ & IŠ (see also Šibík 2003, Table 2, r. 6).
11. KMF, Malý Kriváň Mt., the western slope; 1610 m; W, 30 °, quartzite, 25 m², E_1: 98 %, E_0: 5 %, 18. 7. 1978, RB (see also Bělohlávková 1980, Table 20, r. 16).
12. KMF, Malý Kriváň Mt., the quartzite scree near the Markušov žľab Glen, near the crest on the top of quartzite boulders; 1600 m; 49°11'07,2"; 18°59'53,7"; WNW, 35 °, quartzite, 20 m², total cover: 85 %, E_1: 80 %, E_0: 35 %, 25. 7. 2002; JŠ & IŠ (see also Šibík 2003, Table 2, r. 2).
13. KMF, Malý Kriváň Mt., the low part of boulder quartzite scree near the Markušov žľab Glen; 1585 m; 49°11'07,4"; 18°59'52,7"; WNW, 40 °, quartzite, 25 m², total cover: 75 %, E_1: 70 %, E_0: 60 %, 11. 7. 2001; JŠ (see also Šibík 2003, Table 1, r. 8).
14. KMF, Koniarky Mt., near the top, to the right from a tourist path from the Bublen Saddle to the Hole Mt., below the erosion furrow; 1520 m; 49°11'38,0"; 19°00'35,3"; N, 15 °, coloured slate of keuper, 25 m², celková pokryvnosť: 98 %, E_1: 90 %, E_0: 40 %, 10. 7. 2002; JŠ, IŠ & AD (see also Šibík 2003, Table 2, r. 5).
15. KMF, Veľký Kriváň Mt., the high margin of slope below the quartzite scree, just below the ground elevation "Hrana Veľkého Kriváňa"; 1625 m; NW, 25 °, quartzite, 25 m², total cover: 98 %, E_1: 90 %, E_0: 70 %, 11. 7. 2001; JŠ (see also Šibík 2003, Table 1, r. 14).
16. Hadač & al. 1969: 48, r. 147, Belianske Tatry Mts.
17. Hadač & al. 1969: 48, r. 229, Belianske Tatry Mts.
18. Háberová & Šoltésová 1989, Table 4, r. 2, Vysoké Tatry Mts.
19. Koreň & al. 2004: 18–19, r. 3, Vysoké Tatry Mts.
20. Koreň & al. 2004: 18–19, r. 1, Vysoké Tatry Mts.
21. Západné Tatry Mts, Jamnická dolina Valley, Plačlivô Mt.; 1860 m; NE, 50 °, 16 m², E_1: 100 %, E_0: 100 %, 15. 7. 1973; ZD (see also Dúbravcová & al. 1976, Table 9, r. 3).
22. Koreň & al. 2004: 18–19, r. 2, Vysoké Tatry Mts.
23. Koreň & al. 2004: 18–19, r. 4, Vysoké Tatry Mts.
24. Horák 1971, Table 3, r. 49, Západné Tatry Mts.
25. Západné Tatry Mts, Jamnická dolina Valley, a moraine covered with vegetation below the Ostrý Roháč Mt.; 1800 m; NE, 35 °, 20 m², E_1: 60 %, E_0: 80 %, 14. 9. 1974; ZD (see also Dúbravcová & al. 1976, Table 9, r. 1).
26. Miadok 1995: 26, r. 1, Nízke Tatry Mts.

27. KMF, Biele skaly Mt., northern slopes, the shoulder below the ridge; 1400 m; N, 50 °, limestone, 20 m², E_1: 70 %, E_0: 95 %, 14. 8. 1975, RB (see also Bělohlávková 1980, Table 2, r. 8).
28. Miadok 1995: 26, r. 2, Nízke Tatry Mts.
29. Miadok 1995: 26, r. 3, Nízke Tatry Mts.
30. KMF, Malý Kriváň Mt., the ridge from the Koniarky Saddle, northern slopes, a steep part below the top rocks; 1550 m; NW, 30 °, dolomites, 15 m², E_1: 90 %, E_0: 50 %, 22. 7. 1973, RB (see also Bělohlávková 1980, Table 2, r. 7).
31. KMF, Koniarky Mt., the ridge from the top to the Hole Mt. and towards the village Belá (near the green tourist path), northern slopes; 1450 m; N, 30 °, coloured slate of keuper, 25 m², E_1: 80 %, E_0: 30 %, 17. 8. 1975, RB (see also Bělohlávková 1980, Table 2, r. 9).
32. Koreň & al. 2004: 18–19, r. 7, Vysoké Tatry Mts.
33. KMF, Koniarky Mt., the top plateau; 1475 m; N, 10 °, coloured slate of keuper, 25 m², E_1: 95 %, E_0: 50 %, 9. 8. 1973, RB (see also Bělohlávková 1980, Table 2, r. 6).
34. Lúčanská Malá Fatra Mts (LMF), the massif of Martinské hole, ground elevation Humience (1398 m a. s. l.), windy area near the top of the crest; 1396 m; 49°04'06,5"; 18°48'53,4"; S, 30 °, 25 m², E_1: 75–80 %, E_0: 20 %, 3. 9. 2004, JK & PK.
35. LMF, the massif of Martinské hole, Veterné Mt., the northern slope, eastward from the top, below the saddle; 1433 m; 49°04'50,3"; 18°48'23,4"; N, 15 °, 25 m², total cover: 100 %, E_1: 75 %, E_0: 35–40 %, 7. 9. 2004, JK.
36. KMF, Stoh Mt., the top plateau; 1600 m; NW, 5 °, marl limestone, 20 m², E_1: 98 %, E_0: 40 %, 15. 7. 1973; RB (see also Bělohlávková 1980, Table 2, r. 1).
37. KMF, Malý Kriváň Mt., the ridge from Priehyb Saddle; 1475 m; W, 20 °, dolomite, 25 m², E_1: 98 %, E_0: 15 %, 21. 7. 1973; RB (see also Bělohlávková 1980, Table 2, r. 2).
38. KMF, Malý Kriváň Mt., the ridge from Koniarky Saddle, an exposed plateau on rock ridge at the contact zone between the silicate and carbonate bedrock; 1575 m; 0 °, quartzite, 8 m², E_1: 98 %, E_0: 30 %, 23. 8. 1973; RB (see also Bělohlávková 1980, Table 2, r. 3).
39. KMF, Severné Steny Mt., the south-eastern slope; 1475 m; SE, 30 °, marl limestone, 25 m², E_2: 3 %, E_1: 98 %, E_0: 20 %, 18. 8. 1973, RB (see also Bělohlávková 1980, Table 2, r. 4).
40. KMF, Malý Kriváň Mt., the ridge from the Koniarky Saddle, northern slopes; 1500 m; WNW, 35 °, dolomite, 25 m², E_2: 30 %, E_1: 95 %, E_0: 20 %, 23. 8. 1973, RB (see also Bělohlávková 1980, Table 2, r. 5).
41. Milová & Urbanová 1989: 299–301, Krivánska Malá Fatra Mts.

Table 4:

1. Hadač & al. 1969: 44, r. 12, Belianske Tatry Mts (ut *Vaccinio-Empetretum nigri*).
2. Hadač & al. 1969: 46, r. 219, Belianske Tatry Mts (ut *Cetrario-Vaccinietum uliginosi tatricum*).
3. Hadač & al. 1969: 44, r. 206, Belianske Tatry Mts (ut *Vaccinio-Empetretum nigri*).
4. Hadač & al. 1969: 44, r. 238, Belianske Tatry Mts (ut *Vaccinio-Empetretum nigri*).
5. Braun-Blanquet 1930: 117, Belianske Tatry Mts (ut *Empetreto-Vaccinietum*).
6. Hadač & al. 1969: 44, r. 138, Belianske Tatry Mts (ut *Vaccinio-Empetretum nigri*).
7. Hadač & al. 1969: 44, r. 213, Belianske Tatry Mts (ut *Vaccinio-Empetretum nigri*).
8. Šmarda & al. 1971, Table 13, r. 54, Belianske Tatry Mts (ut *Empetreto-Vaccinietum uliginosi tatricum*).
9. Šmarda & al. 1971, Table 13, r. 116, Belianske Tatry Mts (ut *Empetreto-Vaccinietum uliginosi tatricum*).
10. Šmarda & al. 1971, Table 13, r. 117, Belianske Tatry Mts (ut *Empetreto-Vaccinietum uliginosi tatricum*).
11. Šmarda & al. 1971, Table 13, r. 118, Belianske Tatry Mts (ut *Empetreto-Vaccinietum uliginosi tatricum*).
12. Šmarda & al. 1971, Table 13, r. 119, Belianske Tatry Mts (ut *Empetreto-Vaccinietum uliginosi tatricum*).
13. Krivánska Malá Fatra Mts (KMF), Malý Kriváň Mt., near the top of the rock formation "Sviňa"; 1560 m; 49°11'16,5"; 19°00'04,9"; NNE, 45 °, dolomite, 16 m², total cover: 95 %, E_1: 70 %, E_0: 90 %, 21. 7. 2001; JŠ, IŠ & ZD (see also Šibík 2003, Table 2, r. 7).
14. KMF, Malý Kriváň Mt., the steep "costate" formations declining to the Belianska dolina Valley, just behind the Svinský žľab Glen, just below the ridge; 1585 m; 49°11'11,6"; 19°00'00,4"; N, 45 °, dolomitic limestone, 8 m², total cover: 95 %, E_1: 85 %, E_0: 50 %, 31. 7. 2002; JŠ (see also Šibík 2003, Table 2, r. 8).
15. KMF, Chleb Mt., the edge of the lateral ridge declining to the Vrátna dolina Valley, forming marked western wall of the Chlebské kotle; 1628 m; 49°11'21,3"; 19°03'09,5"; NNE, 30 °,

dolomite, 20 m², total cover: 100 %, E_1: 95 %, E_0: 50 %, 12. 8. 2001; JŠ (see also Šibík 2003, Table 2, r. 9).

16. KMF, Malý Kriváň Mt., the northern slope, below the top, above the avalanche glen near the scree, optically opposite to the Koniarky; 1590 m; 49°10'59,8"; 18°59'31,2"; N, 30 °, dolomitic limestone, 25 m², total cover: 100 %, E_1: 90 %, E_0: 80 %, 19. 8. 2002; JŠ & IŠ (see also Šibík 2003, Table 1, r. 1).
17. KMF, Malý Kriváň Mt., a mosaic community on the northern slope, above the numerous ventilation hollows of Karst formations; 1570 m; 49°11'00,7"; 18°59'29,5"; N, 25 °, dolomitic limestone, 25 m², total cover: 100 %, E_1: 85 %, E_0: 75 %, 19. 8. 2002; JŠ & IŠ (see also Šibík 2003, Table 1, r. 2).
18. KMF, Malý Kriváň Mt., above the glen declining to the Belianska dolina Valley, a conspicuous convex crest declining to the valley; 1580 m; 49°10'59,8"; 18°59'26,1"; NW, 35 °, dolomitic limestone, 25 m², total cover: 100 %, E_1: 95 %, E_0: 60 %, 19. 8. 2002; JŠ & IŠ (see also Šibík 2003, Table 1, r. 3).
19. KMF, Malý Kriváň Mt., the northern slope above the avalanche glen, near the Malá Fatra abyss; 1585 m; 49°10'57,2"; 18°59'22,2"; N, 40 °, dolomitic limestone, 20 m², total cover: 100 %, E_2: 20 %, E_1: 65 %, E_0: 85 %, 24. 7. 2002; JŠ & IŠ (see also Šibík 2003, Table 1, r. 4).
20. KMF, Chleb Mt., the boulder stepped slope of the moraine on the bottom of a cirque; 1500 m; NW, 30 °, limestone, 15 m², E_1: 80 %, E_0: 25 %, 15. 8. 1975; RB (see also Bělohlávková 1980, Table 2, r. 10).
21. KMF, Veľký Rozsutec Mt., the north slope below the crest near the top; 1575 m; NNW, 50 °, dolomite, 20 m², E_1: 90 %, E_0: 10 %, 12. 8. 1975; RB (see also Bělohlávková 1980, Table 2, r. 11).
22. KMF, Chleb Mt., the loamy boulder scree in the bottom of the cirque; 1475 m; N, 25 °, limestone, 20 m², E_1: 80 %, E_0: 25 %, 15. 8. 1975; RB (see also Bělohlávková 1980, Table 2, r. 13).
23. KMF, Malý Kriváň Mt., the northern slope, the plateau on a rock crest in the upper part of the glen covered with dwarf-pine stands and other shrubs; 1570 m; WNW, 30 °, dolomite, 25 m², E_1: 50 %, E_0: 50 %, 16. 8. 1975; RB (see also Bělohlávková 1980, Table 2, r. 12).
24. KMF, Malý Kriváň Mt., northern slopes of the top crests before the big glen (from Koniarky Mt.); 1550 m; N, 40 °, dolomite, 25 m², E_1: 75 %, E_0: 40 %, 16. 8. 1975; RB (see also Bělohlávková 1980, Table 2, r. 14).
25. KMF, Malý Kriváň Mt., northern slopes, rocks covered with vegetation in the big glen; 1550 m; N, 60 °, dolomite, 25 m², E_1: 60 %, E_0: 60 %, 16. 8. 1975; RB (see also Bělohlávková 1980, Table 2, r. 16).

Recieved 13. 12. 2005
Revision recieved 26. 5. 2006
Accepted 2. 6. 2006

Table 1: Comparison of the West Carpathian plant communities of the class *Loiseleurio-Vaccinietea* (a brief synoptic table).

Table 2: Primerjava rastlinskih združb razreda *Loiseleurio-Vaccinietea* Zahodnih Karpatov (skrajšana sinoptična tabela).

1 – *Cetrario nivalis-Vaccinietum gaultherioidis*; 1a – *C.-V. typicum*; 1b – *C.-V. empetretosum nigri*; 2 – *Junco-Callunetum vulgaris*; 3 – *Avenastro versicoloris-Vaccinietum myrtilli*; 4 – *Sphagno capillifolii-Empetretum nigri*; 5 – *Cetrario-Vaccinietum vitis-idaeae*; 6 – *Hylocomio-Vaccinietum vitis-idaeae*; 7 – *Loiseleurio-Vaccinion* (columns 1 & 2); 8 – *Vaccinion myrtilli* (columns 3 – 6).

Number of column			**1a**	**1b**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Number of relevés			63	104	167	25	96	42	41	25	192	204
Average number of taxa			20	21	21	21	18	16	16	30	21	19
Differential taxa of the subassociations												
CC	*Festuca supina*	D1a,7	**86^{3}**	49^{2}	63^{3}	44^{3}	25^{2}	24^{2}	49^{3}	68^{3}	**60^{3}**	35^{3}
	Cladonia rangiferina (E_0)	D1a,7	**68^{3}**	32^{3}	46^{3}	56^{3}	17^{3}	21^{2}	15^{2}	40^{3}	**47^{3}**	20^{3}
	Alectoria ochroleuca (E_0)	D1a	**51^{3}**	7^{2}	23^{3}	16^{2}	-	14^{2}	5^{2}	4^{2}	22^{3}	4^{2}
	Cladonia stellaris (E_0)	D1a	**11^{2}**	-	4^{2}	-	1^{2}	-	2^{3}	4^{2}	4^{2}	1^{2}
LV	*Empetrum nigrum* s. l.	Cc,D1b	8^{2}	**82^{6}**	54^{6}	8^{1}	11^{2}	83^{6}	44^{7}	80^{5}	48^{6}	41^{6}
NS	*Homogyne alpina*	D1b	29^{2}	**59^{3}**	47^{3}	20^{2}	78^{3}	74^{3}	32^{3}	48^{3}	44^{3}	64^{3}
	Huperzia selago	D1b	19^{2}	**42^{2}**	34^{2}	-	6^{2}	36^{2}	46^{2}	44^{2}	29^{2}	25^{2}
	Pleurozium schreberi (E_0)	D1b	17^{3}	**37^{3}**	29^{3}	36^{4}	47^{4}	36^{4}	37^{3}	64^{3}	30^{3}	45^{4}
Cv	*Trommsdorfia uniflora*	D1b	-	**13^{2}**	8^{2}	24^{3}	7^{2}	-	-	12^{2}	10^{2}	5^{2}
Diagnostic taxa of the associations												
lv	*Vaccinium gaultherioides*	T1,C7	100^{7}	88^{7}	**92^{7}**	24^{2}	8^{2}	24^{4}	2^{2}	48^{7}	**83^{7}**	15^{5}
CC	*Campanula alpina*	D1,7	89^{3}	89^{3}	**89^{3}**	56^{3}	11^{2}	21^{2}	27^{3}	12^{2}	**85^{3}**	17^{3}
	Carex sempervirens	D1,7	37^{2}	54^{2}	**47^{2}**	12^{3}	11^{2}	2^{2}	12^{2}	24^{2}	**43^{2}**	11^{2}
SH	*Salix herbacea*	D1,7	21^{2}	15^{4}	**17^{3}**	-	-	-	-	-	**15^{3}**	-
	Polytrichum alpinum (E_0)	D1	11^{2}	20^{3}	**17^{3}**	-	7^{3}	14^{2}	15^{4}	16^{3}	15^{3}	11^{3}
CK	*Bistorta vivipara*	D1,6	19^{3}	9^{2}	**13^{2}**	-	1^{2}	2^{2}	7^{3}	**72^{2}**	11^{2}	11^{2}
	Doronicum stiriacum	D1	17^{2}	8^{2}	**11^{2}**	-	-	10^{2}	5^{2}	-	10^{2}	3^{2}
CU	*Calluna vulgaris*	C2	16^{3}	12^{2}	13^{2}	**100^{7}**	15^{3}	2^{2}	2^{2}	-	24^{5}	8^{2}
pm	*Juniperus sibirica*	D2	19^{2}	15^{2}	17^{2}	**48^{2}**	10^{2}	-	5^{2}	-	21^{2}	6^{2}
pm	*Pinus mugo*	D2	8^{2}	20^{2}	16^{2}	**40^{2}**	14^{2}	10^{2}	24^{2}	16^{2}	19^{2}	15^{2}
Cv	*Solidago *minuta*	D2	11^{2}	12^{2}	11^{2}	**40^{2}**	32^{2}	10^{2}	5^{2}	20^{2}	15^{2}	21^{2}
cv	*Calamagrostis villosa*	D2,3	3^{2}	22^{3}	15^{2}	**44^{2}**	**56^{3}**	24^{2}	20^{2}	20^{3}	19^{2}	38^{3}
ns	*Ligusticum mutellina*	D3	30^{2}	47^{2}	41^{2}	24^{2}	**40^{2}**	12^{3}	5^{2}	8^{2}	39^{2}	23^{2}
NS	*Potentilla aurea*	D3	21^{2}	10^{2}	14^{2}	28^{2}	**36^{2}**	-	7^{2}	12^{2}	16^{2}	20^{2}
MU, NS	*Hypericum maculatum*	D3	-	1^{2}	1^{2}	-	**34^{2}**	-	2^{2}	-	1^{2}	17^{2}
MU	*Gentiana asclepiadea*	D3	-	-	-	8^{2}	**32^{2}**	-	2^{2}	-	1^{2}	16^{2}
	Oreogeum montanum	D3	10^{2}	9^{2}	9^{2}	4^{1}	**30^{2}**	-	-	-	8^{2}	14^{2}
MU	*Veratrum *lobelianum*	D3	2^{1}	1^{1}	1^{1}	-	**29^{2}**	-	-	-	1^{1}	14^{2}
SH, Cv	*Festuca picturata*	D3	2^{3}	2^{2}	2^{2}	-	**19^{2}**	-	2^{2}	-	2^{2}	9^{2}
pm, vp	*Dryopteris dilatata* s. l.	D3	-	1^{2}	1^{2}	-	**18^{2}**	-	-	-	1^{2}	9^{2}
aa	*Athyrium distentifolium*	D3	-	-	-	-	**18^{3}**	-	-	-	-	8^{3}
MU	*Acetosa arifolia*	D3	-	-	-	-	**17^{3}**	5^{2}	-	-	-	9^{3}
ca	*Calamagrostis arundinacea*	D3	-	-	-	-	**16^{3}**	-	-	4^{7}	-	8^{3}
	Deschampsia cespitosa	D3	-	-	-	-	**14^{3}**	-	2^{2}	-	-	7^{3}
	Oxalis acetosella	D3	-	-	-	-	**14^{3}**	2^{2}	-	-	-	7^{3}
	Sphagnum sp. div. (E_0)	D4,8	3^{2}	10^{2}	7^{2}	4^{1}	11^{3}	**100^{7}**	7^{2}	36^{4}	7^{2}	**32^{6}**
OS	*Polytrichum strictum* (E_0)	D4,8	8^{4}	16^{4}	13^{4}	12^{2}	11^{2}	**90^{4}**	39^{4}	56^{5}	13^{4}	**39^{4}**
CK, ES	*Festuca versicolor*	D6	-	2^{3}	1^{2}	8^{2}	-	17^{2}	17^{2}	**68^{3}**	2^{2}	15^{2}
fv	*Bartsia alpina*	D6	6^{2}	3^{2}	4^{2}	-	2^{2}	-	12^{2}	**64^{2}**	4^{2}	11^{2}
CK,cf	*Dryas octopetala*	D6	-	-	-	-	-	-	5^{2}	**56^{2}**	-	8^{2}
MU	*Bistorta major*	D6	8^{3}	9^{2}	8^{2}	4^{2}	12^{3}	24^{2}	5^{2}	**52^{3}**	8^{2}	18^{3}
ES	*Phyteuma orbiculare*	D6	-	-	-	-	-	-	10^{2}	**44^{2}**	-	7^{2}

Number of column			1a	1b	1	2	3	4	5	6	7	8
	Ranunculus breyninus	D6	-	-	-	-	-	-	-	**24²**	-	3²
CK, ac	*Salix reticulata*	D6	-	-	-	-	-	-	-	**24³**	-	3³
fv	*Hedysarum hedysaroides*	D6	-	-	-	-	-	-	-	**24²**	-	3²
Loiseleurio-Vaccinion												
CC	*Juncus trifidus*	D7	92³	89³	90³	72³	11²	29²	20⁴	12³	**88³**	17³
CC, cv	*Hieracium alpinum*	D7	84²	78²	80²	76²	22²	24²	27²	24³	**80²**	24²
CC	*Oreochloa disticha*	D7	70²	63³	66²	56²	7²	31²	27³	24²	**65²**	18²
CC, cv	*Avenula versicolor*	D7	71³	58²	63²	56²	14²	5²	15²	-	**62²**	10²
CC	*Agrostis rupestris*	D7	52³	46³	49³	52³	7²	10²	10³	-	**49³**	7²
	Cladonia gracilis (E_0)	D7	48³	40³	43³	60¹	9²	5²	7³	4²	**45²**	7²
CC, cv	*Pulsatilla scherfelii*	D7	52³	38³	43³	40²	4²	7³	7³	-	**43³**	5³
	Cladonia arbuscula (E_0)	D7	56³	29³	39³	60²	4²	2²	7³	20³	**42³**	6³
	Primula minima	D7	33²	27²	29²	20²	-	2²	5³	-	**28²**	1³
lv	*Loiseleuria procumbens*	C7	-	1⁵	1⁵	-	-	-	-	-	**1⁵**	-
Vaccinion myrtilli												
Cv	*Luzula luzoloides*	D2,8	16²	9¹	11²	**40²**	68³	5²	12³	68²	15²	**44³**
	Dicranum scoparium (E_0)	D8	6²	15⁴	12³	4¹	38³	33³	22³	72³	11³	**38³**
	Hylocomium splendens (E_0)	D8	3³	11³	8³	12³	28⁵	31³	15⁴	84⁶	8³	**33⁵**
pm, vp	*Sorbus *glabrata*	D8	-	3¹	2¹	-	21²	29²	27²	28²	2¹	**25²**
cf	*Salix alpina*	D8	-	-	-	-	-	19²	7²	60⁴	-	**13³**
	Luzula sylvatica	D8	-	-	-	-	18²	7²	5²	8²	-	**12²**
Rhododendro-Vaccinietalia*, *Loiseleurio-Vaccinietea												
	Vaccinium vitis-idaea	Cc	97³	70³	80³	96⁴	76⁴	100⁴	100⁷	92⁵	82³	88⁵
	Vaccinium myrtillus	Cc	81³	90⁴	87⁴	88³	100⁸	100⁵	85⁵	64⁵	87⁴	93⁷
Caricetea curvulae, Carici rupestris-Kobresietea, Elyno-Seslerietea												
CK, Cv	*Campanula tatrae*		11¹	10²	10²	28²	4²	-	-	20²	12²	4²
fv	*Salix retusa s. l.*		11³	8⁴	9³	-	-	2³	2⁴	4⁵	8³	1⁴
CC	*Senecio *carniolicus*		8²	8²	8²	-	1¹	-	2³	-	7²	1²
ES, fv	*Pedicularis verticillata*		3¹	1¹	2¹	-	-	2²	12²	16²	2¹	5²
CK	*Carex atrata*		3²	2²	2²	-	-	2²	5²	8²	2²	2²
ES	*Dianthus nitidus*		-	-	-	-	-	-	7²	32²	-	5²
st	*Sesleria tatrae*		-	-	-	-	-	5²	-	24³	-	4²
cf	*Carex firma*		-	-	-	-	-	2²	-	20²	-	3²
ES	*Biscutella laevigata*		-	-	-	-	-	2¹	5²	24²	-	4²
ES	*Galium anisophyllon*		-	-	-	-	1²	2²	22²	20²	-	8²
as	*Sesleria albicans*		-	-	-	-	1⁵	-	17³	16²	-	6³
oe	*Androsace chamaejasme*		-	-	-	-	-	-	-	24²	-	3²
Mulgedio-Aconitetea												
Cv	*Anemone narcissiflora*		5²	5³	5²	4¹	1²	2²	2²	36²	5²	6²
Cv	*Gentiana punctata*		5¹	28²	19²	20¹	19²	17²	7²	-	19²	14²
cv	*Sempervivum montanum* agg.		2²	5¹	4²	4¹	6¹	-	-	-	4¹	3¹
NS,st	*Anthoxanthum alpinum*		8²	13²	11²	24¹	22²	-	12⁵	44²	13²	18²
	*Achillea *alpestris*		2¹	-	1¹	-	6²	-	10³	8²	1¹	6²
Cv	*Campanula serrata*		-	-	-	-	12²	-	10²	4²	-	8²
Other taxa												
	Avenella flexuosa		46²	55²	51²	72³	90⁴	79³	71⁴	40³	54²	77⁴
	Soldanella carpatica		16²	34²	27²	12²	24²	14²	20³	52³	25²	25²
SH	*Luzula alpinopilosa*		6²	19²	14²	8¹	7²	26²	5²	-	14²	10²
NS	*Nardus stricta*		2²	3²	2²	12²	23³	5²	10³	-	4²	14³
	Euphrasia tatrae		11¹	8¹	9¹	4¹	1¹	-	-	-	8¹	+¹
	*Senecio *carpathicus*		2²	8³	5²	12²	2²	-	-	-	6²	1²
SH	*Leucanthemopsis alpina*		5¹	5²	5²	-	1¹	2³	2²	-	4²	1²
VP	*Picea abies*		-	5²	3²	8²	8³	10³	12²	28²	4²	12³
	Melampyrum pratense		-	1¹	1¹	-	9²	12²	5²	8²	1¹	9²
	Rubus idaeus		-	1²	1²	-	18³	7²	5²	-	1²	11³
	Ranunculus pseudomontanus		3²	8²	6²	4²	3²	2²	12²	4²	6²	5²
	Melampyrum sylvaticum		-	2²	1²	4²	22²	17²	-	4²	2²	14²

Number of column		1a	1b	1	2	3	4	5	6	7	8
pm, ss	*Salix silesiaca*	-	2^{2}	1^{2}	-	7^{2}	2^{2}	5^{4}	8^{2}	1^{2}	6^{2}
	Hieracium lachenalii	-	-	-	-	8^{2}	10^{2}	2^{2}	4^{2}	-	7^{2}
	Parnassia palustris	-	-	-	-	1^{2}	2^{2}	5^{2}	24^{2}	-	5^{2}
	Poa alpina	-	-	-	-	1^{2}	2^{2}	2^{2}	20^{2}	-	4^{2}
	Saxifraga aizoides	-	-	-	-	-	2^{2}	-	24^{2}	-	3^{2}
AT	*Saxifraga paniculata*	-	-	-	-	-	-	2^{2}	20^{2}	-	3^{2}
pc	*Crepis jacquinii*	-	-	-	-	1^{1}	-	-	20^{2}	-	3^{2}
Bryophytes & Lichens (E_0)											
	Cetraria islandica	100^{7}	85^{6}	90^{6}	88^{5}	58^{4}	52^{4}	95^{6}	76^{3}	90^{6}	67^{4}
	Cladonia coccifera	27^{2}	26^{3}	26^{3}	32^{2}	1^{2}	7^{2}	15^{2}	16^{3}	27^{2}	7^{2}
	Cladonia sp.	5^{1}	15^{3}	11^{3}	8^{4}	1^{2}	7^{2}	24^{3}	8^{2}	11^{3}	8^{3}
	Ptilidium ciliare	3^{2}	3^{2}	3^{2}	16^{2}	5^{1}	2^{2}	5^{4}	20^{2}	5^{2}	6^{2}
	Polytrichum piliferum	22^{2}	19^{3}	20^{3}	20^{2}	1^{1}	-	5^{4}	12^{2}	20^{3}	3^{2}
	Cladonia pyxidata s. l.	8^{3}	18^{2}	14^{2}	28^{3}	5^{1}	-	2^{2}	4^{2}	16^{2}	3^{1}
	Thamnolia vermicularis	25^{2}	7^{2}	14^{2}	12^{2}	-	-	2^{1}	12^{2}	14^{2}	2^{2}
	Cladonia uncialis	21^{2}	7^{2}	12^{2}	20^{2}	2^{1}	-	5^{2}	8^{2}	13^{2}	3^{2}
	Cetraria cucullata	29^{3}	2^{2}	12^{2}	8^{2}	-	5^{2}	-	8^{2}	11^{2}	2^{2}
	Cetraria nivalis	17^{2}	8^{2}	11^{2}	12^{2}	1^{2}	2^{2}	-	12^{3}	11^{2}	2^{3}
	Cladonia bellidiflora	6^{3}	12^{2}	10^{2}	4^{1}	1^{1}	2^{2}	-	-	9^{2}	1^{2}
	Rhytidiadelphus triquetrus	3^{2}	2^{2}	2^{2}	4^{4}	14^{2}	-	-	40^{4}	3^{2}	11^{3}
	Polytrichum commune	5^{2}	2^{4}	3^{3}	4^{4}	9^{4}	7^{2}	5^{2}	24^{5}	3^{3}	10^{4}
	Polytrichum juniperinum	5^{3}	9^{4}	7^{4}	12^{2}	10^{2}	2^{5}	7^{2}	20^{2}	8^{3}	9^{2}
	Cladonia furcata	2^{1}	4^{2}	3^{2}	8^{2}	3^{3}	2^{2}	2^{2}	24^{2}	4^{2}	5^{2}
	Cladonia squamosa	3^{2}	5^{2}	4^{2}	12^{2}	-	5^{2}	10^{4}	4^{2}	5^{2}	3^{3}
	Rhytidium rugosum	-	1^{1}	1^{1}	12^{1}	-	-	7^{3}	24^{4}	2^{1}	4^{3}
	Racomitrium lanuginosum	5^{2}	7^{3}	6^{3}	20^{1}	-	-	5^{2}	-	8^{2}	1^{2}
	Cetraria ericetorum	8^{4}	3^{3}	5^{4}	4^{1}	-	-	-	-	5^{3}	-
	Polytrichum sp.	-	-	-	-	2^{4}	12^{3}	10^{3}	8^{2}	-	6^{3}

+ occurrence with frequency lower than 0,5 %

Table 2 (Tabela 2): *Sphagno capillifolii-Empetretum nigri* Bělohlávková ass. nov.

S.-E. luzuletosum alpinopilosae Bělohlávková subass. nov. (rels. 1–12); *S.-E. typicum* Bělohlávková subass. nov. (rels. 13–42); variant with *Cetraria islandica* (rels. 13–28); typical variant (rels. 29-42)

Relevé number		111		1111111222222222	23333333333444		
		123456789012		3456789012345678	90123456789012		
Number of taxa		222232331211	**Cs**	1111111221211111	111 1	**Cs**	**Ca**
		487024019584	**(%)**	2042119467224274	67869210988791	(%)	**(%)**
Diagnostic taxa of association							
	Polytrichum strictum (E_0)	1+1+1a+m133a	100^4	11aaaa..31a343aa	.11.+11a1a111a	87^4	90^4
	Sphagnum capillifolium (E_0)	.....343a145	58^7	.41aa..13ba33a33	b3335..334353.	80^6	74^7
	Sphagnum russowii (E_0)	a43a3.....	42^6	.....a31..3.....	.....b.....	17^6	24^6
	Sphagnum girgensohnii (E_0)	43333...3...	50^7	.....	4	3^8	17^7
	Sphagnum magellanicum (E_0)	...a.....	8^5	.....1a1.....	.....b.....	13^4	12^4
	Sphagnum rubellum (E_0)	.....	–	..4.....4..	.....	7^8	5^8
	Sphagnum quinquefarium (E_0)	.....	–	.....	......4.....	3^8	2^8
	Sphagnum sp. (E_0)	.....	–	3.....	.....	3^7	2^7
LV	*Vaccinium vitis-idaea*	1+111+1++a+1	100^3	1+1aaa3aaaabbabb	111+1a11aaaa31	100^4	100^4
LV	*Vaccinium myrtillus*	aaaaa3+43334	100^6	aa33343aabb443b5	1111+a1aaa111+	100^5	100^5
LV	*Empetrum nigrum* s. l.	+1111.+.....	50^3	43ab31a14453334.	44453334333333	97^7	83^6
	Avenella flexuosa	1111+1.1a3+1	92^3	1+111+....bab111	+++..1+1+++1..	73^3	79^3
NS	*Homogyne alpina*	1+11+a1+a11+	100^3	..r++1++1+11aa+a	....+...++..r+	63^3	74^3
Differential taxa of the subassociations and variants							
CC	*Oreochloa disticha*	+1++1++1++++	**100^2**	+.....	.....	3^2	31^2
CC	*Juncus trifidus*	+++.+++1111+	**92^2**	.....	..+.....	3^2	29^2
CC, SH	*Luzula alpinopilosa*	++++1+++.1++	**92^2**	.....	.....	–	26^2
lv	*Vaccinium gaultherioides*	+11113a.....	**58^4**	+a.....	..+.....	10^3	24^4
CC	*Hieracium alpinum*	+++++111++..	**83^2**	.....	.....	–	24^2
CC	*Festuca supina*	.++r.1+.++.+	**67^2**	.....+.....	.....+.....	7^2	24^2
CC	*Campanula alpina*	.r+..111++1+	**75^2**	.....	.....	–	21^2
	Cladonia rangiferina (E_0)	+1+++..+.+..	**58^2**	+.....+.	.....	7^2	21^2
Cv	*Gentiana punctata*	.++r.r.1r+..	**58^2**	.....	.....	–	17^2
	Alectoria ochroleuca (E_0)	.r.r+....+++	**50^2**	.....	.....	–	14^2
MU	*Bistorta major*	r++.1..1..+.	**50^2**	.....+.....	.....111.....	13^3	24^2
CC	*Polytrichum alpinum* (E_0)	...1.+++.+..	**42^2**	.....1..	.....	3^3	14^2
	Ligusticum mutellina	.....a.++++.	**42^3**	.....	.....	–	12^3
CC	*Doronicum stiriacum*	r...ra..+...	**33^2**	.....	.....	–	10^2
CC	*Agrostis rupestris*	.....11..++.	**33^3**	.....	.....	–	10^3
	Lophozia guttulata (E_0)	.r+.+.....	**25^2**	.....	.....	–	7^2
CC, cv	*Pulsatilla scherfelii*	.....+a.+...	**25^3**	.....	.....	–	7^3
	Cephalozia bicuspidata (E_0)	.r+.+.....	**25^2**	.....	.....	–	7^2
pm, vp	*Sorbus *glabrata*	.....	–	...r+.11+++.1.+.	.....rr....r	**40^2**	29^2
Cv	*Calamagrostis villosa*	.....	–	...a....11+....+	....+++....+.+	**33^3**	24^3
	Salix alpina	.....	–	......++.+.....	...1+1++.....	**27^2**	19^2
	Melampyrum sylvaticum	.....	–	...1.....1.+1	.....+++...	**23^2**	17^2
CK,ES	*Festuca versicolor*	.....	–	......+...+.....	...++r+.....+.	**23^2**	17^2
	Cetraria islandica (E_0)	11a1a.13a311	92^4	**+.++++.+...aa+1.**	.....1.	37^3	52^4
	Dicranum scoparium (E_0)	+....++.....	25^2	**++1....+1a+.1.+3**	.....+.	37^3	33^3
	Pleurozium schreberi (E_0)	+...+..+11..	42^2	**..1....+11aaa+b3**	.....	33^4	36^4
	Hylocomium splendens (E_0)	+++.+...+1..	50^2	**.....+34+a..1.**	.....+	23^4	31^3
	Huperzia selago	+++r+.++.r+.	75^2	**.++.....+.+rr...**	.....	20^2	36^2
	Soldanella carpatica	......+.....	8^2	**+......++++.....**	.....	17^2	14^2
pm	*Pinus mugo*	.....1....	8^3	**.....+..1....+.**	.....	10^2	10^3
pe	*Picea abies*	.....	–	**.....++.a....+.**	.....	13^3	10^3

Relevé number		111 123456789012		1111111222222222 3456789012345678	23333333333444 90123456789012		
Other taxa							
	Melampyrum pratense	.....	–	....++.+.....	++.....	17^{2}	12^{2}
NS, Cv	*Solidago *minuta*	11.....	17^{3}	.....++.....	.....	7^{2}	10^{3}
	Hieracium lachenalii	.....	–	.....+++.....	.....+...	13^{2}	10^{2}
	*Swertia *alpestris*	.....	–	.....+.+r.....	.....	10^{2}	7^{2}
	Luzula sylvatica	.....	–	.....+++.....	.....	10^{2}	7^{2}
	Rubus idaeus	.....	–	.....+.....1	.....r	10^{2}	7^{2}
CC, cv	*Avenula versicolor*	.....++.....	17^{2}	.....	.....	–	5^{2}
NS	*Nardus stricta*	.....+	8^{2}	1	.....	3^{3}	5^{3}
st	*Sesleria tatrae*	.....	–	.....+.+.....	.....	7^{2}	5^{2}
MU	*Acetosa arifolia*	.....	–	.....+....+	.....	7^{2}	5^{2}
Cv	*Luzula luzuloides*	.....	–	.+.....+.....	.....	7^{2}	5^{2}
	Chamerion angustifolium	.....	–	.....+..+.....	.....	7^{2}	5^{2}
	Lonicera nigra	.....	–	.....rr.....	.....	7^{1}	5^{1}
Bryophytes & Lichens (E_0)							
	Polytrichum sp.	.....	–	..r11.....1..1	.....	17^{3}	12^{3}
	Cladonia sp.	.....+...+..	17^{2}	.....1.....	.....	3^{3}	7^{2}
	Cladonia coccifera	.....+.+....	17^{2}	.....+..	.....	3^{2}	7^{2}
	Polytrichum commune	+.....	8^{2}	.....1.....	.....+	7^{3}	7^{2}
	Cladonia digitata	....+.....	8^{2}	..1.....1.....	.....	7^{3}	7^{3}
	Calypogeia neesiana	.r..+.....	17^{2}	.....	.....	–	5^{2}
	Dicranum fuscescens	..+.+.....	17^{2}	.....	.....	–	5^{2}
	Omphalina hudsoniana	..+.+.....	17^{2}	.....	.....	–	5^{2}
	Cladonia squamosa	.r.....+....	17^{2}	.....	.....	–	5^{2}
	Cladonia gracilis	..r.....+..	17^{2}	.....	.....	–	5^{2}
	Cetraria cucullata	.....+...+.	17^{2}	.....	.....	–	5^{2}
	Dicranum congestum	.....+....	8^{2}	.....a....	.....	3^{5}	5^{4}

Taxa occur only in one relevé:

E_1: *Aconitum variegatum* + (21), *Anemone narcissiflora* + (23), *Biscutella laevigata* r (21), *Calluna vulgaris* + (8), *Carex atrata* + (7), *Carex firma* + (21), *Carex *silicicola* + (7), *Dryopteris dilatata* s. l. + (19), *Galium anisophyllon* + (23), *Hieracium* sp. + (11), *Leontodon pseudotaraxaci* + (7), *Leucanthemopsis alpina* 1 (7), *Oxalis acetosella* + (19), *Parnassia palustris* + (21), *Pedicularis verticillata* + (7), *Poa alpina* + (20), *Bistorta vivipara* + (2), *Primula minima* + (7), *Ranunculus pseudomontanus* + (7), *Salix kitaibeliana* 1 (7), *Salix silesiaca* + (21), *Saxifraga aizoides* + (34), *Saxifraga moschata* + (20);

E_0: *Anastrepta orcadensis* + (5), *Barbilophozia lycopodioides* + (6), *Cetraria nivalis* + (5), *Cladonia arbuscula* + (8), *Cladonia bellidiflora* + (8), *Cladonia deformis* r (5), *Cladonia fimbriata* + (8), *Cladonia furcata* + (8), *Cladonia *pyxidata* + (27), *Distichium capillaceum* 1 (21), *Hypnum bambergeri* + (21), *Icmadophila ericetorum* + (5), *Lecidea granulosa* + (8), *Lepraria incana* + (8), *Lophozia sudetica* + (10), *Mylia taylorii* + (35), *Pohlia nutans* r (3), *Polytrichum juniperinum* 2a (27), *Ptilidium ciliare* + (1), *Sphenolobus minutus* + (5), *Tritomaria quinquedentata* + (8).

Cs – Constancy of the subassociation, **Ca** – Constancy of the association.

Table 3 (Tabela 3): *Cetrario islandicae-Vaccinietum vitis-idaeae* (Hadač et al. 1969) Hadač 1987
C.-V. empetretosum nigri subass. nov. (rels. 1–15); *C.-V. typicum* subass. nov. (rels. 16–41); typical variant (rels. 16–35); variant with *Sesleria albicans* (rels. 36–41)

Relevé number			111111		11112222222222333333	333344		
			123456789012345		67890123456789012345	678901		
Number of taxa			11111111 1 1211	**Cs**	3221121121 111 1 1	123232	**Cs**	**Ca**
			251205029066121	**(%)**	19695486058043891990	942303	**(%)**	**(%)**
Diagnostic taxa of association and class *Loiseleurio-Vaccinietea*								
LV	*Vaccinium vitis-idaea*	cst	aab33b+a1++bbba	100^{5}	444543b43a5444445344	334a33	100^{8}	100^{7}
	Cetraria islandica (E_0)	cst	1+3a.b1a4+.1a31	87^{5}	ab3bb5a3a3343333b3b3	aaaaaa	100^{6}	95^{6}
LV	*Vaccinium myrtillus*	cst	1a334ba13113433	100^{6}	a+..33411a.11a31b133	+.+.+.	77^{5}	85^{5}
	Avenella flexuosa	cst	+aa3a1...1+aa11	80^{4}	......111+.++11+133b	..1333	65^{4}	71^{4}
lv	*Festuca supina*		.....1+....1++.	33^{2}	+1+111..a+1.11.....	131..1	58^{3}	49^{3}
vm	*Polytrichum strictum* (E_0)		..1......a1aa34	47^{5}	.....+..13..++11b...	+.....	35^{3}	39^{4}
vm	*Dicranum scoparium* (E_0)		.......+...1.13	27^{4}	...+.......a......1.	.+1...	19^{3}	22^{3}
vm	*Luzula luzuloides*		......+........	7^{2}	..................r.	..+1a.	15^{3}	12^{3}
lv	*Vaccinium gaultherioides*		....	–	........+...........	.....	4^{2}	2^{2}
Differential taxa of the subassociations								
LV	*Empetrum nigrum* s. l.		**45333554a455354**	**100^{8}**	........1a..........	..a...	12^{4}	44^{7}
NS	*Homogyne alpina*		**.1r1+..+a..1+..**	**53^{3}**	......a+......++....	.....+	19^{3}	32^{3}
pm, vp	*Sorbus *glabrata*		**.1r.++...r.+rr.**	**53^{2}**	....	..r.+r	12^{1}	27^{2}
CC	*Oreochloa disticha*		....	–	**1++1.a++a++.1**.....	.....	**42^{3}**	27^{3}
CC	*Campanula alpina*		....	–	**1m+1111a.+1.1**.....	.....	**42^{3}**	27^{3}
CC	*Hieracium alpinum*		+..............	7^{2}	**++r+11.11+..1**.....	.....	**38^{2}**	27^{2}
CC	*Juncus trifidus*		....	–	**..+.aa1ma+**......**1**...	.....	**31^{4}**	20^{4}
	Soldanella carpatica		.......+.......	7^{2}	**..+1+**..............	**.a+.+1**	**27^{3}**	20^{3}
	Polytrichum alpinum (E_0)		....	–	**...aa11a**.........**1**..	.....	**23^{4}**	15^{4}
CC, cv	*Avenula versicolor*		....	–	**1++..+++**...........	.....	**23^{2}**	15^{2}
Differential taxa of the variants								
cv	*Calamagrostis villosa*		+.r.....+.....	20^{2}	**+**.....**+.++1**..	.....	19^{2}	20^{2}
	Cladonia coccifera (E_0)		+.........1+..	20^{2}	**..1..1+**..........	.....	12^{3}	15^{3}
	Cladonia rangiferina (E_0)		+..............	7^{2}	**..1.....1...+1....+.**	.....	19^{3}	15^{3}
CC	*Agrostis rupestris*		....	–	**......a1.+..+**.....	.....	15^{3}	10^{3}
	Cladonia squamosa (E_0)		..a...........	7^{5}	**......++.....b**...	.....	12^{3}	10^{4}
	*Carex *silicicola* Holub		....	–	**......1.....+1**.....	.....	12^{3}	7^{3}
	Cladonia gracilis (E_0)		....	–	**..1..1+**..........	.....	12^{3}	7^{3}
CC,cv	*Pulsatilla scherfelii*		....	–	**..1.1**.....**+**.....	.....	12^{3}	7^{3}
	Cladonia arbuscula (E_0)		....	–	**..1.m1**..........	.....	12^{3}	7^{3}
Cv	*Gentiana punctata*		....	–	**..r..r.1**..........	.....	12^{2}	7^{2}
as	*Sesleria albicans*		....	–	..........+........	**1a++1+**	27^{3}	17^{3}
	Ranunculus pseudomontanus		....	–	....	**11r++.**	19^{2}	12^{2}
	Bartsia alpina		.......+.......	7^{2}	....	**+.1+.r**	15^{2}	12^{2}
	Anthoxanthum alpinum		....	–	....	**a1.aaa**	19^{5}	12^{5}
	Thymus pulcherrimus		....	–	....	**+++++.**	19^{2}	12^{2}
	Pedicularis verticillata		....	–	...+.................	**1+..+1**	19^{2}	12^{2}
Cv	*Campanula serrata*		....	–	....	**..++++**	15^{2}	10^{2}
	*Achillea *alpestris*		....	–	....	**a..1++**	15^{3}	10^{3}
	Phyteuma orbiculare		....	–	.+...................	**.++.+.**	15^{2}	10^{2}
	Scabiosa lucida		....	–	....	**.++.++**	15^{2}	10^{2}
	Antennaria dioica		....	–	....	.+.1++	15^{2}	10^{2}
	Leucanthemum margaritae		....	–	....	**+..11.**	12^{3}	7^{3}
	Dianthus nitidus		....	–	....	**.+..++**	12^{2}	7^{2}
	Potentilla aurea		....	–	....	**.1.++.**	12^{2}	7^{2}

Relevé number		111111 123456789012345		11112222222222333333 67890123456789012345	333344 678901		
Other taxa							
	Huperzia selago	.1.+....++.++.+	47^{2}	+++11.+11+.+..+.....	+.....	46^{2}	46^{2}
pm	*Pinus mugo*	....++.....	13^{2}	++......+....r..1...	...11+	31^{2}	24^{2}
ES	*Galium anisophyllon*	.....+..r.....	13^{2}	++..............+..	+1+.+.	27^{2}	22^{2}
CK, ES	*Festuca versicolor*	......++.....	13^{2}	+m.........+..+.....	.....r	19^{2}	17^{2}
	Picea abies	.+..+.....	13^{2}	........+.....	....ar	12^{3}	12^{2}
NS	*Nardus stricta*	.....	–	........+.........1+	...a..	15^{3}	10^{3}
	Lotus corniculatus	.....	–	++.....	...+..	12^{2}	7^{2}
	Bistorta vivipara	.......+.....	7^{2}	.....	.a...1	8^{4}	7^{3}
	Salix alpina	...+...+.....	13^{2}	+.....	.....	4^{2}	7^{2}
	Thymus alpestris	.....	–	++.....	.....+	12^{2}	7^{2}
	Euphrasia salisburgensis	.....	–	+.....	..+.+.	12^{2}	7^{2}
	Bupleurum ranunculoides	.....	–	++.....	..+...	12^{2}	7^{2}
	Selaginella selaginoides	.....	–	++.....	.1....	12^{2}	7^{2}
Bryophytes & Lichens (E_0)							
	Pleurozium schreberi	31.........a3.a	33^{5}	+.r+.+.......+...+1+	a...1.	38^{2}	37^{3}
	Cladonia sp.	..a1..+a++.....	40^{3}	.....+...a.......1..	+.....	15^{3}	24^{3}
	Hylocomium splendens	+a.....	13^{4}	ab.....	.+1...	15^{4}	15^{4}
	Polytrichum sp.	...1.....1.+a..	27^{3}	.....	.....	–	10^{3}
	Rhytidium rugosum	.....	–	+m.....	..+...	12^{3}	7^{3}
	Polytrichum juniperinum	.....	–	.+1.....+	.....	12^{2}	7^{2}

Taxa occur only in two relevés:
E_1: *Alchemilla monticola* + (39, 40), *Biscutella laevigata* + (38, 41), *Bistorta major* 1 (20), r (21), *Botrychium lunaria* + (16, 17), *Carex *tatrorum* + (37, 38), *Carex atrata* 1 (19), + (20), *Cotoneaster integerrimus* + (16, 17), *Doronicum stiriacum* + (18), 1 (20), *Dryas octopetala* + (37, 38), *Hieracium* sp. + (6, 41), *Chamerion angustifolium* + (5, 24), *Juniperus sibirica* 1 (25), + (29), *Ligusticum mutellina* + (22, 28), *Luzula alpinopilosa* + (19, 21), *Luzula sylvatica* + (4), r (35), *Melampyrum pratense* + (12, 13), *Parnassia palustris* + (38, 40), *Potentilla crantzii* + (38, 39), *Primula minima* 1 (18, 19), *Rubus idaeus* + (2, 31), *Salix silesiaca* + (24), 2a (40), *Solidago *minuta* + (32, 38), *Viola biflora* + (36, 37).
E_0: *Alectoria ochroleuca* + (21, 26), *Cladonia uncialis* 1 (18), + (21), *Plagiothecium curvifolium* 1 (6), + (13), *Polytrichum commune* + (7), 1 (14), *Polytrichum piliferum* 1 (1), 2a (18), *Ptilidium ciliare* 1 (6), 2m (16), *Racomitrium canescens* + (16, 17), *Racomitrium lanuginosum* + (21), 1 (27), *Rhizocarpon geographicum* + (2), 1 (12), *Sanionia uncinata* 1 (6, 27), *Sphagnum capillifolium* + (11, 13), *Sphenolobus minutus* + (13, 15), *Tortella tortuosa* + (16, 17).

Taxa occur only in one relevé:
E_1: *Agrostis capillaris* 1 (39), *Allium *montanum* + (38), *Anemone narcissiflora* + (18), *Arenaria tenella* + (16), *Bellidiastrum michelii* 1 (37), *Calluna vulgaris* + (32), *Deschampsia caespitosa* + (36), *Diphasiastrum alpinum* + (4), *Euphrasia picta* + (39), *Festuca picturata* + (26), *Gentiana asclepiadea* + (5), *Helianthemum grandiflorum* + (38), *Hieracium fritzei* F. W. Schultz 1 (26), *Hieracium lachenalii* + (31), *Hypericum maculatum* + (39), *Leucanthemopsis alpina* + (18), *Luzula sudetica* + (16), *Lycopodium clavatum* + (6), *Phleum hirsutum* + (39), *Pilosella officinarum* r (29), *Poa alpina* + (38), *Primula elatior* + (37), *Rhodax alpestris* + (16), *Salix caprea* + (24), *Salix kitaibeliana* 2m (19), *Saxifraga paniculata* + (38), *Senecio *carniolicus* 1 (18), *Silene acaulis* 2m (19), *Trientalis europaea* + (2), *Trifolium pratense* + (40), *Vicia cracca* + (40).
E_0: *Barbilophozia barbata* 1 (7), *Barbilophozia lycopodioides* + (16), *Bazzania tricrenata* + (13), *Bryum capillare* 1 (6), *Cephalozia bicuspidata* + (14), *Cladonia cenotea* + (17), *Cladonia deformis* + (23), *Cladonia digitata* 1 (24), *Cladonia furcata* + (14), *Cladonia *chlorophaea* + (17), *Cladonia macroceras* + (22), *Cladonia stellaris* 1 (21), *Dicranum fuscescens* 1 (35), *Dicranum polysetum* 1(13), *Encalypta* sp. r (17), *Lecidoma demissum* + (19), *Lophozia ventricosa* + (21), *Mylia taylorii* + (13), *Paraleucobryum enerve* + (19), *Plagiothecium denticulatum* + (17), *Pogonatum aloides* + (2), *Polytrichum formosum* + (35), *Porella platyphylla* r (17), *Pseudevernia furfuracea* + (13), *Sphagnum rubellum* + (15), *Thamnolia vermicularis* r (18).

Cs – Constancy of the subassociation, **Ca** – Constancy of the association.

Table 4 (Tabela 4): *Hylocomio splendentis-Vaccinietum vitis-idaeae* (Hadač et al. 1969) nom. nov. *H.-V. vaccinietosum gaultherioidis* subass. nov. (rels. 1–12); *H.-V. dianthetosum nitidi* subass. nov. (rels. 13–25)

Relevé number			111 123456789012		1111111222222 3456789012345		
Number of taxa			423313245331 765052542559	Cs (%)	2233332212121 7519758793678	Cs (%)	Ca (%)
Diagnostic taxa of the association							
LV	*Vaccinium vitis-idaea*	cst	bbaaama1..1+	83^{4}	aaaaa1133a333	100^{5}	92^{5}
LV	*Empetrum nigrum* s. l.	cst	b.1a1+a+a...	67^{4}	3453343.+1111	92^{6}	80^{5}
vm	*Hylocomium splendens* (E_0)	cst	4m533453aa1+	100^{6}	1334a331+....	69^{5}	84^{6}
	Cetraria islandica (E_0)	cst	+m++1..+..+.	58^{2}	11111111.1aa1	92^{3}	76^{3}
vm	*Dicranum scoparium* (E_0)	cst	..+.++.+.+.+	50^{2}	a1a1+11+++.11	92^{3}	72^{3}
Cv, vm	*Luzula luzuloides*	cst	++++++1a+11.	92^{3}	+.1+.+.1.+...	46^{2}	68^{2}
CC, lv	*Festuca supina*	cst	+1++++1+..++	83^{2}	aa.baa1....+.	54^{4}	68^{3}
	Pleurozium schreberi (E_0)	cst	.+++..+.1111	67^{3}	3a1a11..+...+	62^{4}	64^{3}
CK, cf	*Bistorta vivipara*	D	+++..++1++1+	83^{2}	..++++r+...++	62^{2}	72^{2}
CK, ES	*Festuca versicolor*	D	..++.+++11+1	75^{2}	..1..a.1+1++a	62^{3}	68^{3}
cf, fv	*Bartsia alpina*	D	+.+....+++..	42^{2}	.+a1+++a.++1+	85^{3}	64^{3}
CK, cf	*Dryas octopetala*	D	+.+.....1+..	33^{2}	+1r+++.1..+++	77^{2}	56^{2}
MU	*Bistorta major*	D	.+.....++++1	50^{2}	a..b1ba....1+	54^{4}	52^{3}
	Phyteuma orbiculare	D	+....++1.11.	50^{3}	.+.+++....+..	38^{2}	44^{2}
	Ranunculus breyninus	D	+.....++...r	33^{2}	..+.+.....	15^{2}	24^{2}
	Hedysarum hedysaroides	D	+.+..+.+....	33^{2}	+1.....	15^{3}	24^{2}
	Salix reticulata	D	+.+.....1...	25^{2}	..1a.....+...	23^{3}	24^{3}
Differential taxa of the subassociations							
lv	*Vaccinium gaultherioides*		b33b33443333	**100^{7}**	.....	–	48^{7}
	Cladonia rangiferina (E_0)		mm1m+..++++.	**75^{3}**	+.....	8^{2}	40^{3}
	Rhytidiadelphus triquetrus (E_0)		am+m+a+4...1	**75^{4}**	.....1.....	8^{3}	40^{4}
	Anemone narcissiflora		+.+..++a+++.	**67^{2}**	...1.....	8^{3}	36^{2}
CC	*Oreochloa disticha*		+.++.1..+1..	**50^{2}**	.....	–	24^{2}
CC	*Hieracium alpinum*		1mm1++.....	**50^{3}**	.....	–	24^{3}
oe	*Androsace chamaejasme*		+.+..+++.+..	**50^{2}**	.....	–	24^{2}
	Rhytidium rugosum (E_0)		aa.m1.+.....	**42^{4}**	.....+.	8^{2}	24^{4}
	Campanula tatrae		.++..+++....	**42^{2}**	.....	–	20^{2}
	Cladonia arbuscula (E_0)		m1+m1.....	**42^{3}**	.....	–	20^{3}
cf, pc	*Crepis jacquinii*		+.....++++	**42^{2}**	.....	–	20^{2}
	Pedicularis verticillata		...+..+.+r..	**33^{2}**	.....	–	16^{2}
	Helianthemum grandiflorum		+.....++.+.	**33^{2}**	.....	–	16^{2}
	Linum extraaxillare		+.....1+.+.	**33^{2}**	.....	–	16^{2}
	Pedicularis oederi		+....+.1....	**25^{2}**	.....	–	12^{2}
	Trommsdorfia uniflora		+.....+..+.	**25^{2}**	.....	–	12^{2}
CC	*Campanula alpina*		...+....1+..	**25^{2}**	.....	–	12^{2}
	*Allium *montanum*		.+.....r+.	**25^{2}**	.....	–	12^{2}
	Thamnolia vermicularis (E_0)		+..+....+...	**25^{2}**	.....	–	12^{2}
	Potentilla aurea		.++.....+.	**25^{2}**	.....	–	12^{2}
	Juncus trifidus		...+.....a1.	**25^{3}**	.....	–	12^{3}
CK, cf	*Silene acaulis*		.....+.1.+..	**25^{2}**	.....	–	12^{2}
	Polytrichum piliferum (E_0)		++.....+	**25^{2}**	.....	–	12^{2}
	Cetraria nivalis (E_0)		+m.....1...	**25^{3}**	.....	–	12^{3}
LV	*Vaccinium myrtillus*		....a..+...1	25^{3}	aa3bbab+43aa+	**100^{5}**	64^{5}
	Salix alpina		..m+.....	17^{3}	aabbbbb1+111a	**100^{5}**	60^{4}
vm	*Polytrichum strictum* (E_0)		.....1.11	25^{3}	4.a3434.++aaa	**85^{6}**	56^{5}
	Soldanella carpatica		..+..+..+...	25^{2}	.1aa1111++.+.	**77^{3}**	52^{3}
	Huperzia selago		.....+..+...	17^{2}	.rr+1++.++..+	**69^{2}**	44^{2}
NS	*Homogyne alpina*		.....++++	33^{2}	..b1+1.+11.+.	**62^{3}**	48^{3}
ES	*Dianthus nitidus*		.....	–	..++++.+++.+.	**62^{2}**	32^{2}
cf	*Saxifraga aizoides*		.....	–	+..+++1....+.	**46^{2}**	24^{2}
	Polytrichum commune (E_0)		.....	–	.....aaaaa3	**46^{5}**	24^{5}
	Sphagnum capillifolium (E_0)		.....	–	...+ba.1.1...	**38^{4}**	20^{4}

Relevé number		111 123456789012		1111111222222 3456789012345		
pc	*Saxifraga paniculata*	.....	–	++1....1.+...	**38²**	20²
cf	*Ranunculus alpestris*	.....	–	.++++.....	**31²**	16²
	Sphagnum russowii (E_0)	.....	–	.....1..1+	**23³**	12³
	Sphagnum magellanicum (E_0)	.....	–	.....1.11	**23³**	12³
Other taxa						
	Anthoxanthum alpinum	++....+1....	33²	...++..+++++.	54²	44²
	Avenella flexuosa	+1...+.....	25²	++a+.a1....+.	54³	40³
vp	*Picea abies*	r.+r....r...	33¹	....r+b.....	23³	28²
pm	*Sorbus *glabrata*	.....r..+...	17²	1.1r1.+.....	38²	28²
st	*Sesleria tatrae*	.......+....	8²	+1a++.....	38³	24³
ES	*Carex *tatrorum*	.......+++..	25²	...++.....+.	23²	24²
	Biscutella laevigata	.....+..++..	25²	...+++.....	23²	24²
	Parnassia palustris	+......+rr..	33²	.....+..+....	15²	24²
ES	*Galium anisophyllon*	........+++.	25²	....+.....+..	15²	20²
	Poa alpina	.....++.+r..	33²	.......+.....	8²	20²
NS, Cv	*Solidago *minuta*	.1......1..+	25³	.....+....+..	15²	20²
Cv	*Calamagrostis villosa*	+++.........	25²	.....a....+..	15⁴	20³
cf, pc	*Carex firma*	........++..	17²	...++.+.....	23²	20²
as	*Sesleria albicans*	+....+.....	17²	.......+.+...	15²	16²
tf	*Rhodiola rosea*	......+..+..	17²	..+....+.....	15²	16²
	Scabiosa lucida	+......++...	25²	.....+.....	8²	16²
pm	*Pinus mugo*	.....+..r...	17²	+...r.....	15²	16²
	Viola biflora	.......+.r..	17²	...r.....	8¹	12¹
	Saxifraga moschata	........+...	8²	......1+.....	15³	12²
	*Swertia *alpestris*	......+.....	8²	.r...+.....	15²	12²
Bryophytes and Lichens (E_0)						
	Cladonia furcata	.1++..+.....	33²	...+..1.....	15³	24²
	Polytrichum juniperinum	.+++.+.....	33²	...+.....	8²	20²
	Ptilidium ciliare	+..+.....+..	25²	...+.1.....	15³	20²
	Polytrichum alpinum	.....1.	8³	+a.....+.....	23³	16³
	Cladonia coccifera	...+.....	8²	1.1.1.....	23³	16³

Taxa occur only in two relevés:

E_1: *Aconitum firmum* + (15, 20), *Achillea *alpestris* + (8, 9), *Anthyllis *alpestris* r (9), + (11), *Carex atrata* + (9), 1 (10), *Clematis alpina* + (7, 8), *Hieracium bifidum* + (8, 14), *Hieracium stygium* 1 (15), r (17), *Ligusticum mutellina* + (12, 15), *Luzula sylvatica* + (21, 24), *Melampyrum pratense* + (21), 1 (24), *Pinguicula alpina* + (9), r (19), *Pyrola rotundifolia* + (8), 1 (20), *Salix silesiaca* + (18), 1 (19), *Tephroseris capitata* + (1, 8), *Tofieldia calyculata* + (16, 17), *Traunsteinera globosa* + (1, 8).

E_0: *Cetraria cucullata* + (2, 5), *Cladonia bacillaris* + (9, 12), *Cladonia* sp. + (13, 23), *Cladonia uncialis* + (4, 9), *Dicranum congestum* + (11), 1 (17), *Distichium capillaceum* + (1, 7), *Icmadophila ericetorum* + (4, 9), *Plagiochila asplenioides* + (3, 4), *Polytrichum* sp. 1 (15), + (16), *Ptilium crista-castrensis* + (3, 8), *Sanionia uncinata* + (11), 1 (19).

Taxa occur only in one relevé:

E_1: *Aster alpinus* + (1), *Astragalus australis* + (1), *Astrantia major* + (8), *Bellidiastrum michelii* + (8), *Calamagrostis arundinacea* 3 (8), *Campanula cochlearifolia* r (14), *C. serrata* + (22), *Cardaminopsis arenosa* agg. r (19), *Cerastium *glandulosum* + (6), *Cerastium eriophorum* + (10), *Coeloglossum viride* + (8), *Cortusa matthioli* + (7), *Cynosurus cristatus* + (11), *Delphinium oxysepalum* + (24), *Dianthus *praecox* + (11), *Gymnadenia conopsea* + (9), *Hieracium lachenalii* + (20), *Chamorchis alpina* + (1), *Larix decidua* r (9), *Lilium martagon* + (11), *Melampyrum sylvaticum* + (14), *Myosotis alpestris* + (10), *Orthilia secunda* + (9), *Phleum hirsutum* + (8), *Phleum rhaeticum* + (11), *Poa chaixii* + (18), *Primula halleri* + (10), *Pyrola carpatica* + (25), *Ranunculus pseudomontanus* + (18), *Salix retusa* 2a (22), *Saxifraga wahlenbergii* 1 (19), *Selaginella selaginoides* + (6), *Thesium alpinum* + (9), *Thymus pulcherrimus* + (11).

E_0: *Alectoria ochroleuca* + (9), *Apometzgeria pubescens* + (3), *Barbilophozia lycopodioides* + (3), *Bryum capillare* + (4), *Cladonia fimbriata* + (11), *Cladonia gracilis* + (11), *Cladonia *chlorophaea* + (9), *Cladonia squamosa* + (11), *Cladonia stellaris* + (1), *Dicranella* sp. 1 (16), *Dicranum fuscescens* 2m (4), *Ditrichum flexicaule* 1 (14), *Frullania tamarisci* + (3), *Hypogymnia physodes* r (1), *Lophozia collaris* + (20), *Lophozia sudetica* 2a (17), *Lophozia ventricosa* r (6), *Marsupella funckii* 2a (13), *Peltigera* sp. + (13), *Plagiothecium curvifolium* + (13), *Pseudevernia furfuracea* + (9), *Rhytidiadelphus squarrosus* r (1), *Sphagnum rubellum* 4 (19), *Sphenolobus minutus* + (9), *Tortella tortuosa* r (6).

Cs – Constancy of subassociation, **Ca** – Constancy of association