Thaiszia - J. Bot., Košice, 29 (1): 023-049, 2019
https://doi.org/10.33542/TJB2019-1-02

THAISZIA
JOURNAL OF BOTANY

Two new wet woodlands with Norway spruce from the Western Carpathians

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Kučera P. (2019): Two new wet woodlands with Norway spruce from the Western Carpatians. – Thaiszia – J. Bot. 29 (1): 023-049.

Abstract: Two new associations of wet woodlands with *Picea abies* from the Western Carpathians are described. Stands of the first unit, *Leucobryo glauci-Piceetum abietis*, are located on dryer margins of mires, on plains where water from snow melting and rains remains considerable long above the soil surface. The most characteristic sign of the species-poor flora of this forest plant community is the dominance of moss *Leucobryum glaucum* accompanied by constant presence of *Sphagnum* spp. Two subassociations are distinguished in respect of the ecological differences. The second described plant community, association *Stellario nemorum-Abietetum albae*, occupies quite different habitat of spring areas and other more wet localities. *Abies alba* plays an important role in the canopy, field layer is characterised by constant presence of Stellaria nemorum, Equisetum sylvaticum, Oxalis acetosella, Senecio ovatus, Chaerophyllum hirsutum, Lysimachia nemorum and other species. Three subassociations and five variants are distinguished.

Keywords: Abies alba, ground-water, mire, *Picea abies*, phytocoenology, spring areas, syntaxonomy, Western Carpathians.

Introduction

Wet woodlands with Norway spruce are one of the groups of water-determined forest plant communities. Due to specific ecological regime, a unique species combination of trees, dwarf shrubs, herbs and bryophytes developed. In the Western Carpathians they occur mostly in the montane *Fagus-Abies* zone (see Šomšák 1979, 1983; Bujakiewicz 1981; Majzlanová 1983; Staszkiewicz 1993; Šomšák et al. 1993, 1996; Kubíček et al. 1997a, b; cf. Kučera 2012).

Natural occurrence of Picea abies in these azonal woodlands is preserved by soil conditions which are determined by high level of ground-water causing reduced vitality of other tree species: it is an extragradal natural occurrence of *Picea abies* (gradus = altitudinal vegetation zone, Vegetationsstufe; cf. gradus vegetationis sensu Holub & Jirásek [1967, p. 79]), outside of the main natural species distribution which lies in the supramontane belt in the Western Carpathians (Kučera 2012).

Dominance of *Picea abies* in the water-influenced plant communities under consideration is the reason of their formal syntaxonomical classification in the class *Piceetea excelsae* Klika 1948* (cf. Jirásek 2002, Chytrý et al. 2013; Matuszkiewicz 2002; Exner 2007).

During the preparation of a comprehensive syntaxonomical evaluation of natural *Picea abies* woodlands for the monograph Plant communities of Slovakia, Forest and shrub vegetation (Kučera in Valachovič et al., in prep.) I distinguished two new associations of wet woodlands with *Picea abies*; however, almost all their records are found in the unpublished theses hardly accessible to the public. Aim of this paper is to present the two forest plant communities and the respective phytocoenological relevés.

Material and methods

The initial set of phytocoenological relevés of *Picea abies* wet woodlands was prepared using the Turboveg for Windows database software (Hennekens 2016) (cf. Hennekens & Schaminée 2001) from the Centrálna databáza… (2016) dataset provided for the prepared monograph Plant communities of Slovakia, Forest and shrub vegetation (Valachovič et al., in prep.) and actualised with missing relevés of Šomšák (1976, 1979, 1983).

The dataset of 153 relevés was exported for further modifications and analyses in the software packages JUICE (Tichý 2016) [cf. Tichý 2002] and SYN-TAX 2000

* Syn. *Vaccinio-Piceetea* Br.-Bl. in Br.-Bl. et al. 1939 pro parte min. [cf. Braun-Blanquet et al. 1939], nom. inval., Art. 2b; Kučera (2010, 2012), Kučera & Kliment (2011).

(Podani 2001a, b). Resulting syntaxonomical classification of *Picea abies* wet woodlands in Slovakia is prepared in a comprehensive study (Kučera 2019 in red.).

For purposes of this paper all available relevés irrespective of their plot size ([120] 300–400 m² or without available data on plot size) are used due to small number of recorded relevés. Using JUICE, taxa with unequal taxonomic rank were merged to the nearest mutual rank (Caltha palustris – *C. palustris* ssp. *laeta*, *Galeobdolon luteum* agg. – *G. montanum, Myosotis palustris* agg. – *M. scorpioides*), except *Sphagnum* spp.

When applicable, fidelity calculation (Chytrý et al. 2002; phi coefficient – ϕ) is presented based on the presence/absence data with a standardization of relevé groups to an equal size. Performing the Fisher's exact test, zero fidelity was given to species with significance $P > 0.05$ in a particular cluster (Tichý & Chytrý 2006).

Nomenclature of the vascular plants, bryophytes and lichens follows the checklists of Kubinská & Janovicová (1998) and Marhold et al. (1998): species name *Orthodicranum undulatum* is given according to Šomšák (1976, p. 54, tab. 4) (= *Dicranum bergeri* Blandow?). The abbreviations for vegetation layers of plant communities (E_0 – ground layer: bryophytes, lichens; E_1 – field layer: herbs, grasses, dwarf shrubs…; etc.) are used according to Klika (1948, p. 29–30), layer names according to Rodwell et al. (1991). Syntaxa nomenclature rules are applied in accordance with Weber et al. (2000).

Results

The overall syntaxonomical evaluation of wet woodlands with *Picea abies* (and *Abies alba*) of the Western Carpathians is prepared within another study (Kučera 2019 in red.). In this place are presented two new plant communities of coniferous wet woodlands dominated by (1) *Picea abies* and (2) *Picea abies* and *Abies alba*.

1. *Leucobryo glauci-Piceetum abietis* Šomšák ex P. Kučera 2019 ass. nov. hoc loco

Syn.: *Leucobryo-Piceetum* Šomšák in Šomšák et al. 1993 nom. nud. (Art. 2b) [original form: "*Leucobryo-Piceetum* Štefanovič 1961", nom. fictum (Šomšák et al. 1993, p. 186)]

Non: *Leucobryo-Piceo-Pinetum* Stefanović et Popović ex Stefanović 1964

Original diagnosis: tab. 1.

Nomenclatural type: tab. 1, rel. 9, holotypus hoc loco.

Stands of the plant community are characterized by dominance of *Picea abies*, this species is also a determining component of the understorey. From other trees is a higher constancy reached only by *Pinus sylvestris*.

The most characteristic feature of phytocoenoses of this association is the dominance of *Leucobryum glaucum* in the ground layer. Also, other bryophytes are constant: *Sphagnum* spp. usually with the high dominance (most often *S. girgensohnii, S. palustre* agg.), *Dicranum scoparium, Pleurozium schreberi*, less frequent *Hylocomium splendens, Polytrichum commune* and others.

The field layer consists of stable assemblage of *Vaccinium myrtillus, Luzula pilosa, V. vitis-idaea, Avenella flexuosa, Calamagrostis arundinacea, Maianthemum bifolium, Dryopteris carthusiana, Athyrium filix-femina, C. villosa* as well as *Equisetum sylvaticum* and *Melampyrum sylvaticum*.

Recorded overall species composition, especially considering bryophytes, is biased due to field expertise of a respective author: more detailed species records are given in the relevés of Šomšák (1976) (see tab. 1, rel. 9–11).

Stands of *Leucobryo glauci-Piceetum* are found on shallow humic podzols in plains where water from snow melting and rains remains considerable long above the soil surface (Šomšák 1976, Šomšák et al. 1993). Located are on dryer margins of mires, growth of *Picea abies* trees is not limited by water regime (Šomšák 1976).

Data on the occurrence of this association were recorded only in the Popradská kotlina, in the glacifluvial terrain southerly of the Tatras (Šomšák 1976, Ferančíková 1994, Maťová 1994, Viceníková 1998, Novotková 1999*).

On the ground of floristic differences, following subcommunities are differentiated here:

1a. *Leucobryo glauci-Piceetum abietis typicum* P. Kučera 2019 subass. nov. hoc loco

Original diagnosis: tab. 1, rel. 1–13.

Nomenclatural type: tab. 1, rel. 9, holotypus hoc loco.

This subassociation represents typically developed stands, differentiated by presence of *Avenella flexuosa, Calamagrostis villosa* and *Melampyrum sylvaticum* (cf. Ferančíková 1994, Viceníková 1998, Novotková 1999).

A separate subunit with *Caltha palustris, Crepis paludosa* and ± absence of the three aforementioned species could be differentiated, though only two phytocoenological relevés (tab. 1, rel. 12–13) are available. The canopy of the relevant stands is distinguished also by presence of *Alnus glutinosa*.

* Novotková (1999, tab. 1, rel. 3) published one relevé from her diploma thesis (Ferančíková 1994, tab. 1, rel. 1) with more accurate data on species composition

1b. *Leucobryo glauci-Piceetum abietis agrostietosum caninae* P. Kučera 2019 subass. nov. hoc loco

Original diagnosis: tab. 1, rel. 14–15.
Nomenclatural type: tab. 1, rel. 14, holotypus hoc loco.

Characteristic feature of this subassociation is the presence of *Glyceria fluitans, Ajuga reptans, Agrostis canina, Ranunculus flammula, Cirsium palustre*. These species represent shift in the ecological conditions of stands towards the mire woodland of *Sphagno palustris-Piceetum* Šomšák 1979 (cf. Kučera 2019 in red.).

Nomenclatural note:

Šomšák (1976) and later his students used the name "*Leucobryo-Piceetum* Stefanovič 1961" in their theses (see Šomšák et al. 1993). This name is a nomen fictum and the corresponding name was validly published only later – by Stefanović (1964) and its exact original form was "*Leucobryo-Piceo-Pinetum*" (nom. illeg., Def. V). That association represents an ecologically different plant community (more detailed analysis: Kučera 2012, p. 247). In consideration of the original delimitation of the association by Šomšák (1976) (nom. ined., Art. 1) the correct author citation of the name published by Šomšák et al. (1993) is "*Leucobryo-Piceetum* Šomšák in Šomšák et al. 1993" (nom. nud., Art. 2b).

2. *Stellario nemorum-Abietetum albae* P. Kučera 2019 ass. nov. hoc loco

Syn.: *Equiseto sylvatici-Abietetum sensu* auct. slov. non Moor 1952
Original diagnosis: tab. 2.
Nomenclatural type: tab. 2, rel. 8, holotypus hoc loco

Stands of this woodland are determined by *Picea abies* and *Abies alba*. These two tree species are accompanied by *Fagus sylvatica*, sometimes *Sorbus aucuparia* was recorded. The understorey consists of the all four mentioned species, the most constant shrub species are *Lonicea nigra* and *L. xylosteum*.

The probable cause of *Picea* dominance over *Abies* within most of the recorded stands is the historical human influence. The presence of *Fagus* in the community habitats was significantly reduced as well, along with often drastic reduction in the adjacent forest vegetation.

Table 1. Association *Leucobryo glauci-Piceetum abietis* Šomšák ex P. Kučera 2019 ass. nov.
A – subassociation *Leucobryo glauci-Piceetum abietis typicum* P. Kučera 2019 subass. nov.
B – subassociation *Leucobryo glauci-Piceetum abietis agrostietosum caninae* P. Kučera 2019 subass. nov.
e = species occurrence without a cover-abundance value

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subassociation							**A**							**B**	
Tree and shrub species															
E3															
Picea abies	5	4	4	5	5	5	4	4	5	4	5	4	4	4	2
Pinus sylvestris	.	.	+	.	+	.	.	r	r	.	.	.	+	+	3
Larix decidua	.	.	.	+	.	.	r	.	.	.	.	.	.	.	.
Alnus glutinosa	.	.	.	.	.	.	.	.	.	.	.	1	1	.	+
Betula pendula	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Betula pubescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r
Alnus incana	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
E2															
Picea abies	+	+	2	2	1	2	1	2	2	+	1	+	1	2	.
Frangula alnus	.	.	.	.	.	.	.	.	.	.	.	.	r	+	.
Alnus glutinosa	.	.	r	.	r	.	.	.	.	.	.	.	.	.	.
Sorbus aucuparia	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.
E1															
Picea abies	+	2	2	1	3	1	+	2	.	+	1	1	1	1	2
Sorbus aucuparia	.	r	+	r	.	.	r	+	.	.	.	r	r	+	r
Alnus glutinosa	.	.	.	.	.	.	.	.	.	.	.	r	+	.	r
Frangula alnus	.	.	.	.	.	.	.	.	r	.	+	.	.	+	.
Salix aurita	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.
Alnus incana	.	.	.	.	.	.	.	.	.	.	r	.	.	+	.
Pinus sylvestris	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Betula pendula	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Salix caprea	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Abies alba	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.
Betula pubescens	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Differential field layer species (E1) within the association															
Subassociation typicum															
Avenella flexuosa	2	1	3	1	+	1	2	1	1	+	.	.	.	.	.
Calamagrostis villosa	+	+	r	.	1	+	+	.	+	+	1	.	.	.	.
Melampyrum sylvaticum	2	+	2	1	.	.	+	+	.	.	.	.	+	.	.
Calluna vulgaris	.	r	.	.	+	.	.	+	.	.	.	.	.	.	.
Subassociation agrostietosum caninae															
Glyceria fluitans	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1

Tab. 1 – cont.

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ajuga reptans	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Agrostis canina	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Ranunculus flammula	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Agrostis stolonifera	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Cirsium palustre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r
Chosen species of wet habitats															
Equisetum sylvaticum	.	.	.	.	1	+	+	1	1	1	.	r	r	.	+
Carex echinata	.	.	.	+	.	.	+	+	.	.	.	.	+	1	+
Caltha palustris	.	.	.	.	.	.	.	.	.	.	+	r	+	1	+
Potentilla erecta	.	.	.	+	.	.	+	.	.	+	.	.	.	.	.
Lysimachia vulgaris	.	.	.	.	.	.	.	.	+	.	.	.	.	+	+
Carex canescens	.	.	.	.	.	.	.	.	.	1	+	.	.	.	+
Crepis paludosa	.	.	.	.	.	.	.	.	.	.	.	r	+	.	+
Carex nigra	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Chaerophyllum hirsutum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Myosotis palustris agg.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Ranunculus repens	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Valeriana dioica	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Other field layer species (E1)															
Vaccinium myrtillus	2	1	3	2	4	3	2	2	2	1	2	1	2	2	2
Luzula pilosa	2	+	+	2	.	1	1	1	1	1	1	+	+	+	r
Vaccinium vitis-idaea	+	+	1	+	2	1	1	1	1	1	1	.	+	1	+
Calamagrostis arundinacea	+	+	.	+	+	1	+	.	+	+	.	r	+	.	.
Maianthemum bifolium	+	.	1	+	1	+	.	+	r	.	.	+	+	+	.
Dryopteris carthusiana	r	r	.	+	.	.	+	r	1	.	.	+	+	+	r
Athyrium filix-femina	.	.	+	+	+	.	1	.	+	+	.	+	1	+	r
Luzula luzuloides	.	+	r	+	.	2	1	.	.	r	.	+	.	.	.
Hieracium murorum	.	+	+	.	+	.	+	.	.	.	.	+	r	.	.
Oxalis acetosella	.	+	.	.	.	.	.	+	2	+	.	1	+	.	.
Orthilia secunda	+	.	.	.	.	+	.	.	.	.	2	.	+	+	.
Rubus idaeus	.	.	.	.	.	.	.	.	+	.	+	.	.	.	r
Lycopodium annotinum	+	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Solidago virgaurea	r	.	.	.	.	.	.	.	.	.	.	r	.	.	.
Deschampsia cespitosa	.	.	.	+	.	.	.	.	.	.	.	.	.	r	.
Senecio ovatus	.	.	.	r	.	.	.	.	r	.	.	.	.	.	.
Veronica officinalis	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.
Ground layer species (E0)															
Leucobryum glaucum	3	2	3	2	e	e	3	2	3	4	2	2	3	2	3

Tab. 1 – cont.

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sphagnum girgensohnii	.	2	.	.	e	e	.	2	2	1	.	.	.	3	.
Sphagnum sp.	1	.	.	1	.	.	1	.	.	.	.	.	.	.	.
Sphagnum centrale	.	.	.	.	e	.	.	.	.	.	.	.	.	2	2
Sphagnum palustre	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Sphagnum magellanicum	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.
Sphagnum capillifolium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Dicranum scoparium	1	1	2	2	e	e	2	2	.	2	+	1	1	1	1
Pleurozium schreberi	+	1	1	1	e	e	+	2	2	1	+	.	.	1	.
Hylocomium splendens	.	1	+	.	e	.	+	+	+	+	+	.	.	.	.
Polytrichum commune	.	1	.	+	e	e	.	+	+	1	.	.	.	.	.
Polytrichum formosum	1	.	.	.	.	.	+	2	r	.	.	+	1	.	+
Lepidozia reptans	+	.	.	.	.	.	.	.	+	+	+	.	.	.	+
Dicranella heteromalla	.	.	.	.	.	e	.	+	r	.	.	.	.	+	.
Plagiothecium curvifolium	1	.	.	1	.	.	+	.	.	.	.	.	.	.	+
Rhytidiadelphus triquetrus	.	.	.	.	.	.	.	.	+	+	+	.	.	+	.
Plagiomnium affine	1	.	.	1	.	.	+	.	.	.	.	.	.	.	.
Pohlia nutans	.	.	.	.	e	.	.	.	.	+	+	.	.	.	.
Calypogeia integristipula	.	.	.	.	.	.	.	.	+	.	1	.	.	.	+
Orthodicranum undulatum	.	.	.	.	.	.	.	.	2	+	.	.	.	.	.
Rhizomnium punctatum	.	.	.	.	.	.	.	.	.	.	r	.	.	.	1

Other E1 and E0 species in one relevé only:

Rel. 4: E0 – *Lepidozia* sp. +;
Rel. 6: E1 – *Lycopodium clavatum* 1, *Polygala vulgaris* r;
Rel. 8: E0 – *Plagiothecium* sp. +;
Rel. 9: E1 – *Dryopteris filix-mas* +, *Corallorrhiza trifida* r, *Gymnocarpium dryopteris* r, *Huperzia selago* r; E0 – *Eurhynchium angustirete* +, *Mnium* sp. +, *Lophocolea heterophylla* r, *Plagiothecium laetum* r;
Rel. 10: E0 – *Herzogiella seligeri* +, *Hypnum cupressiforme* +; *Cladonia* sp. r;
Rel. 11: E1 – *Bistorta major* r, *Equisetum fluviatile* r, *Pyrola media* r; E0 – *Plagiochila asplenioides* 2, *Tetraphis pellucida* +, *Polytrichum strictum* r;
Rel. 15: E0 – *Pellia* sp. 1, *Chiloscyphus pallescens* +.

Relevé sites:

Rel. 1 (Ferančíková 1994, tab. 1, rel. 3): Popradská kotlina, Tatranská Polianka, forest stand 764 (right section), 920 m a.s.l., slope 1 °, aspect E, relevé area 20 × 20 m, cover E3 85 %, E2 1 %, E1, 20 %, E0 50 %, age of stand 81–100 years, 11. 8. 1992.

Rel. 2 (Viceníková 1998, tab. 7, rel. 1 [tab. 15, rel. 88]): Popradská kotlina, Nová Polianka, forest stand 705b, 880 m a.s.l., slope 2 °, aspect S, relevé area 400 m², cover E3 70 %, E2 1 %, E1 10 %, E0 50 %, 30. 9. 1993.

Rel. 3 (Ferančíková 1994, tab. 1, rel. 6): Popradská kotlina, Tatranská Polianka, Gerlachovská hora, forest stand 764 (upper section), 940 m a.s.l., slope 3 °, aspect S, relevé area 20 × 20 m, cover E3 75 %, E2 20 %, E1 70 %, E0 85 %, age of stand 81–100 years, 25. 9. 1993.

Rel. 4 (Novotková 1999, tab. 1, rel. 3): Popradská kotlina, Tatranská Polianka, forest stand 764, 920 m a.s.l., slope: almost plain, relevé area 20 × 20 m, cover E3 85 %, E2 10 %, E1 70 %, E0 40 %, age of stand 81–100 years, 11. 8. 1992.

Rel. 5 (Viceníková 1998, tab. 15, rel. 90): Popradská kotlina, Tatranské Matliare, forest stand 1 134, 860 m a.s.l., slope 2 °, aspect E, relevé area 400 m², cover E3 90 %, E2 5 %, E1 85%, E0 65 %, 21. 9. 1991.

Rel. 6 (Viceníková 1998, tab. 15, rel. 91): Popradská kotlina Basin, Tatranské Matliare, forest stand 1 093a, 830 m a.s.l., slope – (plain), relevé area 400 m², cover E3 75 %, E2 20 %, E1 70 %, E0 80 %, 20. 11. 1991.

Rel. 7 (Ferančíková 1994, tab. 1, rel. 2): Popradská kotlina Basin, Tatranská Polianka, forest stand 764 (central section), 910 m a.s.l., slope 1 °, aspect S, relevé area 20 × 20 m, cover E3 65 %, E2 5 %, E1 35 %, E0 50 %, age of stand 81–100 years, 11. 8. 1992.

Rel. 8 (Viceníková 1998, tab. 7, rel. 2 [tab. 15, rel. 89]): Popradská kotlina, Nová Polianka, forest stand 701, 830 m a.s.l., slope 2 °, aspect SSE, relevé area 400 m², cover E3 70 %, E2 10 %, E1 35 %, E0 75 %, 15. 9. 1993.

Rel. 9 (Šomšák 1976, tab. 4, rel. 2): Popradská kotlina Basin, Tatranské Matliare, SE from the spot height 832.4, 830 m a.s.l., relevé area 20 × 20 m, cover E3 85 %, E2 25 %, E1 60 %, E0 70 %, 16. 10. 1970.

Rel. 10 (Šomšák 1976, tab. 4, rel. 1): Popradská kotlina Basin, Batizovce, W from the spot height 877.0 (above hunter's chalet), 850 m a.s.l., relevé area 20 × 20 m, cover E3 75 %, E2 5 %, E1 45 %, E0 85 %, age of stand 80–100 years, 27. 5. 1970.

Rel. 11 (Šomšák 1976, tab. 4, rel. 4): Popradská kotlina Basin, Gerlachov "Kunštat", S below the spot height 842.5, 835 m a.s.l., relevé area 20 × 20 m, cover E3 85 %, E2 15 %, E1 60 %, E0 70 %, age of stand 60 years, 19. 10. 1970.

Rel. 12 (Ferančíková 1994, tab. 1, rel. 4): Popradská kotlina Basin, Gerlachov, forest stand 737 (central part of the right section), 840 m a.s.l., slope 5 °, aspect S, relevé area 20 × 20 m, cover E3 80 %, E2 1 %, E1 10 %, E0 300 %, age of stand 81–100 years, 19. 8. 1993.

Rel. 13 (Ferančíková 1994, tab. 1, rel. 5): Popradská kotlina Basin, Danielov dom, forest stand 722 (lower section), approx. 250 m to SW from the chalet Chata za Humbiargom, 825 m a.s.l., slope: plain, relevé area irregular – 400 m², cover E3 85 %, E2 1 %, E1 25 %, E0 75 %, age of stand 81–100 years, 27. 8. 1993.

Rel. 14 (Ferančíková 1994, tab. 3, rel. 4): Popradská kotlina Basin, Gerlachov, forest stand 735 (left upper section), beside the chalet Chata za Humbiargom, 830 m a.s.l., slope: plain, relevé area 20 × 20 m, cover E3 65 %, E2 20 %, E1 65 %, E0 95 %, age of stand 61–80 years, 1. 10. 1993.

Rel. 15 (Maťová 1994, p. 44): Popradská kotlina Basin, Tatranské Zruby, forest stand 797b, 820 m a.s.l., slope: plain, relevé area 20 × 20 m, cover E3 75 %, E2 0 %, E1 30 %, E0 65 %, age of stand 61–80 years, 22. 9. 1993.

Table 2. Association *Stellario nemorum-Abietetum albae* P. Kučera 2019 ass. nov.
A – subassociation *Stellario nemorum-Abietetum albae calamagrostietosum villosae* Majzlanová ex P. Kučera 2019 subass. nov.
B – subassociation *Stellario nemorum-Abietetum albae crepidetosum paludosae* P. Kučera 2019 subass. nov.
typical variant (rel. 12–15)
variant *Lycopodium annotinum* (rel. 16–18)
variant *Cardamine *opicii* (rel. 19–20)
C – subassociation *Stellario nemorum-Abietetum albae petasitetosum albi* Majzlanová ex P. Kučera 2019 subass. nov.
variant *Maianthemum bifolium* (rel. 21–23)
typical variant (rel. 24–36)
ϕ = species fidelity within the association (× 100, rounded to units)

Relevé number	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Subassociation	A											ϕ	B										C																ϕ
Tree and shrub species																																							
E3																																							
Picea abies	3	3	2	4	3	3	2	4	2	3	4	–	4	5	4	3	4	4	4	4	4	–	3	3	4	4	4	2	2	2	3	2	2	2	2	2	2	3	–
Abies alba	1	1	2	.	1	1	2	+	2	1	.	–	+	.	1	1	+	.	r	.	.	–	1	1	.	r	1	+	2	1	1	2	2	.	2	r	1	1	–
Fagus sylvatica	.	.	+	.	.	+	+	.	+	.	.	–	.	.	.	.	.	.	.	.	.	–	.	.	.	r	r	.	.	+	.	+	+	.	.	.	.	.	–
Sorbus aucuparia	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	2	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	–
Alnus incana	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	r	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
E2																																							
Picea abies	2	+	.	2	+	.	+	+	.	+	+	–	+	.	.	+	.	1	2	1	r	–	.	.	+	r	r	+	+	.	.	.	+	r	.	+	.	+	–
Sorbus aucuparia	1	+	+	.	.	1	+	.	+	+	.	–	.	.	3	r	.	.	.	1	r	–	+	1	+	.	+	+	.	.	+	.	+	.	r	.	r	.	–
Lonicera nigra	+	.	+	.	.	.	.	.	+	+	.	–	r	+	1	.	.	.	.	.	.	–	r	+	+	.	.	+	.	.	+	.	.	+	+	r	r	.	–
Fagus sylvatica	.	.	+	.	.	r	r	+	r	r	.	–	.	.	.	+	r	+	.	.	.	–	+	+	.	.	.	r	.	.	+	+	.	.	.	.	.	+	–
Abies alba	1	.	.	1	.	+	.	.	.	+	+	48	.	.	+	.	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Lonicera xylosteum	.	.	.	.	.	r	.	.	.	+	.	–	.	.	.	.	.	.	.	.	.	–	+	.	.	r	.	r	.	.	.	.	.	.	+	.	.	.	–
Acer pseudoplatanus	.	.	r	.	.	r	.	r	.	.	.	–	.	.	.	.	.	.	.	.	.	–	.	.	+	.	r	.	.	.	.	.	.	.	.	.	.	.	–
Salix caprea	.	.	.	.	.	r	.	.	.	r	.	–	.	.	.	.	.	.	r	.	.	–	.	.	.	.	.	r	.	r	.	.	.	.	.	.	.	.	–
Sambucus racemosa	.	.	.	.	.	.	.	r	.	+	.	–	.	.	+	.	.	.	.	.	.	–	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	–
E1																																							
Picea abies	1	+	+	1	+	+	+	+	+	+	+	32	+	+	1	1	1	+	1	r	r	–	.	+	+	.	.	+	r	.	+	.	+	+	.	.	.	+	–
Abies alba	1	+	+	1	+	1	+	1	+	2	2	43	1	.	.	1	1	+	1	.	.	–	1	+	.	+	+	+	.	.	+	.	+	+	+	.	.	+	–

Tab. 2 – cont.

Relevé number	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Sorbus aucuparia	.	.	+	.	+	.	.	1	1	.	+	–	1	1	1	+	+	+	+	.	+	43	r	1	.	.	r	+	.	.	r	+	+	.	.	.	.	.	–
Fagus sylvatica	.	.	.	.	.	r	.	r	.	.	r	–	r	.	.	.	r	+	.	.	r	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	–
Lonicera xylosteum	.	.	.	.	.	.	.	r	.	.	+	–	.	.	.	.	.	.	.	.	.	–	.	.	.	r	.	.	+	.	.	.	+	.	.	.	.	–
Acer pseudoplatanus	.	.	.	.	.	.	.	r	.	.	.	–	.	.	.	.	r	+	r	.	.	39	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Lonicera nigra	.	.	.	.	.	.	.	.	.	.	.	–	+	1	1	.	.	+	.	.	.	59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Salix caprea	.	.	.	.	.	.	.	r	.	.	r	–	.	.	.	.	.	.	r	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Rosa pendulina	.	.	r	.	.	.	.	.	+	.	.	–	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Sambucus racemosa	.	.	.	.	.	.	.	.	.	.	+	–	.	.	.	.	.	.	.	.	.	–	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	–
Betula pubescens	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	r	.	.	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Alnus incana	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	r	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Salix silesiaca	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	r	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Differential field layer species (E1) within the association																																						
Subassociation *calamagrostietosum*																																						
Avenella flexuosa	1	+	+	1	+	+	+	+	.	+	+	64	+	.	.	.	+	+	.	.	.	–	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	–
Veronica officinalis	r	.	.	r	.	.	+	+	+	.	.	60	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Luzula luzuloides	1	+	+	1	+	.	.	.	1	.	.	55	.	.	.	.	.	.	.	.	.	–	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	–
Prenanthes purpurea	1	1	+	1	+	1	1	+	+	+	+	49	+	+	+	+	+	r	r	.	.	–	+	+	.	.	.	.	.	1	.	.	.	.	.	.	1	–
Hieracium murorum	1	+	1	1	+	+	1	+	.	+	+	48	+	.	+	1	r	.	.	.	+	–	+	+	+	.	.	.	.	.	.	+	.	.	.	.	.	–
Phyteuma spicatum	+	+	+	+	.	.	.	.	+	.	.	47	.	.	.	.	.	.	.	.	.	–	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Calamagrostis villosa	+	1	1	+	.	1	+	+	1	+	+	40	+	.	.	.	+	1	1	+	.	–	+	.	+	+	+	.	+	.	.	.	.	+	.	.	+	–
Gentiana asclepiadea	1	+	1	+	+	+	+	+	.	+	+	35	1	+	+	.	.	r	+	.	.	–	.	+	+	+	+	.	.	+	+	+	.	+	.	.	+	.	–
Solidago virgaurea	+	+	+	+	+	+	.	.	.	.	.	34	1	.	.	.	r	.	.	.	.	–	+	+	.	.	.	.	.	+	.	.	.	.	.	.	.	–
Maianthemum bifolium	+	+	1	+	.	1	.	+	.	1	+	34	.	2	.	.	+	1	+	.	r	–	+	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Dryopteris dilatata	.	+	+	.	.	1	+	.	+	1	.	29	.	.	.	.	.	+	+	+	+	–	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Subassociation *crepidetosum*																																						
Crepis paludosa	.	.	.	.	.	.	.	.	.	.	.	–	+	+	1	+	1	+	1	2	.	82	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	–
Caltha palustris (rel. 5), *C. palustris* ssp. *laeta*	.	.	.	.	+	.	.	.	.	.	.	–	2	1	1	+	.	.	.	3	3	67	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Sanicula europaea	.	.	.	.	.	.	.	.	.	.	.	–	+	.	+	+	.	.	.	.	.	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–

Tab. 2 – cont.

Relevé number	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Lycopodium annotinum	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	1	2	2	.	.	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Ranunculus repens	.	+	.	.	+	.	.	.	+	.	.	–	r	+	1	1	+	.	+	.	2	49	.	.	+	.	.	.	.	.	.	.	+	.	+	.	+	.	–
Vaccinium vitis-idaea	.	.	.	.	+	.	.	.	.	.	+	–	+	.	+	.	1	1	+	.	.	42	.	.	+	r	.	.	.	.	.	.	.	.	.	.	.	.	–
Gymnocarpium dryopteris	.	.	.	+	.	.	.	+	.	.	.	–	.	1	.	.	1	2	.	.	+	36	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	–
Luzula luzulina	+	+	+	.	.	+	.	.	+	.	.	–	1	1	+	+	.	.	.	+	r	36	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Variant *Cardamine *opicii*																																						
Viola biflora	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	3	2	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Cardamine amara ssp. *opicii*	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	2	2	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Athyrium distentifolium	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	+	2	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Senecio subalpinus	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	+	1	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Alchemilla sp.	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	+	1	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Subassociation *petasitetosum*																																						
Geranium robertianum	.	.	r	.	.	.	.	.	.	.	.	–	.	.	.	r	.	.	.	.	.	–	+	+	.	1	1	1	+	1	+	+	1	.	1	+	.	.	66
Ranunculus lanuginosus	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	–	1	1	1	1	1	+	.	1	.	.	.	2	.	.	.	.	63
Myosotis palustris agg.	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	2	+	–	r	+	.	1	1	1	1	1	+	+	+	.	.	.	+	.	59
Petasites albus	+	.	.	.	.	.	.	.	.	.	.	–	1	1	.	2	+	+	.	+	+	–	3	3	3	3	4	3	4	3	4	4	4	4	4	4	4	2	55
Cardamine flexuosa	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	–	+	.	.	.	+	+	.	.	.	.	1	.	.	1	+	.	53
Ranunculus platanifolius	.	.	+	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	–	+	.	+	.	.	+	+	.	+	+	.	.	+	.	.	.	49
Urtica dioica	.	+	.	.	+	r	.	r	.	.	.	–	.	.	.	.	.	.	.	r	.	–	+	+	+	1	1	+	+	.	.	.	.	+	+	+	+	.	44
Chrysosplenium alternifolium	+	+	+	.	+	.	1	.	.	.	.	–	.	1	+	1	.	.	.	1	2	–	r	+	+	1	1	+	1	+	.	+	+	1	+	1	1	+	43
Milium effusum	+	.	.	.	.	.	+	.	.	.	.	–	.	.	.	.	.	.	.	.	.	–	+	+	.	.	+	.	+	.	+	+	+	.	.	.	.	.	40
Characteristic field layer species of the association (E1)																																						
Stellaria nemorum	+	2	+	+	2	+	1	+	.	+	+	–	.	+	1	.	.	.	.	2	4	–	.	1	1	3	3	1	1	+	+	2	1	1	2	1	2	.	–
Lysimachia nemorum	.	+	+	.	1	.	.	+	+	.	+	–	+	1	+	2	.	.	.	.	.	–	+	+	+	.	.	.	+	+	.	+	.	.	.	+	.	+	–

Tab. 2 – cont.

Relevé number	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Impatiens noli-tangere	+	+	.	1	.	.	+	.	.	+	.	–	.	+	.	1	.	.	.	.	.	–	.	r	.	+	.	+	+	.	.	+	+	+	.	+	.	1	–
Cardamine trifolia	.	1	1	.	1	.	+	.	2	+	.	–	.	.	.	.	.	.	.	.	.	–	2	1	.	1	1	1	.	.	+	.	1	.	.	.	.	+	–
Adenostyles alliariae	.	.	+	+	+	.	.	+	.	+	+	–	.	.	.	.	.	.	.	.	+	–	+	1	.	.	.	.	.	+	1	.	.	+	+	.	+	.	–
Rubus hirtus	+	1	+	.	.	.	.	.	+	.	.	–	+	+	.	2	.	.	.	.	.	–	+	.	.	.	.	.	+	.	+	.	+	.	.	+	.	.	–
Carex sylvatica	+	.	r	.	.	.	.	.	.	.	.	–	.	.	r	+	.	.	.	.	.	–	+	.	.	.	+	+	.	+	+	.	+	.	.	+	.	.	–
Galium odoratum	.	.	.	.	+	+	.	.	+	.	.	–	+	.	+	.	.	.	.	.	.	–	1	+	.	1	.	.	.	+	+	.	.	.	.	+	.	.	–
Poa remota	.	.	.	.	.	.	+	.	+	.	.	–	.	.	.	.	.	.	.	.	.	–	1	.	.	1	.	.	.	.	+	.	.	+	.	.	.	.	–
Cicerbita alpina	.	+	.	.	.	.	.	.	+	.	.	–	.	.	.	.	.	.	.	.	.	–	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	–
Other field layer species (E_1)																																							
Oxalis acetosella	3	3	2	3	3	2	2	2	3	2	2	–	1	2	1	2	2	1	1	+	1	–	2	3	1	2	2	2	+	1	3	+	+	1	+	+	1	2	–
Equisetum sylvaticum	2	3	2	2	3	3	1	3	2	1	2	–	3	3	2	2	4	3	3	2	+	–	1	1	1	1	1	1	1	+	2	2	1	+	2	1	2	1	–
Senecio ovatus	1	+	1	1	+	+	+	+	3	+	+	–	1	+	+	1	+	+	.	.	+	–	+	1	+	1	1	.	+	+	+	.	.	+	+	2	.	+	–
Rubus idaeus	+	3	.	+	2	+	+	+	2	+	+	–	1	1	1	1	r	r	+	+	+	–	+	+	1	1	1	+	.	1	+	.	.	+	.	.	+	+	–
Chaerophyllum hirsutum	1	1	+	+	1	.	3	.	+	.	.	–	1	1	1	1	r	.	.	1	2	–	1	1	1	1	1	.	1	3	1	2	+	2	1	+	2	.	–
Vaccinium myrtillus	1	+	2	+	+	1	1	1	1	1	1	34	2	1	2	1	3	+	2	+	1	34	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.	1	–
Athyrium filix-femina	.	.	+	.	.	+	.	+	+	+	+	–	+	1	.	2	+	+	+	1	+	–	.	+	+	1	1	1	+	+	+	+	+	+	+	+	.	.	–
Calamagrostis arundinacea	1	.	+	+	.	+	1	+	+	.	1	–	+	.	1	.	1	.	.	.	.	–	+	2	+	.	+	+	+	.	1	+	2	+	+	.	.	.	–
Homogyne alpina	1	+	.	1	+	+	.	1	+	+	1	–	1	2	.	.	1	1	1	+	+	–	+	+	.	3	+	.	.	.	+	.	.	.	.	.	.	.	–
Dryopteris carthusiana	+	+	.	+	1	+	+	+	+	.	+	–	1	2	2	.	1	.	2	.	.	–	+	.	+	1	.	.	.	.	.	+	+	.	.	+	.	+	–
Deschampsia cespitosa	+	.	.	+	.	.	.	.	.	+	+	–	+	+	.	.	1	+	.	2	1	–	r	+	.	1	+	.	+	+	.	.	+	+	.	+	.	.	–
Dryopteris filix-mas	.	+	+	.	+	+	+	+	+	+	.	–	.	.	.	.	.	.	.	.	r	–	+	+	+	1	+	+	.	+	.	+	.	+	+	.	.	.	–
Epilobium montanum	.	+	.	+	.	.	.	.	.	+	.	–	.	.	.	+	.	.	.	+	1	–	+	+	.	1	.	.	1	.	.	.	.	.	.	+	.	+	–
Phegopteris connectilis	.	.	+	.	.	.	.	.	.	.	.	–	.	+	.	.	+	1	+	.	1	–	+	.	.	.	.	.	+	.	.	+	.	.	+	+	.	.	–
Fragaria vesca	.	+	+	.	.	.	.	+	.	+	.	–	+	.	.	+	.	.	.	.	.	–	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	–
Luzula sylvatica	+	.	.	.	.	.	.	.	+	.	.	–	.	.	.	.	+	.	.	.	+	–	+	+	.	.	.	.	.	+	.	.	+	.	.	.	.	.	–
Veratrum album ssp. *lobelianum*	.	+	.	.	.	.	.	.	+	.	.	–	.	.	.	.	.	r	r	.	.	–	1	+	.	.	+	.	.	.	.	.	.	.	.	+	.	.	–
Glyceria nemoralis	+	+	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	+	.	–	+	.	.	+	.	.	+	.	.	.	+	.	.	.	.	.	–
Anemone nemorosa	+	.	.	.	.	.	+	1	.	+	.	–	.	.	.	.	.	.	.	.	.	–	.	+	.	.	.	.	.	.	+	.	.	.	+	.	.	–

Tab. 2 – cont.

Relevé number	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Dentaria glandulosa	.	+	+	.	.	.	.	.	.	+	.	–	.	.	.	.	.	.	.	.	.	–	+	+	.	+	.	.	.	.	.	+	.	.	.	.	.	–
Cardamine amara	.	.	.	.	.	+	.	.	.	.	.	–	1	.	+	1	.	.	.	.	.	–	+	.	.	.	.	.	.	.	+	.	.	+	.	.	.	–
Calamagrostis epigejos	+	.	.	.	.	.	+	.	.	.	.	–	.	.	.	.	.	.	.	.	.	–	+	1	.	.	.	.	.	.	+	.	+	.	.	.	.	–
Poa palustris	.	.	+	.	.	+	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	–	.	.	.	1	.	.	.	.	.	+	+	.	1	.	.	.	–
Veronica anagallis-aquatica	.	.	+	.	.	.	.	.	+	.	.	–	.	.	.	.	.	.	.	.	.	–	.	.	.	1	+	.	.	.	.	+	.	1	.	.	.	.	–
Mycelis muralis	.	.	.	.	.	.	+	.	.	.	.	–	.	+	+	+	.	.	.	.	.	–	.	r	.	.	.	.	.	.	.	.	.	+	.	.	.	.	–
Filipendula ulmaria	.	+	.	.	.	.	.	.	.	.	.	–	+	+	.	.	.	.	.	.	.	–	.	.	1	.	.	.	.	+	.	.	.	.	.	.	.	.	–
Luzula pilosa	+	.	.	+	.	.	.	.	.	.	.	–	.	.	2	1	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Doronicum austriacum	.	+	.	.	.	.	.	.	.	.	+	–	.	.	.	.	.	r	.	.	.	–	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Galeobdolon luteum	.	.	.	+	.	.	.	.	.	.	.	–	.	.	.	1	.	.	.	.	.	–	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	–
Symphytum tuberosum	.	.	.	.	+	.	.	.	.	.	.	–	.	.	.	r	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	–
Myosotis sylvatica	.	.	.	.	.	.	.	+	+	.	.	–	.	.	.	.	.	+	.	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Circaea alpina	.	.	.	.	.	.	.	.	.	.	.	–	.	+	.	.	.	.	.	.	.	–	+	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	–
Carex remota	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	.	.	–	+	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	–
Differential ground layer species (E0)																																							
Subassociation *calamagrostietosum*																																							
Polytrichum commune	2	.	.	1	.	2	3	1	1	2	1	54	.	.	.	.	+	.	.	.	.	–	.	.	.	3	.	.	.	2	1	.	.	.	.	.	1	–
Subassociation *crepidetosum*																																							
Polytrichum formosum	.	.	.	.	.	.	.	.	.	.	.	–	+	1	+	1	+	1	.	+	2	92	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Pleurozium schreberi	.	.	.	.	.	.	.	.	.	.	.	–	.	.	1	.	+	+	+	.	.	59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Dicranum scoparium	.	.	2	.	1	.	.	1	2	.	.	–	2	2	2	1	1	1	1	+	+	53	.	.	.	1	2	3	3	.	2	2	.	.	.	2	2	1	–
Conocephalum conicum	.	.	.	.	1	.	.	.	.	.	.	–	1	1	1	1	.	.	.	.	.	49	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Plagiomnium rostratum	.	.	.	.	1	.	.	.	.	.	.	–	2	3	2	2	.	.	.	.	.	49	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Variant *Cardamine *opicii*																																							
Rhizomnium magnifolium	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	3	4	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–

Tab. 2 – cont.

Relevé number	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Sphagnum squarrosum	.	.	.	.	.	.	.	.	.	.	.	–	.	.	.	.	.	.	.	+	1	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	–
Subassociation *petasitetosum*																																							
Plagiomnium affine	.	1	1	1	.	2	.	2	1	2	1		2	2	.	2	.	.	.	.	.	–	2	1	2	.	1	1	1	2	1	1	2	2	1	2	1	1	41
Other ground layer species (E0)																																							
Sphagnum girgensohnii	.	2	.	3	2	.	.	1	.	.	3	–	.	.	.	.	5	4	4	+	.	–	2	.	2	3	.	.	.	2	.	.	3	2	2	1	2	3	–
Plagiothecium curvifolium	2	.	.	1	.	.	.	1	2	.	1	–	1	.	.	.	+	.	+	.	.	–	1	2	2	.	2	.	.	.	.	.	2	2	.	2	.	1	–
Cirriphyllum piliferum	2	.	.	.	1	.	1	.	2	1	.	–	.	.	.	.	.	.	.	.	.	–	.	1	1	.	.	.	1	.	1	.	2	1	1	1	.	.	–
Rhizomnium punctatum	2	.	.	.	1	.	.	.	2	.	.	–	.	.	.	.	.	+	1	.	.	–	2	2	2	.	1	.	.	.	.	.	2	1	.	1	1	.	–
Plagiomnium undulatum	.	2	2	.	.	2	.	.	.	2	.	–	.	.	+	+	.	.	.	.	.	–	1	2	.	.	.	.	.	2	.	1	.	2	.	.	.	.	–
Plagiothecium undulatum	.	.	.	1	1	.	.	1	.	.	.	–	1	2	1	1	.	.	.	.	.	–	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1	–
Hylocomium splendens	.	.	.	.	1	.	.	1	.	.	1	–	+	.	2	.	.	.	.	.	.	–	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1	–
Plagiochila asplenioides	.	.	.	1	.	.	.	1	.	.	1	–	.	.	+	.	.	.	+	.	.	–	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	–
Thuidium tamariscinum	.	.	.	.	.	.	2	.	.	.	.	–	.	.	.	.	.	.	.	.	.	–	1	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	–

Other E1 and E0 layer species in one or two relevés only:

Rel. 1: E1 – *Asarum europaeum* +;
Rel. 2: E1 – *Valeriana tripteris* +;
Rel. 3: E1 – *Adoxa moschatellina* +;
Rel. 4: E1 – *Digitalis grandiflora* +, *Polygonatum verticillatum* +, *Galeopsis tetrahit* r;
Rel. 5: E0 – *Rhizomnium pseudopunctatum* 1;
Rel. 7: E1 – *Festuca drymeja* 1, *Angelica sylvestris* +;
Rel. 8: E1 – *Asarum europaeum* +;
Rel. 10: E1 – *Huperzia selago* +;
Rel. 12: E1 – *Galium schultesii* 1, *Ajuga reptans* +, *Agrostis capillaris* r; E0 – *Marchantia polymorpha* 1;
Rel. 13: E1 – *Galeopsis pubescens* +, *Huperzia selago* +, *Polygonatum verticillatum* 1, *Streptopus amplexifolius* +; E0 – *Marchantia polymorpha* +, *Plagiothecium laetum* +;
Rel. 14: E1 – *Pulmonaria obscura* +, *Viola reichenbachiana* +;
Rel. 15: E1 – *Galium rotundifolium* +, *Viola reichenbachiana* +;
Rel. 16: E1 – *Agrostis stolonifera* +, *Equisetum palustre* +, *Soldanella hungarica* +;
Rel. 17: E1 – *Leucanthemum rotundifolium* +, *Listera cordata* r; E0 – *Rhytidiadelphus triquetrus* 1;
Rel. 18: E1 – *Leucanthemum rotundifolium* r; E0 – *Sphagnum palustre* 2, *Brachythecium starkei* +;
Rel. 19: E1 – *Cardamine pratensis* 1, *Rumex alpinus* 1, *Stellaria alsine* 1, *Carex canescens* +, *C. flava* +, *C. nigra* +, *Galium palustre* +, *Juncus* sp. +, *Nardus stricta* +, *Prunella vulgaris* +, *Cirsium palustre* r; E0 – *Cratoneuron decipiens* 3, *Pellia neesiana* 2, *Atrichum undulatum* +, *Brachythecium salebrosum* +, *Dicranella palustris* +;
Rel. 20: E1 – *Primula elatior* 1, *Acetosa arifolia* +, *Cardamine hirsuta* +, *Dryopteris expansa* +, *Glyceria fluitans* +, *Veronica beccabunga* +, *Gnaphalium sylvaticum* r; E0 – *Rhytidiadelphus squarrosus* +;
Rel. 21: E1 –*Moehringia trinervia* +;
Rel. 24: E1 – *Primula elatior* 1, *Acetosa arifolia* +, *Polygonatum multiflorum* +, *Scrophularia scopolii* +;
Rel. 24: E1 – *Aruncus vulgaris* r;
Rel. 33: E1 – *Galeopsis pubescens* r;
Rel. 36: E0 – *Brachythecium rivulare* 1, *Rhytidiadelphus triquetrus* 1.

Relevé sites:

Rel. 1 (Majzlanová 1982, tab. 13, rel. 20): Skorušinské vrchy, Blatná dolina, above the road, above the spot height 886.8, slope 3 °, aspect W, relevé area 25 × 15 m, cover E3 75 %, E2 20 %, E1 90 %, E0 60 %, age of stand 100 years, 17. 9. 1979.
Rel. 2 (Majzlanová 1982, tab. 13, rel. 15): Skorušinské vrchy, Čimhová – Hájisko, plain terrace in a spring area, 1 150 m a.s.l., slope 3–5 °, aspect N, relevé area 10 × 40 m, cover E3 75 %, E2 5 %, E1 100 %, E0 35 %, age of stand 100–120 years, 2. 10. 1979.

Rel. 3 (Majzlanová 1982, tab. 13, rel. 16): Skorušinské vrchy, Mihulčia dolina, above right side of the road, slope 7 °, aspect SW, relevé area 20 × 20 m, cover E3 80 %, E2 2 %, E1 95 %, E0 30 %, age of stand 80–90 years, 14. 7. 1979.

Rel. 4 (Majzlanová ined., tab. 2, rel. 5): Skorušinské vrchy, Blatná dolina, above the road, below the spot height 886.8, 900 m a.s.l., relevé area 400 m², cover E3 75 %, E2 20 %, E1 95 %, E0 65 %, 17. 9. 1979.

Rel. 5 (Majzlanová ined, tab. 2, rel. 10): Skorušinské vrchy, Čimhová, Hájisko, plain terrace in a spring area, 1150 a.s.l., slope 4 °, aspect N, relevé area 400 m², cover E3 65 %, E2 5 %, E1 100 %, E0 25 %, 2. 10. 1979.

Rel. 6 (Majzlanová 1982, tab. 13, rel. 18): Skorušinské vrchy, Mihulčia dolina, spot height 884.8, small plane above the road, relevé area 20 × 20 m, cover E3 85 %, E2 5 %, E1 80 %, E0 60 %, age of stand 90 years, 14. 7. 1979.

Rel. 7 (Majzlanová 1982, tab. 13, rel. 21): Skorušinské vrchy, Blatná dolina – Výhon, 880 m a.s.l., slope 3 °, aspect W, relevé area 20 × 20 m, cover E3 75 %, E2 20 %, E1 90 %, E0 40 %, age of stand 90 years, 17. 9. 1979.

Rel. 8 (Majzlanová ined., tab. 2, rel. 2): Skorušinské vrchy, Mihulčia dolina, spot height 884.8, small plane above the road, relevé area 400 m², cover E3 85 %, E2 5 %, E1 750 %, E0 90 %, 14. 7. 1979.

Rel. 9 (Majzlanová 1982, tab. 13, rel. 19): Skorušinské vrchy, Blatná dolina, SW from the spot height 961.2, 870 m a.s.l., slope 3 °, aspect SW, relevé area 20 × 20 m, cover E3 70 %, E2 2 %, E1 100 %, E0 35 %, age of stand 90 years, 15. 9. 1979.

Rel. 10 (Majzlanová 1982, tab. 13, rel. 17): Skorušinské vrchy, Mihulčia dolina, right side of the road, 900 m a.s.l., relevé area 20 × 20 m, cover E3 85 %, E2 2 %, E1 95 %, E0 40 %, age of stand 90 years, 14. 7. 1979.

Rel. 11 (Majzlanová ined., tab. 2, rel. 3): Skorušinské vrchy, Mihulčia dolina, cca 500 m from the relevé Nr. 2 [i. e., Rel. 9 here], right side of the road, 900 m a.s.l., relevé area 400 m², cover E3 85 %, E2 2 %, E1 90 %, E0 55 %, 14. 7. 1979.

Rel. 12 (Šomšák 1983, tab. 2, col. VI, rel. 2): Oravské Beskydy, Zákamenné (Podkopčianske), frontier ridge to Poland, to the south of the spot height Kaňovka (952.4) at the spring area of the brook Zasihlianka, 860 m a.s.l., slope 2–5 °, aspect S,

Rel. 13 (Šomšák 1983, tab. 2, col. VI, rel. 3): Oravská Magura, Oravská Lesná, valley of the Nová rieka River, elevated deluvium on the right bank of the brook, opposite to the spot heigt 850.6, 700 m a.s.l., 20. 8. 1980.

Rel. 14 (Šomšák 1983, tab. 2, col. VI, rel. 1): Oravská Magura, Oravská Lesná (Pribišská), the complex "Borcok" on the right bank of the Biela Orava river, flat foothill with inclination 5–10 °, aspect N, 770 m a.s.l., 3. 10. 1979.

Rel. 15 (Šomšák 1983, tab. 2, col. VI, rel. 4): Oravská Magura, Beňova Lehota (Kubínska hoľa), to the north of the village, sylvan complex "Mackovo", 790 m a.s.l., slope 1–3 °, aspect S, 21. 8. 1980.

Rel. 16 (Šomšák et al. 1996: tab. 4, rel. 2): Podtatranská brázda (eastern part), Nature reserve Bor, number of stand 1745, 930 m a.s.l., cover E3 70 %, E2 1 %, E1 80 %, E0 95 %.

Rel. 17 (Kubíček et al. 1997b: tab. 1, rel. 2): Podtatranská brázda (eastern part), Nature reserve Bor, number of stand 1746, 930 m a.s.l., cover E3 75 %, E2 5 %, E1 80 %, E0 75 %, age of stand 120.

Rel. 18 (Šomšák et al. 1996: tab. 4, rel. 1): Podtatranská brázda (eastern part), Nature reserve Bor, number of stand 1746, 930 m a.s.l., cover E3 65 %, E2 20 %, E1 75 %, E0 95 %.

Rel. 19 (Kučera 2012, p. 296, rel. 32): Veľká Fatra, Smrekovica, western slope, plot with brooklet, 48°59,447' N, 19°12,344' E, 1 345 m a.s.l., slope 30–35 ° [inaccurate value], aspect WNW (287 °), relevé area –, total cover 100 %, E3 60 %, E2 5 %, E1 90 %, E0 70 %, 31. 8. 2005, P. Kučera, D. Bernátová.

Rel. 20 (Kučera 2012, p. 295, rel. 31): Veľká Fatra, Smrekovica, western slope, 48°59,407' N, 19°12,313' E, 1 339 m a.s.l., slope 35–40 ° [inaccurate value], aspect W (270 °), relevé area 8 × 15 m (slightly irregular), total cover 98 %, E3 75 %, E2 3 %, E1 85 %, E0 80 %, 31. 8. 2005, P. Kučera, D. Bernátová.

Rel. 21 (Majzlanová 1982, tab. 13, rel. 1): Skorušinské vrchy, Čierny potok, end of the valley of the brook Čierny potok (group of springs), 1 030 m a.s.l., slope 15 °, aspect N, relevé area 20 × 20 m, cover E3 75 %, E2 5 %, E1 100 %, E0 45 %, age of stand 100 years, 28. 7. 1978.

Rel. 22 (Majzlanová 1982, tab. 13, rel. 2): Skorušinské vrchy, Ľanovisko, 850 m a.s.l., slope 5 °, aspect SW, relevé area 20 × 20 m, cover E3 80 %, E2 0 %, E1 100 %, E0 35 %, age of stand 100 years, 14. 7. 1979.

Rel. 23 (Majzlanová 1982, tab. 13, rel. 4): Skorušinské vrchy, Čierny potok, terrace between the road and brook, 930 m a.s.l., aspect N, relevé area 20 × 20 m, cover E3 70 %, E2 10 %, E1 100 %, E0 60 %, age of stand 90 years, 2. 8. 1978.

Rel. 24 (Majzlanová ined., tab. 2, rel. 6): Skorušinské vrchy, Čierny potok, end of the valley of the brook Čierny potok, group of springs, 1 030 m a.s.l., slope 15 °, aspect S, relevé area 400 m², cover E3 75 %, E2 5 %, E1 100 %, E0 45 %, 28. 7. 1978.

Rel. 25 (Majzlanová 1982, tab. 13, rel. 3): Skorušinské vrchy, Mihulčie, above the third tributary stream, on left side of the road, 1 050 m a.s.l., slope 12 °, aspect SE, relevé area 20 × 20 m, cover E3 85 %, E2 0 %, E1 100 %, E0 30 %, age of stand 80–100 years, 20. 8. 1980.

Rel. 26 (Majzlanová 1982, tab. 13, rel. 13): Skorušinské vrchy, Mihulčia dolina, below the spot height 873.0, 850 m a.s.l., slope 10 °, aspect SW, relevé area 20 × 20 m, cover E3 80 %, E2 0 %, E1 100 %, E0 30 %, age of stand 80 years, 14. 7. 1979.

Rel. 27 (Majzlanová 1982, tab. 13, rel. 12): Skorušinské vrchy, Oravice, right side of the rivulet Oravica, 790 m a.s.l., slope 10 °, aspect NE, relevé area 20 × 20 m, cover E3 60 %, E2 5 %, E1 100 %, E0 35 %, age of stand 80 years, 13. 7. 1979.

Rel. 28 (Majzlanová 1982, tab. 13, rel. 9): Skorušinské vrchy, Oravice, 780 m a.s.l., slope 7 °, aspect SW, relevé area 20 × 15 m, cover E3 65 %, E2 2 %, E1 100 %, E0 45 %, age of stand 80–100 years, 12. 7. 1979.

Rel. 29 (Majzlanová 1982, tab. 13, rel. 14): Skorušinské vrchy, Mihulčia dolina, SW from the spot height 1 170.0, slope 7 °, aspect SE, relevé area 20 × 20 m, cover E3 80 %, E2 0 %, E1 95 %, E0 35 %, age of stand 100 years, 14. 7. 1979.

Rel. 30 (Majzlanová 1982, tab. 13, rel. 10): Skorušinské vrchy, Oravice, 820 m a.s.l., slope 3 °, aspect SE, relevé area 20 × 20 m, cover E3 65 %, E2 0 %, E1 100 %, E0 35 %, age of stand 100 years, 12. 7. 1979.

Rel. 31 (Majzlanová 1982, tab. 13, rel. 8): Skorušinské vrchy, Oravice, cca 200 m from a brooklet, 780 m a.s.l., slope 7 °, aspect SW, relevé area 20 × 15 m, cover E3 60 %, E2 2 %, E1 100 %, E0 60 %, age of stand 90–100 years, 12. 7. 1979.

Rel. 32 (Majzlanová 1982, tab. 13, rel. 5): Skorušinské vrchy, Čierny potok, cca 200 m before the first roadside stack, slope 3 °, aspect SW, relevé area 15 × 25 m, cover E3 65 %, E2 0 %, E1 100 %, E0 55 %, age of stand 80 years, 2. 8. 1978.

Rel. 33 (Majzlanová 1982, tab. 13, rel. 11): Skorušinské vrchy, Oravice, tributary of the rivulet Oravica, below a maintained footpath, 900 m a.s.l., slope 5 °, aspect NE, relevé area 20 × 20 m, cover E3 65 %, E2 2 %, E1 100 %, E0 35 %, age of stand 90 years, 13. 7. 1979.

Rel. 34 (Majzlanová 1982, tab. 13, rel. 6): Skorušinské vrchy, Koniarka, 920 m a.s.l., slope 7 °, aspect SW, relevé area 10 × 30 m, cover E3 75 %, E2 2 %, E1 100 %, E0 50 %, age of stand 90 years, 15. 7. 1979.

Rel. 35 (Majzlanová 1982, tab. 13, rel. 7): Skorušinské vrchy, Oravice, cca 300 m westwards from the spot height 947, slope 5 °, aspect SE, relevé area 10 × 25 m, cover E3 60 %, E2 2 %, E1 100 %, E0 40 %, age of stand 90–100 years, 12. 7. 1979.

Rel. 36: (Majzlanová ined., tab. 2, rel. 12): Skorušinské vrchy, Výhon, Blatná dolina, 880 m a.s.l., relevé area 400 m², slope 2 °, aspect W, cover E3 75 %, E2 20 %, E1 95 %, E0 45 %, 17. 9. 1979.

The natural occurrence of *Fagus* in the stands of this community is indicated by higher constancy of young individuals in the understorey. Natural competition between *Abies, Fagus* and *Picea* might locally have led to extinction of the latter species before the era of substantial anthropogenic influence.

The field layer is dominated by *Oxalis acetosella* and *Equisetum sylvaticum*, higher cover-abundance values are reached also by *Stellaria nemorum, Petasites albus*, rarely *Chaerophyllum hirsutum*. Except *Oxalis* and *Equisetum*, constant species are *Senecio ovatus, Stellaria nemorum, Ch. hirsutum, Rubus idaeus, Chrysosplenium alternifolium, Vaccinium myrtillus, Gentiana asclepiadea, Athyrium filix-femina* and *Calamagrostis arundinacea*.

The most abundant ground layer species is *Plagiomnium affine*, accompanied by *Dicranum scoparium* and/or *Sphagnum girgensohnii*, the less frequent bryophytes are *Plagiothecium curvifolium, Cirriphyllum piliferum* and *Polytrichum commune*.

Stands of *Stellario nemorum-Abietetum* are bound to habitat of spring areas and other more wet localities (Majzlanová 1983, 1993; Šomšák 1983). Till present, they were recorded most often in the flysch mountains of northern

Slovakia: Oravská Magura, Oravské Beskydy (Šomšák 1983) and Skorušinské vrchy (Majzlanová ined., 1982). Several records are known from Podtatranská brázda (Podspády surroundings: Šomšák et al. 1996, Kubíček et al. 1997b) and Veľká Fatra Mts (Kučera 2012).

Phytocoenoses of the association were usually labelled by Slovak authors as "Equiseto sylvatici-Abietetum Moor 1952/resp. (Moor 1952) Ellenberg et Klötzli 1972" in the past. The latter unit is, however, ecologically very different unit (cf. Kučera 2019 in red.).

On the ground of floristic differences, following subcommunities are differentiated here:

2a. *Stellario nemorum-Abietetum albae calamagrostietosum villosae* Majzlanová ex P. Kučera 2019 subass. nov. hoc loco

Syn.: *Equiseto sylvatici-Abietetum calamagrostietosum villosae* Majzlanová 1982 nom. ined. (Art. 1); *Equiseto sylvatici-Abietetum calamagrostietosum villosae* Majzlanová 1993 nom. nud. (Art. 2b).

Original diagnosis: tab. 2, rel. 1–11.

Nomenclatural type: tab. 2, rel. 8, holotypus hoc loco.

This subcommunity represents typical subassociation. Phytocoenoses of the subunit are positively differentiated by the set of species *Avenella flexuosa, Veronica officinalis, Luzula luzuloides, Phyteuma spicatum, Maianthemum bifolium, Solidago virgaurea*. Species *Calamagrostis villosa, Prenathes purpurea, Gentiana asclepiadea, Dryopteris dilatata* partly overlap to the other two subassociations; however, the negative differentiation of this subcommunity is very distinct (cf. tab. 2). Occurrence of *Polytrichum commune* is concentrated to this subcommunity according to the available data.

This subunit was documented by phytocoenological relevés in the unpublished dissertation of Majzlanová (1982) and differentiated as the subassociation *calamagrostietosum villosae* under the association name "*Equiseto sylvatici-Abietetum* (Moor 1952) Ellenberg et Klötzli 1972". The name of the subassociation was published by the authoress a decade later (Majzlanová 1993, p. 4, 5); however, without an original diagnosis (nom. nud., Art. 2b) and it was never validated.

The name giving taxon (*Calamagrostis villosa*) is not an explicit characteristic species for this subcomunity within here considered original relevé data of Majzlanová (cf. tab. 2); however, the originally proposed subassociation name is retained to credit the primary authoress.

2b. *Stellario nemorum-Abietetum albae crepidetosum paludosae* P. Kučera 2019 subass. nov. hoc loco

Original diagnosis: tab. 2, rel. 12–20.

Nomenclatural type: tab. 2, rel. 13, holotypus hoc loco.

This subassociation is defined by *Crepis paludosa, Caltha palustris* ssp. *laeta*, *Ranunculus repens* and other herb species. The ground layer is characterized by constancy of *Polytrichum formosum* and *Dicranum scoparium*. In respect of *Petasites albus* occurrence is this subassociation a transitional unit to *Stellario-Abietetum petasitetosum*.

Three variants of the subassociation are here differentiated, each of them was documented by only three or four relevés to the present (tab. 2):

The typical variant is characterized by constant presence of *Caltha palustris* ssp. *laeta*, *Ranunculus repens, Crepis paludosa, Luzula luzulina, Sanicula europaea*. The ground layer is characterized by constancy of *Polytrichum formosum, Plagiothecium undulatum, Plagiomnium rostratum* and *Conocephalum conicum*.

The variant with *Lycopodium annotinum* is associated with this subassociation on the basis of the simultaneous presence of *Crepis paludosa, Petasites albus, Prenanthes purpurea, Polytrichum formosum* and absence of the most of differential species of the other two subassociations of *Stellario nemorum-Abietetum*. This subunit presents a transitional variant towards the association *Equiseto-Piceetum* Šmarda 1950 floristically as well as by its geographical location: *Stellaria nemorum* is absent as well as other character species of *Stellario nemorum-Abietetum* (*Lysimachia nemorum, Impatiens noli-tangere, Cardamine trifolia, Geum rivale, Plagiomnium affine* etc.). The constant presence and higher cover-abundance values of *Lycopodium annotinum* refer to an additional ecological tendency to *Soldanello montanae-Piceetum* Volk in Br.-Bl. et al. 1939 (cf. Šomšák et al. (1996), tab. 4, rel. 3).

Kučera (2012) published two relevés of *Picea* communities on springs from the Veľká Fatra Mts (Vyšné Matejkovo). They form a separate variant with *Cardamine amara* ssp. *opicii, Viola biflora, Athyrium distentifolium, Senecio subalpinus, Rhizomnium magnifolium, Sphagnum squarrosum* and other species. Differences from the all of other relevés of the association are the high altitudinal elevation (above 1 330 m a.s.l.) and granodiorites as the geological bedrock. Kučera (2012) mentioned other similar localities of such habitat in the Veľká Fatra Mts.

2c. *Stellario nemorum-Abietetum albae petasitetosum albi* Majzlanová ex P. Kučera 2019 subass. nov. hoc loco

Syn.: *Equiseto sylvatici-Abietetum petasitetosum albi* Majzlanová 1982 nom. ined. (Art. 1); *Equiseto sylvatici-Abietetum petasitetosum albi* Majzlanová 1993 nom. nud. (Art. 2b)

Original diagnosis: tab. 2, rel. 21–36.

Nomenclatural type: tab. 2, rel. 24, holotypus hoc loco.

Stands of this subcommunity are defined by dominance of *Petasites albus* and constant presence of the species set *Myosotis palustris* agg., *Geranium robertianum, Cardamine flexuosa, Urtica dioica, Ranunculus platanifolius, Chrysosplenium alternifolium* and others.

Two variants of the subassociation are here differentiated:

a) typical variant (rel. 24–36),

b) variant with *Maianthemum bifolium* (rel. 21–23), with presence of some species of the subassociation *Stellario-Abietetum typicum* (*Avenella flexuosa, Maianthemum bifolium, Calamagrostis villosa*, cf. tab. 2) while retaining the character species of *Stellario-Abietetum petasitetosum* (typus rel. 23).

The unit was documented by phytocoenological relevés in the unpublished dissertation of Majzlanová (1982) and recognised as the subassociation *petasitetosum albi* under the association name "*Equiseto sylvatici-Abietetum* (Moor 1952) Ellenberg et Klötzli 1972". The name was published a decade later (Majzlanová 1993, p. 4, 5); however, without an original diagnosis (nom. nud., Art. 2b) and it was never validated.

Relevés of wet *Picea-Abies-Fagus* woodland with dominance of *Petasites albus* (and *Equisetum sylvaticum*); however, with poor presence of *Stellaria nemorum* and without *Sphagnum girgensohnii* and/or *Polytrichum commune*, were published by Kuoch (1954) and included into the association *Equiseto-Abietetum* Moor 1952. Further studies are required to clarify how many Kuoch's (1954, tab. 8) relevés would be probably more appropriate to place within the association *Stellario nemorum-Abietetum albae* P. Kučera 2019.

Syntaxonomical and nomenclatural note

Somewhat similar plant community to *Stellario nemorum-Abietetum* P.Kučera 2019 was published from Bohemia by Samek (1961) as the association *Petasito--Piceetum* Samek 1961. The latter association was not recognized or mentioned as a synonym neither in the new vegetation survey of the Czech Republic (Chytrý et al. 2013) nor in the older unfinished series edited by J. Moravec (Jirásek 2002); however, Sofron (1981) accepted this association.

Exner (2007) included *Petasito-Piceetum* Samek 1961 under the association name "*Equiseto-Abietetum* Moor 1952 ex Kuoch 1954". Phytocoenoses of *Petasito-Piceetum* Samek 1961 differ considerably from the original diagnosis of the association *Equiseto-Abietetum* Moor 1952 (cf. Moor 1952): they are separate units.

Substantial distinctness of *Petasito-Piceetum* (Samek 1961, tab. II) is evident also in comparison to the data on the association *Stellario nemorum-Abietetum* P. Kučera 2018:

a) the latter community has very low to low presence of species constant in *Petasito-Piceetum*: *Cardamine amara, Circaea* spp., *Luzula sylvatica, Gymnocarpium dryopteris, Phegopteris connectilis, Galeobdolon luteum* agg.;

b) *Stellario nemorum-Abietetum* has a long list of species which were not documented in *Petasito-Piceetum*: *Rubus idaeus, Gentiana asclepiadea, Calamagrostis arundinacea, Dryopteris filix-mas, Prenanthes purpurea, Lysimachia nemorum, Cardamine trifolia, Adenostyles alliariae* and others.

Therefore, *Petasito-Piceetum* Samek 1961 is here treated as a parallel but separate plant community to *Stellario nemorum-Abietetum* P. Kučera 2019. For nomenclatural purposes, the nomenclatural type of the former association is set here:

***Petasito albi-Piceetum* Samek 1961**

Original diagnosis: Samek (1961), tab. II, rel. 3, 5, 9, 11, 18.

Nomenclatural type: Samek (1961), tab. II, rel. 3, lectotypus hoc loco.

Acknowledgements

I would like to thank to I. Pekárová (Bratislava) for her valuable help with literature. Elaboration of this study was partially supported by the Slovak grant agency VEGA, project No. 2/0119/19.

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Received: February 12th 2018
Revised: January 28th 2019
Accepted: January 30th 2019