# Subalpine tall-forb vegetation (*Mulgedio-Aconitetea*) in the Czech Republic: syntaxonomical revision

**Subalpínská vysokobylinná vegetace třídy *Mulgedio-Aconitetea* v České republice: syntaxonomická revize**

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Kočí M. (2001): Subalpine tall-forb vegetation (*Mulgedio-Aconitetea*) in the Czech Republic: syntaxonomical revision. – Preslia, Praha, 73: 289–331.

Phytosociological synthesis of the subalpine tall-forb vegetation of the Czech Republic was performed using the Braun-Blanquet approach. Analysis of ca. 800 relevés collected from the published literature and newly recorded in the field was carried out. Sixteen associations are distinguished, their species composition is documented in a synoptic table and brief comments on their ecology and distribution are given. These associations are assigned to the orders *Calamagrostietalia villosae* (alliances *Calamagrostion villosae* and *Calamagrostion arundinaceae*), *Alnetalia viridis* (alliance *Salicion silesiacae*), and *Adenostyletalia* (alliances *Adenostylion* and *Dryopterido-Athyrion distentifolii*).

K e y w o r d s : Ecology, distribution, high-mountain vegetation, phytosociology, vegetation survey

## Introduction

The communities of the class *Mulgedio-Aconitetea* are natural tall-grass and tall-forb mesophilous and hygromesophilous grasslands or shrubberies (krummholz) with significantly developed herb layer. They occur from the supramontane, though predominantly from the subalpine, to the alpine belts. Their distribution ranges from western and northern Europe as far as to southern Siberia (Hilbig 1995, Ermakov et al. 2000). In Central European mountain ranges, namely in the Alps, the Hercynian ranges and the Carpathians, herbaceous communities are traditionally assigned to the alliances *Adenostylion alliariae* (tall-forb dominated), *Calamagrostion villosae* and *Calamagrostion arundinaceae* (tall-grass dominated), and *Dryopterido-Athyrion* (fern dominated). The subalpine shrub communities belong to the alliances *Alnion viridis* (willow and green alder dominated), occurring in the Alps, the Dinaric ranges, and the Carpathians, and to the *Salicion silesiacae* (willow and birch dominated), occurring in the Western Carpathians and the cirques of the Hercynian ranges (Mucina & Maglocký 1985, Karner & Mucina 1993, Oberdorfer 1993, Moravec et al. 1995, Pott 1995, Veselá 1995). The alliances *Adenostylion pyrenaicae* and *Cirsion flavispinae* are found in south-western Europe (Pyrenees, Sierra Nevada) (Quezel & Rioux 1954, Rivas-Martínez et al. 1984). The tall-forb communities of northern Europe are assigned to the nordic alliance *Lactucion alpinae* (Kielland-Lund 1981) or to the *Adenostylion alliariae* (Dierßen 1996). Communities of the *Cirsion appendiculati* and *Geion coccinei* (Horvat et al. 1974) occur in south-eastern Europe (southern Balkans). The tall-forb communities of southern Siberia were ordered to the class *Aconito-Geranietea albiflori* (Chytrý et al. 1993), which was recently united with the *Mulgedio-Aconitetea* (Ermakov et al. 2000).

## History of research of the *Mulgedio-Aconitetea* communities in the Czech Republic

Botanical research has a long tradition in the Czech mountains (Krkonoše Mts, Hrubý Jeseník Mts, Králický Sněžník Mts and Šumava Mts). Until the beginning of the 20th century many authors focused mostly on flora and phytogeography. Jeník (1961) characterized this research as "picking up isolated peculiarities". Vegetation survey began in the 1920s. First phytosociological studies focused on the Krkonoše Mts (Schustler 1918, Zlatník 1925, 1928, Hueck 1939). Several tall-forb communities, e.g. *Calamagrostietum villosae*, *Athyrietum alpestris*, *Calamagrostietum arundinaceae* or *Salicetum lapponum*, were described, particularly in Zlatník's papers. The tall-forb communities of lower altitudes (*Mulgedietum alpini*) were described from the Krušné hory Mts by Kästner (1938). An important paper for phytosociological nomenclature is the list of the communities of central Europe (Klika & Hadač 1944) where the name "*Mulgedio-Aconitetea*" was first, however invalidly, published. A study concerned with the vegetation of the Hrubý Jeseník Mts was published by Šmarda (1950). From the Polish part of the Krkonoše mountains Macko (1952) reported the communities *Calamagrostietum villosae sudeticum*, *Petasitetum albi sudeticum* and *Adenostyletum alliariae*. Important works are those by J. Jeník concerned with subalpine vegetation and its relationships to environmental factors (Jeník 1958, 1959a, 1959b etc.) and phytogeographic peculiarities (Jeník 1960), which were summarized in the book "Alpine vegetation of the Krkonoše Mts, the Hrubý Jeseník Mts and the Králický Sněžník Mts" (Jeník 1961). A number of *Mulgedio-Aconitetea* communities were described there. Holub et al. (1967) first proposed a provisional alliance *Dryopteridi-Athyrion*. Subalpine *Molinia caerulea* grasslands were studied by Válek (1961) and Berciková (1976, 1977) in the Krkonoše Mts. Subalpine shrub vegetation was studied by Rejmánek et al. (1971). Sofron & Štěpán (1971) published a paper about the vegetation of the cirques of the Šumava Mts. Sýkora & Štursa (1973) focused on the fern-dominated tall-forb vegetation and its syntaxonomical position within the class *Mulgedio-Aconitetea*. Studies of nitrophilous vegetation along the montane rivers banks and roads, which is closely related to the *Mulgedio-Aconitetea* and *Galio-Urticetea* classes, were published by Kopecký (1971, 1974) and Kopecký & Hejný (1971). Subalpine vegetation of the Polish part of the Krkonoše Mts was studied and mapped by Matuszkiewicz & Matuszkiewicz (1975). The paper by Burešová (1976) on the Krkonoše Mts is from the same time. Jeník et al. (1980) published a remarkable study on subalpine and alpine vegetation of the Velká kotlina Cirque in the Hrubý Jeseník Mts. The vegetation survey in the Krkonoše Mts resulted in a list of the treeless vegetation units (Hadač & Štursa 1983). Kopecký (1990) dealt with the vegetation dominated by *Cicerbita alpina*. Krahulec (1990) treated subalpine vegetation of the Králický Sněžník Mts. The most recent papers on the tall-forb vegetation in the Krkonoše Mts were published by Wagnerová (1992, 1994) and in the Hrubý Jeseník Mts by Kočí (2001).

## Natural conditions of Czech tall-forb communities

Communities of the class *Mulgedio-Aconitetea* are best developed in the High Sudeten Mts (i.e. Krkonoše Mts, Králický Sněžník Mts and Hrubý Jeseník Mts) in the N and NE part of the Czech Republic (Figs. 1, 2), which reach altitudes of about 1400–1600 m. Above the timberline, which is situated at approximately 1200–1350 m a.s.l. (Jeník &

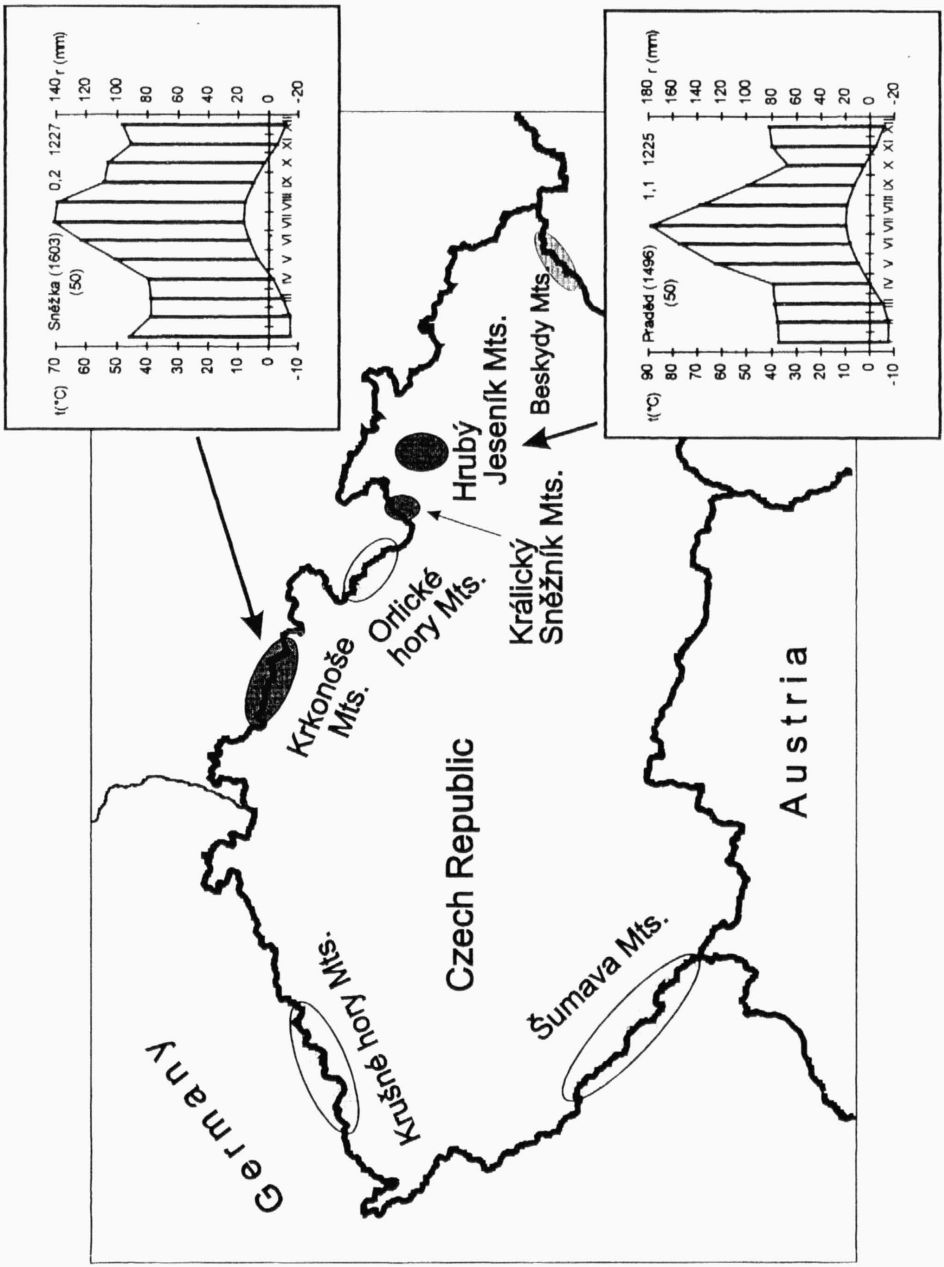


Fig. 1. – Main areas of the occurrence of *Mulgedio-Aconitetea* communities and climatic characteristic of the highest locations of the mountains.

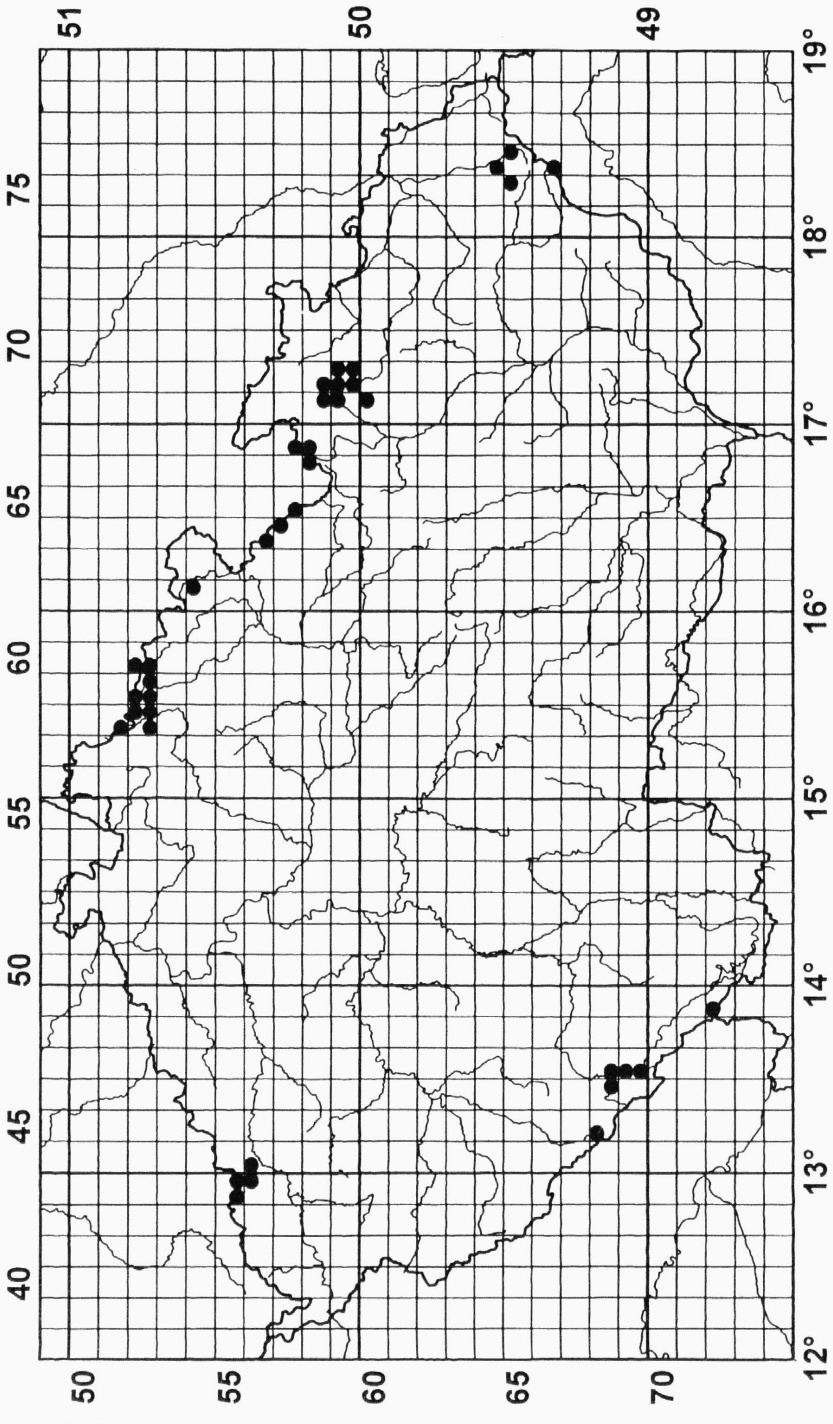


Fig. 2. – Distribution of *Mulgedio-Aconitetea* communities in the Czech Republic.

Lokvenc 1962, Jeník 1972, 1973, Deylová-Skočdopolová 1984), these mountains have a subalpine-alpine belt, which has been continuously treeless from the last glacial period. The tall-herb communities typically occupy the subalpine belt. However, they also occur at lower altitudes of the montane and the supramontane belts, e.g. in the Šumava Mts, the Krušné hory Mts, the Orlické hory Mts and the Adršpašsko-Teplické skály rocks. At lower altitudes they occupy places where environmental conditions prevent tree growth and where the microclimate is similar to the climate of the higher altitudes (e.g. bottoms of V-shaped valleys, canyons). The summit areas of the mountains (above 1200 m) belong to the cold climatic region CH4 (Quitt 1971), the coldest region found in the Czech Republic. It is characterized by a short, moderately cold and humid summer, and a cold and humid winter with a snow cover of ca. 200 days/yr. The mean annual temperature (Fig. 1) is 1–3 °C and rainfall is about 1200–1600 mm (Vesecký et al. 1961). The bedrock is mostly formed by nutrient-poor acidic metamorphic substrates such as gneiss, mica-slate, phyllite. The soils under tall-herb communities are mostly deep podzols and rankers or stony rankers and lithosols on the steep slopes of the cirques (Culek 1996). Usually they are rich in nutrients, humus and water, supplied by eolic sedimentation, snow avalanches and water. The tall graslands of the *Calamagrostietalia villosae* have the most favourable soil conditions (pH, humus, C/N ratio) (Kubátová-Kořínková 1972). In the harsh climate of the subalpine belt, the *Mulgedio-Aconitetea* communities occupy places which are well protected against frost and strong winds, notably leeward SE to E facing slopes, terrain depressions and valleys. The most suitable habitats within the subalpine belt occur in glacial cirques, which originated due to anemo-orographic systems (Jeník 1961) in the glacial periods. At present the cirques are characterized by exceptionally high species richness and community diversity. The most important factor for the distribution of vegetation above the timberline seems to be wind (Jeník 1961, Jeník et al. 1980, Krahulec 1990), which strongly influences the distribution of snow. The thickness of the snow cover varies according to the prevailing wind directions and local topographic features. The relationships between topography, snow cover and vegetation were investigated by several authors (e.g. Jeník 1958, Cudlín et al. 1973, Štursa et al. 1973, Piňosová 1986). The tall-forb vegetation is confined to places protected from the mechanical effect of strong wind, with a distinctive snow cover during the winter. Štursa et al. (1973) summarized the effects of snow cover on vegetation into four points: (a) protective effect of herbs and soil against freezing; (b) mechanical effect – sliding snow masses and falling avalanches are a crucial element in the ecosystems of the cirques; they support the development of several remarkable plant communities, including some tall-herb types; (c) hydrological effect – supplying the soil with water during and after snow melting; (d) phenological effect – phenological delay is found in places where snow persists until late spring.

## Methods

Phytosociological relevés were collected from the literature – about 600 relevés, and the field – about 200 relevés (see Appendix). They were stored in the Czech National Phytosociological Database (Chytrý 1997) using the database program TURBO(VEG) (Hennekens 1996). Classification of the communities was carried out using the Braun-Blanquet approach (Braun-Blanquet 1964, Westhoff & van der Maarel 1978). The whole

data set and subsequently subsets of similar relevés were classified by TWINSPAN (Hill 1979). The results of this analysis were used as a guideline for recognizing associations, and also, in part, for building the higher syntaxonomical units. The final classification of the relevés into communities was performed subjectively, being based primarily on the TWINSPAN results. The synoptic table (Table 1) was prepared using the MEGATAB and the SHIFTTAB programs. In the table, the syntaxa are distinguished by blocks of diagnostic species (D.S.). They include those preferring one syntaxon where they have their optimum, and those that differ syntaxa in terms of one hierarchical level. Transgresive diagnostic species (transgr.) are characteristic for one syntaxon of higher hierarchical level and some of the lower-level syntaxa within it (cf. Mucina 1993). Constant species (Const.) are those with occurrence frequency higher than 60%, exceptionally, for species-poor vegetation, higher than 50%. In the text and tables the symbols $E_3$, $E_2$, $E_1$ and $E_0$ are used for the tree, shrub, herb and moss layer, respectively. The abbreviations "Dom.", "Subdom." are used to designate dominants and subdominants. Correspondence analysis (CA) from the program CANOCO (ter Braak & Šmilauer 1998) was applied for the presentation of the variation among the communities on the association level. Default options with $\log_2$-transformation of percentage constancy data matrix were used. The names of the syntaxa were checked according to the International Code of Phytosociological Nomenclature (Weber et al. 2000). The abbreviations used in conjunction with nomenclature include: "Syn." – nomenclature synonym, "Syntax. syn." – syntaxonomical synonym, "Incl." – inclusive, "Art." – article of the Code, "p.p." – pro parte. "Non" indicates syntaxon names, which are not identical with the syntaxon in question. Threatened species listed in the text correspond to the red lists by Holub & Procházka (2000) and Váňa (1993, 1995). The nomenclature follows Ehrendorfer (1973) for vascular plants, Frey et al. (1995) for bryophytes, and Poelt (1969) for lichens.

## Conspectus of the syntaxa

Class: *Mulgedio-Aconitetea* Hadač et Klika in Klika 1948
- Order: *Calamagrostietalia villosae* Pawłowski, Sokołowski et Wallisch 1928
  - Alliance: *Calamagrostion villosae* Pawłowski, Sokołowski et Wallisch 1928
    - Association: *Sphagno compacti-Molinietum caeruleae* Wagnerová ex Berciková 1976
    - Association: *Crepido-Calamagrostietum villosae* (Zlatník 1925) Jeník 1961
    - Association: *Sileno vulgaris-Calamagrostietum villosae* Jeník, Bureš et Burešová 1980
    - Association: *Bistorto-Deschampsietum alpicolae* (Zlatník 1925) Burešová 1976
    - Association: *Violo sudeticae-Deschampsietum cespitosae* (Jeník et al. 1980) Kočí 2001
  - Alliance: *Calamagrostion arundinaceae* (Luquet 1926) Jeník 1961
    - Association: *Bupleuro-Calamagrostietum arundinaceae* (Zlatník 1928) Jeník 1961
- Order: *Alnetalia viridis* Rübel ex Rejmánek in Huml et al. 1979
  - Alliance: *Salicion silesiacae* Rejmánek, Sýkora et Štursa 1971
    - Association: *Salici silesiacae-Betuletum carpaticae* Rejmánek, Sýkora et Štursa 1971
    - Association: *Pado-Sorbetum* W. Matuszkiewicz et A. Matuszkiewicz 1975
    - Association: *Piceo-Salicetum silesiacae* Rejmánek, Sýkora et Štursa 1971
- Order: *Adenostyletalia* G. Br.-Bl. et J. Br-Bl. 1931
  - Alliance: *Adenostylion* Br.-Bl. 1926, Luquet 1926
    - Association: *Ranunculo platanifolii-Adenostyletum alliariae* (Krajina 1933) Dúbravcová et Hadač ex Kočí 2001
    - Association: *Salicetum lapponum* Zlatník 1928
    - Association: *Trollio altissimi-Geranietum sylvatici* Jeník, Bureš et Burešová 1980

Association: *Laserpitio-Dactylidetum glomeratae* Jeník, Bureš et Burešová 1980
Association: *Chaerophyllo-Cicerbitetum alpinae* (Kästner 1938) Sýkora et Hadač 1984
Alliance: *Dryopterido-Athyrion distentifolii* (Holub ex Sýkora et Štursa 1973) Jeník et al. 1980
Association: *Daphno mezerei-Dryopteridetum filicis-maris* Sýkora et Štursa 1973
Association: *Adenostylo-Athyrietum alpestris* (Zlatník 1928) Jeník 1961

**Description of the syntaxa**

## *Mulgedio-Aconitetea* Hadač et Klika in Klika 1948[1]

Supramontane to subalpine tall-grass and tall-forb grasslands and related shrubberies

Syn.: *Adenostyletea* Br.-Bl. et R. Tx. 1943 (phantom, Eggler 1952), *Betulo-Adenostyletea* Br.-Bl. et R. Tx. 1943 (Art. 8), *Mulgedio-Aconitetea* Hadač et Klika in Klika et Hadač 1944 (Art. 8), *Mugo-Alnetea viridis* Eggler 1952 p.p (Art. 8), *Aconito-Cardaminetea* Hadač 1956 p.p. (Art. 29), *Stellario nemorum-Geranietea sylvatici* Niemann et al. 1973 p.p. max. (Art. 3b, 29), *Nardo-Calamagrostietea villosae* Jeník et al. 1980 p.p. (Art. 29)
Syntax. syn.: *Betulo-Adenostyletea* Br.-Bl. 1948, *Betulo-Alnetea viridis* Rejmánek in Huml et al. 1979, *Aconito-Geranietea albiflori* Zhitlukhina et Onishchenko ex Chytrý, Pešout et Anenchonov 1993

D.S.: *Aconitum napellus* subsp. *hians*, *A. variegatum*, *A. vulparia*, *Adenostyles alliariae*, *Angelica sylvestris*, *Athyrium distentifolium*, *Calamagrostis villosa*, *Cirsium heterophyllum*, *Doronicum austriacum*, *Geranium sylvaticum*, *Hieracium prenanthoides*, *Poa chaixii*, *Polygonatum verticillatum*, *Polygonum bistorta*, *Ranunculus platanifolius*, *Rumex alpestris*, *Veratrum album* subsp. *lobelianum*, *Viola biflora*

The class *Mulgedio-Aconitetea* includes tall grasslands, broad-leaved tall-forb communities, tall-fern communities and related krummholz. In the Czech mountains, it is confined primarily to the supramontane and subalpine belts. This vegetation is situated mostly on leeward slopes with long-lying snow cover. The soils are usually deep, well supplied with nutrients and water. It is possible to distinguish three orders in the Czech Republic: *Calamagrostietalia villosae* – rich in grasses, *Adenostyletalia* – rich in broad-leaved tall forbs and *Alnetalia viridis* – shrub vegetation.

## *Calamagrostietalia villosae* Pawłowski, Sokołowski et Wallisch 1928

Tall grasslands of the subalpine belt on acidic soils

Syn.: *Calamagrostietalia arundinaceae* Eggler 1952 (Art. 8), *Calamagrostietalia arundinaceae* Sýkora et Štursa 1973 (Art. 8, 31)

D.S.: *Achillea millefolium* subsp. *sudetica*, *Anemone narcissiflora*, *Avenella flexuosa*, *Calluna vulgaris*, *Gentiana asclepiadea*, *Luzula luzuloides* subsp. *cuprina* (Rochel ex Aschers. et Graebn.) Chrtek et Křísa, *Melampyrum sylvaticum* agg., *Molinia caerulea*, *Poa chaixii* (transgr.), *Potentilla aurea*, *Silene vulgaris*, *Solidago virgaurea* subsp. *minuta*, *Viola lutea* subsp. *sudetica*

Tall grasslands with a dominance of grasses *Calamagrostis villosa, C. arundinacea*, *Molinia caerulea* and *Deschampsia cespitosa*. They are widespread on the leeward slopes of the subalpine belt. The communities are characterized by long-lasting snow cover, deep

[1] The communities of the order *Rumicetalia alpini* Mucina in Karner et Mucina 1993 have sometimes been assigned to the class *Mulgedio-Aconitetea* (Klika & Hadač 1944, Klika 1948, Karner & Mucina 1993). They include nitrophilous, anthropogenic vegetation occupying the surroundings of the mountain folds (stables) and huts. Because of their secondary origin and significant participation of the synanthropic species, I prefer to order them to the *Galio-Urticetea* Passarge ex Kopecký 1969 (cf. Kliment & Jarolímek 1995, Moravec et al. 1995, Pott 1995).

Table 1. – Synoptic table of the *Mulgedio-Aconitetea* communities in the Czech Republic. The numbers given in columns of the table are the percentage constancy of the species. In cases of a low number of relevés (less then 5) the numbers represent the actual frequency of occurrence; they are given in italics. The blocks of diagnostic species (D.S.) are in bold. SM: *Sphagno-Molinietum*, CC: *Crepido-Calamagrostietum*, SC: *Sileno-Calamagrostietum*, BD: *Bistorto-Deschampsietum*, VD: *Violo-Deschampsietum*, BC: *Bupleuro-Calamagrostietum*, SB: *Salici-Betuletum*, PS: *Pado-Sorbetum*, PSal: *Piceo-Salicetum*, RA: *Ranunculo-Adenostyletum*, Slap: *Salicetum lapponum*, TG: *Trollio-Geranietum*, LD: *Laserpitio-Dactylidetum*, CC: *Chaerophyllo-Cicerbitetum*, DD: *Daphno-Dryopteridetum*, AA: *Adenostyli-Athyrietum alpestris*. See Appendix 1 for data sources.

| Column | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Community | SM | CC | SC | BD | VD | BC | SB | PS | PSal | RA | Slap | TG | LD | ChC | DD | AA |
| Number of relevés | 34 | 84 | 120 | 36 | 41 | 55 | 15 | 13 | 4 | 59 | 14 | 15 | 23 | 55 | 37 | 116 |
| **D.S. *Sphagno-Molinietum*** | | | | | | | | | | | | | | | | |
| *Molinia caerulea* | **100** | 39 | 11 | 11 | 29 | 24 | 20 | . | . | 5 | 7 | 27 | 22 | . | . | 0.9 |
| *Nardus stricta* | **79** | 30 | 11 | 33 | 20 | 4 | . | . | . | 3 | . | 7 | 9 | . | . | 2 |
| *Vaccinium uliginosum* | **27** | 7 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| *Sphagnum compactum* | **21** | . | . | 6 | . | . | . | . | . | . | . | . | . | . | . | . |
| **D.S. *Crepido-Calamagrostietum*** | | | | | | | | | | | | | | | | |
| *Melampyrum sylvaticum* agg. | 6 | **50** | 7 | . | 7 | 24 | 40 | . | . | . | . | . | 4 | . | . | 0.9 |
| *Pulsatilla * alba* | 3 | **48** | 0.8 | . | . | 27 | . | . | . | . | . | . | . | . | . | . |
| *Anemone narcissiflora* | 3 | **39** | . | . | 5 | 47 | . | . | . | . | . | . | 4 | . | . | . |
| *Crepis conyzifolia* | 6 | **32** | . | . | 10 | 15 | . | . | . | 2 | . | 7 | . | . | . | . |
| **D.S. *Violo-Deschampsietum*** | | | | | | | | | | | | | | | | |
| *Poa chaixii* | . | 16 | 7 | 11 | **76** | 40 | 33 | . | . | 37 | 7 | 73 | 39 | 8 | 3 | 4 |
| *Viola * sudetica* | . | 4 | 2 | 6 | **61** | 6 | 7 | . | . | . | . | 13 | 9 | . | . | . |
| *Avenochloa planiculmis* | . | 2 | 0.8 | . | **15** | 2 | . | . | . | 2 | . | 7 | 4 | . | . | . |
| **D.S. *Bupleuro-Calamagrostietum*** | | | | | | | | | | | | | | | | |
| *Lilium martagon* | . | 6 | 0.8 | . | 2 | **89** | 40 | 15 | . | 22 | . | 7 | 22 | . | 24 | 6 |
| *Digitalis grandiflora* | . | 1 | 0.8 | . | 17 | **69** | 20 | . | . | . | . | 7 | 44 | . | 14 | . |
| *Thesium alpinum* | . | 7 | . | . | 15 | **56** | . | . | . | . | . | . | . | . | . | . |
| *Pimpinella major* | . | 2 | . | . | . | **49** | . | 8 | . | 2 | . | . | 4 | . | 11 | . |
| *Pleurospermum austriacum* | . | 1 | . | . | . | **47** | 27 | . | . | . | . | . | 4 | . | 11 | . |
| *Bupleurum * vapincense* | . | . | . | . | . | **35** | . | . | . | . | . | . | 9 | . | . | . |
| *Thymus * sudeticus* | 3 | . | . | . | . | **20** | . | . | . | . | . | . | . | . | . | . |
| **D.S. *Salici-Betuletum*** | | | | | | | | | | | | | | | | |
| *Luzula sylvatica* | . | 1 | 20 | 11 | 32 | 6 | **80** | . | 1 | 25 | . | 7 | 22 | 34 | . | 18 |
| *Equisetum sylvaticum* | 3 | . | 0.8 | 3 | 10 | . | **53** | . | . | 2 | 7 | 7 | 17 | 9 | . | 0.9 |
| *Rosa pendulina* | . | . | 2 | . | 2 | 31 | **47** | 8 | 1 | . | 7 | . | 13 | 2 | 11 | . |
| *Asarum europaeum* | . | . | . | . | . | 6 | **47** | . | . | . | . | 7 | 13 | . | 11 | . |
| *Vicia sepium* | . | . | . | . | 12 | 2 | **40** | . | . | . | . | . | 26 | . | 3 | . |
| *Aruncus dioicus* | . | . | . | . | . | 2 | **27** | . | . | . | . | . | . | . | . | 2 |
| **D.S. *Pado-Sorbetum*** | | | | | | | | | | | | | | | | |
| *Dryopteris dilatata* | . | 8 | 3 | . | 2 | 2 | 7 | **77** | 3 | 5 | 7 | . | . | 28 | 5 | 16 |
| *Prunus avium* | . | . | . | . | . | . | . | **39** | . | . | . | . | . | . | . | . |
| *Ribes petraeum* | . | . | . | . | . | 2 | . | **46** | . | 2 | 7 | . | . | . | . | 0.9 |
| *Gymnocarpium dryopteris* | . | . | . | . | . | . | . | **39** | 2 | 2 | . | . | . | 6 | 19 | 3 |
| *Lonicera nigra* | . | 1 | . | . | . | . | 7 | **31** | 2 | 2 | . | . | . | 8 | 8 | 0.9 |
| *Prunus * borealis* | . | . | . | . | . | 2 | . | **23** | . | 2 | . | . | . | . | . | 0.9 |
| **D.S. *Piceo-Salicetum*** | | | | | | | | | | | | | | | | |
| *Picea abies* | . | 4 | 0.8 | . | . | 9 | 33 | 23 | **4** | 2 | . | . | 4 | 2 | . | 6 |
| *Acer pseudoplatanus* | . | 7 | . | . | . | 7 | 27 | 15 | **4** | 2 | . | . | 4 | 9 | 19 | 6 |
| *Sphagnum girgensohnii* | 12 | 6 | 5 | 3 | . | . | . | 23 | **4** | . | 36 | . | 4 | 8 | 3 | 9 |
| *Polytrichum commune* | 12 | 16 | 8 | 6 | . | . | . | . | **4** | . | 14 | . | . | 6 | 3 | 5 |
| *Phegopteris connectilis* | . | . | 0.8 | . | . | 4 | . | 15 | **3** | 2 | . | . | . | 26 | 14 | 4 |

| Column | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Community | SM | CC | SC | BD | VD | BC | SB | PS | PSal | RA | Slap | TG | LD | ChC | DD | AA |
| Number of relevés | 34 | 84 | 120 | 36 | 41 | 55 | 15 | 13 | 4 | 59 | 14 | 15 | 23 | 55 | 37 | 116 |
| **D.S. *Salicetum lapponum*** | | | | | | | | | | | | | | | | |
| *Salix lapponum* | . | 1 | . | . | . | . | . | . | . | 2 | **100** | . | . | . | . | . |
| *Rhizomnium punctatum* | . | . | 3 | . | 2 | 7 | 7 | 8 | 1 | 14 | **57** | . | 22 | 23 | 8 | 9 |
| **D.S. *Trollio-Geranietum*** | | | | | | | | | | | | | | | | |
| *Trollius europaeus* | . | . | . | . | 7 | 9 | 13 | . | . | 2 | . | **100** | 35 | . | . | . |
| *Cardamine pratensis* | . | . | . | . | 20 | . | . | . | . | 5 | . | **73** | 22 | . | . | . |
| *Ligusticum mutellina* | . | 1 | 22 | 19 | 39 | . | . | . | . | 17 | 14 | **60** | 9 | . | . | 2 |
| *Ranunculus acris* | . | . | . | 6 | 46 | 6 | 13 | . | . | 10 | . | **60** | 26 | 4 | . | . |
| *Crepis mollis* | . | . | . | . | 32 | 11 | . | . | . | . | . | **40** | 22 | . | . | . |
| *Primula elatior* | . | . | . | . | . | 15 | 7 | . | . | 10 | . | **40** | 9 | 9 | 8 | . |
| *Phleum alpinum* | . | 5 | . | 6 | 20 | 4 | . | . | . | 10 | . | **27** | 9 | . | . | . |
| *Cerastium fontanum* | . | . | . | . | 12 | . | . | . | . | 2 | . | **27** | . | . | . | . |
| *Alchemilla subcrenata* | . | . | . | . | . | . | . | . | . | . | . | **20** | . | . | . | . |
| **D.S. *Laserpitio-Dactylidetum*** | | | | | | | | | | | | | | | | |
| *Dactylis glomerata* agg. | . | . | 0.8 | . | 20 | 9 | 13 | . | . | 2 | . | 20 | **96** | 15 | 11 | . |
| *Carduus personata* | . | . | . | . | 5 | 20 | . | . | . | 27 | . | 13 | **83** | 9 | 41 | . |
| *Laserpitium archangelica* | . | . | . | . | . | 6 | 33 | . | . | . | . | 13 | **61** | . | . | . |
| *Cirsium oleraceum* | . | . | . | . | . | 4 | 20 | . | . | . | . | 7 | **48** | 7 | 3 | . |
| *Mercurialis perennis* | . | . | . | . | 10 | 18 | 13 | . | . | . | . | 7 | **48** | 2 | 14 | . |
| *Stachys alpina* | . | . | . | . | . | 4 | . | . | . | . | . | . | **30** | . | . | . |
| *Scrophularia scopolii* | . | . | . | . | 5 | 2 | . | . | . | . | . | . | **26** | 2 | 8 | . |
| *Campanula latifolia* | . | . | . | . | . | 9 | . | . | . | 3 | . | . | **22** | 2 | 14 | . |
| *Aconitum vulparia* | . | . | . | . | . | . | 13 | . | . | . | . | . | **17** | . | 3 | . |
| **D.S. *Chaerophyllo-Cicerbitetum*** | | | | | | | | | | | | | | | | |
| *Petasites albus* | . | . | . | . | 5 | 16 | 7 | . | 2 | 7 | . | . | 4 | **85** | 22 | 0.9 |
| *Athyrium filix-femina* | . | 2 | 2 | . | . | 11 | 67 | . | . | 9 | . | . | 4 | **62** | 43 | 7 |
| *Senecio fuchsii* | . | . | 2 | . | 12 | 2 | . | . | . | 17 | . | 20 | 9 | **59** | 8 | 4 |
| *Lamiastrum montanum* | . | . | . | . | . | 7 | 13 | 8 | . | 3 | . | . | 9 | **56** | 27 | 4 |
| *Urtica dioica* | . | . | . | 3 | 7 | 7 | . | 15 | . | 10 | . | . | 17 | **47** | 46 | 5 |
| *Chrysosplenium alternifolium* | . | . | . | 3 | 5 | . | . | 23 | . | 27 | 7 | . | 13 | **44** | 5 | 3 |
| *Impatiens noli-tangere* | . | . | . | . | . | . | . | . | . | 3 | . | . | . | **35** | 14 | . |
| **D.S. *Daphno-Dryopteridetum*** | | | | | | | | | | | | | | | | |
| *Dicranum scoparium* | 3 | 14 | 3 | . | . | 7 | 7 | . | . | . | 7 | . | . | 2 | **62** | 18 |
| *Scrophularia nodosa* | . | . | . | . | . | 20 | . | . | . | . | . | . | 4 | 11 | **46** | . |
| *Racomitrium sudeticum* | . | 4 | 0.8 | . | . | . | . | . | . | 2 | . | . | . | . | **43** | 5 |
| *Pulmonaria obscura* | . | . | . | . | . | 15 | . | . | . | . | . | . | 4 | 2 | **35** | . |
| *Lamiastrum galeobdolon* | . | . | . | . | . | 4 | . | . | . | . | . | . | . | . | **32** | 0.9 |
| *Plagiothecium cavifolium* | . | . | . | . | . | 2 | . | . | . | 3 | . | . | . | . | **32** | 5 |
| *Myosotis sylvatica* | . | . | . | . | . | 7 | 7 | . | . | . | . | . | 4 | . | **27** | . |
| *Actaea spicata* | . | . | . | . | . | 7 | . | . | . | . | . | . | . | 2 | **24** | . |
| *Corydalis intermedia* | . | . | . | . | . | . | . | . | . | . | . | . | . | . | **22** | . |
| **D.S. *Calamagrostion villosae*** | | | | | | | | | | | | | | | | |
| *Homogyne alpina* | 79 | 74 | 35 | 47 | 12 | 20 | . | . | 2 | 10 | . | 20 | . | 6 | . | 23 |
| *Anthoxanthum alpinum* | 44 | 63 | 20 | 31 | 46 | 27 | . | . | . | 12 | 7 | 33 | 17 | . | . | 0.9 |
| *Potentilla aurea* | 6 | 56 | 12 | 14 | 27 | 38 | 7 | . | . | 7 | . | 33 | . | . | . | . |
| *Rhinanthus pulcher* | . | 12 | 0.8 | . | 17 | 22 | . | . | . | . | . | 20 | . | . | . | . |
| *Hypochaeris uniflora* | 15 | 23 | . | . | 5 | 6 | . | . | . | . | . | . | . | . | . | . |
| *Geum montanum* | 6 | 14 | . | 3 | . | . | . | . | . | . | 7 | . | . | . | . | . |
| *Luzula sudetica* | 6 | 6 | 0.8 | 6 | 5 | 2 | . | . | . | . | . | . | . | . | . | . |
| *Arnica montana* | 3 | 10 | 0.8 | . | . | 2 | . | . | . | . | . | . | . | . | . | . |
| **D.S. *Alnetalia viridis*, *Salicion silesiacae*** | | | | | | | | | | | | | | | | |
| *Betula pubescens* (*B. carpatica*) | . | 8 | . | . | . | 6 | 93 | 46 | . | . | . | . | 4 | . | 3 | 3 |
| *Salix silesiaca* | . | 12 | 0.8 | . | 7 | 24 | 87 | 62 | 4 | 5 | 43 | 7 | 13 | . | 5 | 2 |
| *Daphne mezereum* | . | 1 | . | . | . | 33 | 67 | 46 | . | 10 | . | . | 17 | . | 57 | . |

| Column | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Community | SM | CC | SC | BD | VD | BC | SB | PS | PSal | RA | Slap | TG | LD | ChC | DD | AA |
| Number of relevés | 34 | 84 | 120 | 36 | 41 | 55 | 15 | 13 | 4 | 59 | 14 | 15 | 23 | 55 | 37 | 116 |
| *Paris quadrifolia* | . | 1 | 2 | . | 5 | 13 | 60 | 39 | 2 | 10 | . | . | 22 | 9 | 70 | 11 |
| *Prenanthes purpurea* | . | 19 | 3 | . | . | 20 | 33 | 31 | 4 | 7 | 14 | . | 4 | 49 | 19 | 13 |
| *Sorbus * glabrata* | . | 18 | 2 | . | . | 9 | 20 | 92 | 3 | 7 | 21 | . | 4 | 23 | . | 9 |
| *Streptopus amplexifolius* | . | 20 | 0.8 | 3 | . | . | 7 | 31 | 1 | 12 | . | . | . | 11 | 5 | 17 |
| **D.S. *Adenostylion alliariae*** | | | | | | | | | | | | | | | | |
| *Chaerophyllum hirsutum* | . | . | . | 6 | 32 | 2 | 67 | 46 | . | 68 | 50 | 53 | 74 | 75 | 5 | 3 |
| *Alchemilla glabra* | . | 4 | . | 6 | 17 | 9 | . | 23 | . | 46 | 43 | 47 | 17 | 4 | 5 | 3 |
| *Thalictrum aquilegiifolium* | . | 4 | . | . | 5 | 18 | 33 | 31 | . | 42 | 7 | 13 | 4 | 29 | 16 | 4 |
| *Myosotis nemorosa* | . | . | . | 8 | 54 | 27 | 47 | 31 | . | 39 | 36 | 80 | 70 | 31 | 11 | 5 |
| *Valeriana sambucifolia* | . | . | . | . | 12 | 15 | 7 | 15 | . | 32 | 29 | 13 | 30 | 24 | 27 | . |
| *Epilobium alpestre* | . | . | . | 3 | 17 | 13 | 20 | . | . | 32 | . | 33 | 39 | 11 | 27 | . |
| *Crepis paludosa* | 3 | 2 | . | . | 27 | . | 60 | 8 | 1 | 27 | 71 | 47 | 26 | 60 | . | 3 |
| *Geum rivale* | . | . | . | 3 | 2 | 9 | 27 | . | . | 7 | 7 | 20 | 26 | 11 | . | . |
| *Cirsium heterophyllum* | . | 4 | . | . | 7 | 24 | 33 | . | . | 7 | . | 20 | 22 | 13 | 8 | 0.9 |
| **D.S. *Dryopterido-Athyrion*** | | | | | | | | | | | | | | | | |
| *Rubus idaeus* | 3 | 27 | 16 | . | 7 | 66 | 40 | 85 | 2 | 31 | 29 | 13 | 48 | 65 | 100 | 58 |
| *Dryopteris filix-mas* | . | 5 | 8 | . | . | 44 | 53 | 69 | . | 29 | 7 | . | 17 | 15 | 97 | 34 |
| *Athyrium distentifolium* | 6 | 55 | 27 | 14 | 10 | 58 | 33 | 100 | 3 | 54 | 21 | 13 | 22 | 51 | 65 | 98 |
| *Oxalis acetosella* | . | 5 | 12 | 6 | . | 4 | . | 54 | 1 | 19 | 29 | . | 4 | 67 | 41 | 74 |
| **D.S. *Calamagrostietalia villosae*** | | | | | | | | | | | | | | | | |
| *Avenella flexuosa* | 85 | 89 | 83 | 67 | 51 | 55 | 53 | 46 | . | 19 | 21 | 7 | 4 | 2 | 11 | 50 |
| *Solidago virgaurea* s.l. | 77 | 73 | 38 | 36 | 5 | 60 | 47 | 31 | . | 12 | . | 13 | 4 | 2 | 22 | 9 |
| *Gentiana asclepiadea* | 68 | 73 | 15 | 14 | 2 | 64 | 7 | 69 | . | 22 | 7 | . | . | 2 | 41 | 37 |
| *Trientalis europaea* | 56 | 56 | 41 | 17 | 20 | 22 | 20 | 15 | 1 | 3 | 29 | 13 | 9 | 2 | 41 | 45 |
| *Luzula luzuloides* | 24 | 74 | 57 | 28 | 59 | 71 | 53 | 23 | 1 | 25 | 21 | 60 | 57 | 6 | 3 | 12 |
| *Silene vulgaris* | 27 | 70 | 28 | 8 | 37 | 71 | 40 | 8 | . | 19 | 7 | 60 | 26 | . | 8 | 5 |
| *Calluna vulgaris* | 35 | 45 | 5 | . | 2 | 36 | . | . | . | . | . | . | . | . | 3 | 0.9 |
| *Calamagrostis arundinacea* | 6 | 38 | 23 | . | 20 | 98 | 80 | 69 | . | 19 | . | . | 17 | 17 | 54 | 20 |
| *Achillea * sudetica* | . | 21 | 0.8 | 3 | 37 | 36 | . | . | . | 3 | . | 13 | 17 | . | . | . |
| *Convallaria majalis* | . | 18 | . | . | . | 15 | 13 | . | . | . | . | . | 4 | . | . | . |
| *Dianthus * alpestris* | . | 1 | . | . | 10 | 9 | . | . | . | . | . | . | 4 | . | . | . |
| **D.S. *Adenostyletalia alliariae*** | | | | | | | | | | | | | | | | |
| *Adenostyles alliariae* | 6 | 12 | 8 | 6 | 12 | 7 | 67 | 85 | 2 | 98 | 50 | 33 | 35 | 9 | 41 | 51 |
| *Stellaria nemorum* | . | . | 0.8 | 8 | 12 | 7 | 20 | 39 | 1 | 66 | 14 | 13 | 39 | 84 | 46 | 43 |
| *Aconitum * hians* | . | 7 | 2 | 8 | 51 | 55 | 80 | 46 | . | 64 | 57 | 67 | 83 | 9 | 35 | 10 |
| *Cicerbita alpina* | . | 7 | 3 | . | 7 | 9 | 40 | 85 | 2 | 49 | 57 | . | 9 | 78 | 30 | 31 |
| *Milium effusum* | . | . | . | . | 2 | 9 | 60 | 54 | . | 42 | 21 | . | 9 | 9 | 68 | 20 |
| *Viola biflora* | 3 | 5 | 3 | 6 | 27 | 27 | 13 | 31 | 3 | 36 | 79 | 67 | 44 | 11 | 27 | 6 |
| *Heracleum sphondylium* | . | 4 | . | . | 20 | 44 | 20 | 15 | . | 27 | . | 13 | 74 | . | 16 | . |
| *Epilobium montanum* | . | . | 2 | . | . | 15 | 33 | 8 | . | 5 | . | 20 | 22 | 40 | 51 | 3 |
| *Silene dioica* | . | 17 | 7 | 6 | 7 | 22 | 13 | 62 | . | 48 | . | . | 35 | 25 | 32 | 37 |
| **D.S. *Mulgedio-Aconitetea*** | | | | | | | | | | | | | | | | |
| *Calamagrostis villosa* | 88 | 96 | 93 | 36 | 51 | 75 | 80 | 77 | 3 | 59 | 100 | 87 | 57 | 36 | 76 | 84 |
| *Veratrum * lobelianum* | 62 | 80 | 32 | 47 | 32 | 66 | 87 | 92 | 3 | 59 | 71 | 33 | 30 | 4 | 35 | 50 |
| *Polygonum bistorta* | 62 | 74 | 71 | 86 | 76 | 51 | 40 | 46 | . | 54 | 100 | 80 | 26 | 9 | 3 | 45 |
| *Rumex alpestris* | 21 | 60 | 45 | 28 | 68 | 60 | 80 | 92 | . | 86 | 57 | 67 | 78 | 36 | 65 | 84 |
| *Senecio * nemorensis* | 9 | 63 | 27 | 19 | 66 | 78 | 87 | 92 | 2 | 64 | 50 | 47 | 70 | 16 | 92 | 62 |
| *Ranunculus platanifolius* | 6 | 61 | 11 | 3 | 24 | 64 | 60 | 54 | . | 58 | 14 | 40 | 9 | 36 | 30 | 19 |
| *Polygonatum verticillatum* | 3 | 43 | 19 | 6 | 17 | 64 | 80 | 46 | . | 17 | 7 | 7 | 17 | 2 | 38 | 27 |
| *Geranium sylvaticum* | . | 8 | 3 | . | 56 | 71 | 73 | 54 | . | 51 | 14 | 87 | 87 | 25 | 32 | 5 |
| *Doronicum austriacum* | . | . | . | 3 | 5 | 2 | 27 | . | 1 | 12 | . | 7 | . | 9 | 8 | 3 |
| *Aconitum variegatum* | . | . | . | . | 7 | 13 | . | 8 | . | . | . | . | 30 | 8 | 27 | . |
| *Angelica sylvestris* | . | 1 | . | . | 7 | 35 | 47 | 46 | . | 12 | 7 | 7 | 48 | 2 | 14 | 2 |
| *Hieracium prenanthoides* | . | 6 | . | . | 2 | 13 | 20 | 8 | . | 10 | . | . | . | . | . | . |

| Column | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Community | SM | CC | SC | BD | VD | BC | SB | PS | PSal | RA | Slap | TG | LD | ChC | DD | AA |
| Number of relevés | 34 | 84 | 120 | 36 | 41 | 55 | 15 | 13 | 4 | 59 | 14 | 15 | 23 | 55 | 37 | 116 |
| *Delphinium elatum* | . | . | . | . | 2 | 24 | 7 | 8 | . | . | . | 13 | 30 | 2 | 16 | . |
| **Other species** | | | | | | | | | | | | | | | | |
| *Deschampsia cespitosa* | 38 | 30 | 18 | 100 | 100 | 20 | 7 | 15 | 1 | 75 | 86 | 93 | 61 | 34 | 3 | 16 |
| *Vaccinium myrtillus* | 91 | 94 | 53 | 14 | 20 | 66 | 87 | 54 | 3 | 10 | 7 | 33 | 9 | 15 | 30 | 50 |
| *Potentilla erecta* | 74 | 49 | 30 | 31 | 54 | 44 | 47 | . | . | 9 | 29 | 60 | 22 | 4 | . | 3 |
| *Phyteuma spicatum* | . | 13 | 2 | . | 22 | 49 | 47 | 31 | . | 24 | 7 | 53 | 39 | 17 | 16 | 3 |
| *Hypericum maculatum* | . | 29 | 5 | . | 51 | 64 | 47 | 46 | . | 29 | 29 | 67 | 83 | 8 | 46 | 9 |
| *Maianthemum bifolium* | 6 | 18 | 4 | 3 | 2 | 20 | 7 | 15 | . | 2 | . | 7 | . | 9 | 19 | 13 |
| *Vaccinium vitis-idaea* | 15 | 29 | 5 | . | 5 | 15 | 7 | 8 | 1 | . | . | . | . | . | . | 0.9 |
| *Epilobium angustifolium* | . | 5 | 3 | . | 7 | 33 | . | 31 | . | 27 | 7 | . | 4 | 15 | 43 | 8 |
| *Agrostis tenuis* | 3 | 7 | 2 | . | 10 | 4 | 7 | . | . | 2 | . | 7 | 9 | 8 | . | 0.9 |
| *Filipendula ulmaria* | . | . | . | . | 17 | 13 | 20 | 8 | . | 7 | . | 27 | 44 | 13 | . | . |
| *Festuca rubra* agg. | . | 2 | 0.8 | 3 | 24 | 2 | . | . | . | . | . | 7 | 9 | . | . | . |
| *Agrostis stolonifera* agg. | . | . | 0.8 | . | 24 | 2 | . | . | . | 2 | . | 7 | 13 | . | 3 | . |
| *Veronica chamaedrys* | . | . | . | 3 | 24 | . | . | . | . | . | . | 7 | 13 | 2 | . | 0.9 |
| *Leontodon hispidus* | . | 12 | 0.8 | . | 15 | 29 | . | . | . | 2 | 7 | 33 | 4 | . | . | . |
| *Carex pallescens* | 9 | 8 | 2 | . | 37 | 18 | . | . | . | 3 | . | 33 | 35 | . | . | . |
| *Ajuga reptans* | . | . | 0.8 | . | 15 | 18 | 33 | . | . | . | . | 33 | 35 | 17 | . | . |
| *Galium saxatile* | . | 8 | 6 | 6 | 5 | 11 | . | . | . | 2 | . | . | . | 2 | 5 | 5 |
| *Allium schoenoprasum* | 3 | . | . | 3 | 15 | 15 | . | . | . | 3 | 7 | 13 | . | . | . | . |
| *Swertia perennis* | 3 | 2 | . | . | 5 | 2 | . | . | . | 3 | 29 | . | . | . | . | . |
| *Senecio rivularis* | . | . | . | . | 12 | . | 13 | . | . | 3 | 7 | 20 | 4 | 4 | . | . |
| *Caltha palustris* | . | . | . | 3 | 5 | . | 13 | . | . | 2 | . | 20 | 22 | 6 | . | . |
| *Festuca supina* | . | 4 | 20 | 11 | 12 | 4 | . | . | . | . | 7 | . | . | . | . | . |
| *Carex atrata* | 3 | 2 | . | . | 5 | 2 | . | . | . | 3 | . | 7 | . | . | . | . |
| *Hieracium lachenalii* | . | 5 | . | . | 5 | 13 | 7 | . | . | . | . | . | 4 | . | 3 | . |
| *Galeopsis pubescens* | . | . | 0.8 | . | 7 | . | 7 | . | . | . | . | . | . | 2 | 8 | 0.9 |
| *Huperzia selago* | 6 | 2 | 2 | . | . | . | . | . | 1 | . | . | . | . | 2 | . | 0.9 |
| *Ranunculus nemorosus* | . | . | 0.8 | . | 10 | 20 | 7 | . | . | 3 | . | 13 | 13 | . | . | . |
| *Alchemilla monticola* | . | . | . | 8 | 2 | 4 | . | . | . | 5 | . | 13 | 17 | . | . | . |
| *Ranunculus lanuginosus* | . | 1 | . | . | . | 11 | . | . | . | 7 | . | . | 4 | 18 | . | . |
| *Gymnadenia conopsea* | . | 2 | . | . | 2 | 16 | . | . | . | 3 | . | 7 | . | . | . | . |
| *Hieracium alpinum* | 21 | 17 | 3 | 6 | . | 4 | . | . | . | . | . | . | . | . | . | . |
| *Epilobium palustre* | . | . | . | 3 | 10 | . | . | . | . | . | 14 | . | 9 | . | . | 0.9 |
| *Stellaria alsine* | . | . | . | . | 5 | . | . | . | . | 2 | 7 | . | . | 4 | . | 0.9 |
| *Galium odoratum* | . | . | . | . | 2 | 6 | . | . | . | . | . | . | . | 6 | 19 | 0.9 |
| *Poa nemoralis* | . | . | . | . | 2 | 6 | . | . | . | 5 | . | . | 4 | . | 5 | . |
| *Carex bigelowii* | 21 | 1 | 2 | 25 | . | . | . | . | . | . | . | . | . | . | . | . |
| *Cystopteris fragilis* | . | . | 0.8 | . | . | . | 7 | . | . | 2 | 7 | . | . | . | . | . |
| *Juncus filiformis* | 15 | . | . | 6 | 2 | . | . | . | . | . | 21 | . | . | . | . | . |
| *Carex nigra* | 3 | . | . | 6 | 2 | . | . | . | . | . | . | . | 4 | . | . | . |
| *Bartsia alpina* | 6 | 1 | . | . | . | 6 | . | . | . | . | 7 | . | . | . | . | . |
| *Allium victorialis* | . | 8 | 0.8 | . | . | 4 | . | . | . | 2 | . | . | . | . | . | . |
| *Gnaphalium norvegicum* | . | 11 | . | . | 7 | 6 | . | . | . | . | . | . | . | . | 3 | . |
| *Campanula barbata* | . | 4 | . | . | 12 | 2 | . | . | . | . | . | 7 | . | . | . | . |
| *Dactylorhiza maculata* | . | 4 | . | . | 5 | 4 | . | . | . | . | . | 7 | . | . | . | . |
| *Carex sylvatica* | . | . | . | . | . | 4 | . | . | . | 2 | . | . | . | 6 | 3 | . |
| *Vicia cracca* | . | . | . | . | 15 | 2 | . | . | . | . | . | 13 | 22 | . | . | . |
| *Dactylorhiza fuchsii* | . | . | 0.8 | . | 5 | . | 27 | . | . | . | . | . | . | 2 | . | . |
| *Carex canescens* | . | . | . | 3 | . | . | . | . | . | 2 | 14 | . | . | . | . | 0.9 |
| *Circaea alpina* | . | . | . | . | . | . | 7 | 8 | . | . | . | . | . | 2 | 14 | 4 |
| *Lunaria rediviva* | . | . | . | . | . | 13 | . | . | . | . | . | . | 13 | 4 | 19 | . |
| *Galium boreale* | . | . | . | . | 27 | 15 | . | . | . | . | . | 20 | 17 | . | . | . |

| Column | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Community | SM | CC | SC | BD | VD | BC | SB | PS | PSal | RA | Slap | TG | LD | ChC | DD | AA |
| Number of relevés | 34 | 84 | 120 | 36 | 41 | 55 | 15 | 13 | 4 | 59 | 14 | 15 | 23 | 55 | 37 | 116 |
| *Poa supina* | . | . | . | 3 | 2 | . | . | . | . | 3 | . | . | . | 2 | . | . |
| *Pimpinella saxifraga* agg. | . | . | 0.8 | . | 10 | 2 | . | . | . | . | . | . | 9 | . | . | . |
| *Poa trivialis* | . | . | . | 3 | . | . | . | . | . | 5 | . | . | 4 | 2 | . | . |
| *Myosotis scorpioides* | . | . | . | . | 2 | 2 | . | . | . | 5 | . | . | . | 2 | . | . |
| *Pulmonaria officinalis* | . | . | . | . | . | 4 | 7 | . | . | . | . | . | . | 4 | 8 | . |
| *Melampyrum pratense* | . | 1 | 2 | . | . | 2 | 7 | . | . | . | . | . | . | . | . | . |
| *Cerastium holosteoides* | . | . | . | 6 | 2 | . | . | . | . | . | . | 7 | 4 | . | . | . |
| *Epilobium alsinifolium* | . | . | . | 3 | 7 | . | . | . | . | . | . | 7 | . | 2 | . | . |
| *Cardaminopsis halleri* | . | . | . | . | . | 2 | . | . | . | 2 | . | 7 | . | 2 | . | . |
| *Blechnum spicant* | . | 10 | 3 | . | . | . | . | . | 1 | . | . | . | . | . | . | 0.9 |
| *Angelica archangelica* | . | . | . | . | . | 2 | . | . | . | 3 | . | 13 | . | . | . | 0.9 |
| *Sorbus * glabrata* juv. | . | 11 | 3 | . | . | 6 | 40 | 39 | . | 2 | 7 | . | . | 2 | 3 | 3 |
| *Picea abies* juv. | 3 | 4 | 4 | . | . | . | 13 | 31 | . | 2 | . | . | 4 | 11 | 3 | 3 |
| *Betula pubescens* juv. | . | 2 | 2 | . | . | 2 | 7 | 23 | . | . | . | . | 4 | . | 3 | 3 |
| *Salix silesiaca* juv. | . | 1 | 3 | . | . | . | 20 | . | . | 2 | 21 | . | 4 | . | . | . |
| *Salix hastata* juv. | . | 2 | . | . | 2 | 4 | 7 | . | . | . | . | 7 | . | . | . | . |
| *Acer pseudoplatanus* juv. | . | . | . | . | . | 4 | 7 | . | . | . | . | . | 13 | 8 | 32 | 2 |
| **$E_3$** | | | | | | | | | | | | | | | | |
| *Sorbus * glabrata* | . | 2 | . | . | . | . | 13 | . | . | 2 | . | . | . | 2 | . | . |
| *Picea abies* | . | 6 | . | . | . | . | 7 | . | . | 5 | . | . | . | 9 | . | . |
| **$E_2$** | | | | | | | | | | | | | | | | |
| *Sambucus racemosa* | . | . | . | . | . | 7 | . | . | . | . | . | . | . | 9 | 5 | 0.9 |
| *Salix caprea* | . | 2 | . | . | . | 6 | . | . | . | . | . | . | . | 8 | 3 | . |
| *Pinus mugo* | . | 12 | . | . | 2 | 9 | . | 15 | . | . | . | . | . | . | . | 2 |
| **$E_0$** | | | | | | | | | | | | | | | | |
| *Polytrichum formosum* | 6 | 11 | 10 | 3 | 2 | 6 | 13 | 15 | 3 | 10 | 14 | 7 | . | 9 | 5 | 28 |
| *Plagiothecium denticulatum* | . | 4 | 6 | 3 | 2 | 11 | 7 | 15 | . | 9 | . | 7 | . | 4 | 22 | 37 |
| *Plagiomnium affine* | . | . | 2 | 3 | 22 | 27 | 13 | . | 1 | 19 | . | 27 | 39 | 20 | 24 | 12 |
| *Pohlia nutans* | 3 | 1 | 3 | 3 | . | 4 | 7 | . | 2 | 5 | . | 7 | 4 | 2 | 24 | 16 |
| *Brachythecium reflexum* | . | 7 | 0.8 | . | . | 11 | 20 | 8 | . | 15 | 14 | 7 | 17 | . | 3 | 24 |
| *Plagiothecium laetum* | . | 4 | 0.8 | . | 2 | 2 | 13 | 23 | . | 3 | . | . | 4 | 8 | 19 | 15 |
| *Rhytidiadelpus squarrosus* | . | 29 | 4 | 6 | 10 | 4 | . | . | . | 7 | 7 | 20 | 4 | . | . | 8 |
| *Brachythecium rivulare* | . | . | . | 3 | 7 | 2 | 13 | 8 | . | 14 | 7 | . | 30 | 17 | . | . |
| *Brachythecium rutabulum* | 3 | . | . | 3 | 5 | 6 | . | . | . | 5 | . | 20 | 9 | 9 | 16 | 4 |
| *Rhodobryum roseum* | . | 8 | . | . | 2 | 9 | 7 | . | . | 9 | 7 | 7 | 17 | 2 | 11 | 6 |
| *Dicranella heteromalla* | 3 | . | 0.8 | . | . | 4 | . | . | 1 | 2 | . | . | 4 | 4 | . | 6 |
| *Philonotis seriata* | . | . | . | . | 5 | . | 7 | . | . | 7 | 21 | 7 | 4 | 2 | . | 2 |
| *Plagiothecium succulentum* | 3 | 2 | 0.8 | . | 2 | . | . | . | . | 7 | . | 7 | 17 | 4 | . | 3 |
| *Chiloscyphus polyanthos* | . | . | . | . | 2 | . | 7 | . | 1 | 7 | 7 | 7 | 9 | 9 | . | 0.9 |
| *Philonotis fontana* | . | . | . | 3 | 2 | . | . | . | . | 5 | 7 | . | 4 | 2 | . | . |
| *Cladonia chlorophaea* | . | . | 0.8 | . | 2 | 11 | 7 | . | . | 2 | . | . | . | . | 5 | 3 |
| *Lescuraea incurvata* | . | . | . | . | 2 | 6 | . | . | . | 7 | . | . | 9 | 4 | 11 | 0.9 |
| *Racomitrium heterostichum* | 3 | . | 0.8 | . | . | 7 | . | . | . | 5 | . | . | 4 | . | 11 | 10 |
| *Polytrichum longisetum* | . | 4 | 0.8 | 3 | . | 2 | . | . | . | . | . | 7 | 4 | . | . | 11 |
| *Paraleucobryum sauteri* | . | . | 2 | . | . | 2 | 7 | . | . | . | . | 7 | . | 4 | 3 | 8 |
| *Lophocolea heterophylla* | . | 1 | 2 | . | . | . | 13 | 8 | . | . | . | . | . | 2 | 3 | 6 |
| *Cynodontium polycarpon* | . | 1 | 0.8 | . | . | 7 | 13 | . | . | 2 | . | . | . | . | 8 | 4 |
| *Brachythecium starkei* | . | 2 | . | . | . | 2 | . | . | . | 7 | . | . | . | 2 | 3 | 3 |
| *Atrichum undulatum* | . | . | . | . | . | 4 | 13 | . | . | . | . | . | 13 | 4 | 3 | 3 |
| *Drepanocladus uncinatus* | . | 2 | 0.8 | . | 2 | . | 13 | 15 | . | 3 | . | . | . | 8 | . | . |
| *Rhytidiadelpus triquetrus* | . | 1 | . | 3 | 2 | 7 | 7 | . | . | 2 | 7 | . | . | 2 | 3 | . |
| *Ceratodon purpureus* | . | . | . | . | 2 | 7 | 7 | . | . | . | . | . | 13 | . | 3 | 0.9 |
| *Pleurozium schreberi* | . | 18 | 3 | . | 5 | 9 | . | . | . | . | . | . | 4 | 2 | . | 2 |
| *Pogonatum urnigerum* | . | 1 | 0.8 | . | . | 13 | . | . | . | 3 | . | . | 9 | 6 | 11 | 0.9 |

| Column | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Community | SM | CC | SC | BD | VD | BC | SB | PS | PSal | RA | Slap | TG | LD | ChC | DD | AA |
| Number of relevés | 34 | 84 | 120 | 36 | 41 | 55 | 15 | 13 | 4 | 59 | 14 | 15 | 23 | 55 | 37 | 116 |
| *Polytrichastrum alpinum* | 3 | . | 2 | 11 | . | . | . | . | . | 2 | . | . | . | . | 16 | 2 |
| *Calliergon stramineum* | 3 | 1 | 2 | 6 | . | . | . | . | . | . | 7 | . | . | . | . | . |
| *Hylocomium splendens* | . | 10 | 0.8 | . | 2 | 11 | . | . | . | . | . | . | . | . | 5 | 0.1 |
| *Barbilophozia lycopodioides* | . | 7 | 2 | . | . | 13 | . | . | . | . | . | . | . | . | 5 | 3 |
| *Rhytidiadelphus loreus* | . | 1 | 0.8 | . | . | 4 | . | . | 1 | . | . | . | . | . | . | 0.9 |
| *Scapania undulata* | . | . | . | . | . | . | 7 | 8 | 1 | . | 7 | . | . | 6 | . | . |
| *Mnium marginatum* | . | . | . | . | . | 2 | . | 15 | . | 2 | . | 13 | 4 | . | . | . |
| *Bryum pseudotriquetrum* | . | . | . | 3 | . | . | . | . | . | 2 | 7 | 13 | 17 | . | . | . |
| *Cirriphyllum piliferum* | . | . | . | . | . | 4 | . | . | . | 2 | . | 7 | 4 | 4 | . | . |
| *Marchantia polymorpha* | . | . | . | 3 | 2 | . | . | . | . | 7 | . | . | . | 2 | . | 0.9 |
| *Cratoneuron commutatum* | . | . | . | 3 | . | . | . | . | . | 3 | . | . | 13 | 6 | . | 0.9 |
| *Bryum capillare* agg. | . | . | . | . | 2 | 13 | . | . | . | 2 | . | . | 13 | . | 3 | . |
| *Cratoneuron filicinum* | . | . | . | . | . | 2 | 7 | . | . | . | . | . | 9 | . | 5 | 2 |
| *Eurhynchium praelongum* | 3 | . | . | . | . | . | . | . | . | 2 | . | . | 4 | . | . | 0.9 |
| *Mnium hornum* | . | . | . | . | . | . | . | . | . | 3 | . | 7 | . | 6 | 3 | . |
| *Pellia epiphylla* | . | . | 0.8 | . | . | . | . | . | . | 10 | . | . | . | 9 | . | 3 |
| *Scapania irrigua* | . | . | . | . | . | 2 | . | . | . | 2 | 14 | . | . | . | . | 0.9 |
| *Plagiomnium cuspidatum* | . | . | . | . | 2 | . | . | 8 | . | 3 | . | . | 4 | . | . | . |
| *Plagiochila asplenioides* | . | . | . | . | . | . | . | 8 | . | 2 | . | . | . | 4 | 5 | . |
| *Plagiochila porelloides* | . | . | . | . | . | 2 | . | . | . | 2 | . | . | 9 | 4 | . | . |
| *Marsupella emarginata* | . | . | 0.8 | . | . | . | . | . | 1 | 2 | . | . | . | . | . | 0.9 |
| *Polytrichum juniperinum* | . | 1 | 0.8 | . | . | 2 | . | . | . | . | . | . | . | . | 5 | . |
| *Bryum schleicheri* | . | . | 0.8 | . | 5 | . | . | . | . | 5 | . | . | . | 4 | . | . |
| *Dicranum fuscescens* | . | 2 | 0.8 | . | . | . | . | . | . | . | . | . | . | . | 3 | 0.9 |
| *Barbilophozia hatcherii* | . | . | 0.8 | . | . | . | . | . | . | 2 | . | . | . | . | 3 | 2 |
| *Lophocolea bidentata* | . | . | 2 | . | . | . | . | . | . | . | . | . | . | 8 | 5 | 6 |
| *Brachythecium mildeanum* | . | . | . | . | 2 | . | . | . | . | . | . | 7 | 4 | . | . | 0.9 |
| *Brachythecium velutinum* | . | . | 0.8 | . | . | . | . | 8 | . | . | . | . | 4 | 6 | . | . |
| *Sphagnum squarrosum* | . | . | 0.8 | . | . | . | . | . | . | 2 | 29 | . | . | . | . | 0.9 |
| *Isopterygiopsis muelleriana* | . | . | 0.8 | 3 | . | . | . | . | . | 2 | . | . | . | 2 | . | . |
| *Plagiomnium rostratum* | . | . | . | . | . | . | . | . | . | 2 | . | 7 | 9 | . | . | 0.9 |
| *Oxystegus cylindricus* | . | . | . | . | . | 9 | . | . | . | 2 | . | 7 | 9 | . | . | . |

Species in three columns:

$E_2$: *Sorbus sudetica* 2: 11, 6: 11, 7: 7; *Populus tremula* 2: 1, 6: 4, 7: 7; *Fagus sylvatica* 6: 4, 10: 2, 14: 4.

$E_1$: *Agrostis rupestris* 2: 2, 3: 0.8, 4: 3; *Anthriscus nitidus* 10: 19, 14: 4, 16: 0.9; *Briza media* 5: 15, 6: 2, 13: 4; *Campanula rotundifolia* 1: 3, 2: 1, 6: 4; *Cardamine amara* 10: 3, 13:4, 14: 22; *Dryopteris carthusiana* 3: 3, 8: 15, 16: 4; *Equisetum arvense* 5: 2, 13: 4; 14: 4; *Festuca ovina* s. str. 2: 1, 3: 0.8, 6: 2; *Fragaria vesca* 6: 7, 13: 4, 15: 3; *Galium mollugo* agg. 5: 2, 15: 3, 16: 0.9; *G. pumilum* 1: 12, 2: 4, 6: 4; *Hieracium aurantiacum* 2: 2, 5: 5, 6: 4; *Sedum maximum* 6: 9, 13: 4, 15: 14; *Lysimachia nemorum* 10: 3, 13: 4, 14: 11; *Melampyrum nemorosum* 1: 3, 2: 2, 3: 0.8; *Melica nutans* 2: 1, 6: 9, 13: 4; *Pinus mugo* juv. 1: 3, 2: 2, 4: 6; *Ranunculus repens* 4: 3, 10: 7, 14: 13; *Rosa pendulina* juv. 3: 0.8, 6: 2, 7: 20; *Rubus saxatilis* 2: 1, 6: 4, 13: 4; *Scabiosa lucida* 5: 10, 6: 4, 13: 9; *Sedum alpestre* 6: 2, 15: 8, 16: 0.9; *Taraxacum* sect. *Ruderalia* 5: 2, 13: 9, 14: 2; *Thelypteris limbosperma* 3: 0.8, 8: 8, 16: 2; *Viola palustris* 1: 3, 4: 8, 14: 6.

$E_0$: *Amblystegium tenax* 3: 0.8, 10: 2, 16: 0.9; *Barbilophozia barbata* 6: 6, 15: 11, 16: 3; *B. floerkei* 2: 1, 3: 0.8, 14: 5; *Brachythecium glareosum* 2: 1, 13: 4, 14: 2; *Campylium stellatum* 7: 7, 12: 7, 13: 4; *Cephalozia bicuspidata* 2:1, 10: 2, 16: 2; *Cladonia fimbriata* 2: 1, 3: 0.8, 6: 6; *C. pyxidata* 2: 1, 6: 2, 15: 3; *Dicranella palustris* 10: 3, 11: 29, 15: 3; *Diplophyllum albicans* 3: 0.8, 14: 2, 16: 2; *Kiaeria starkei* 2: 1, 3: 2, 14: 3; *Mnium spinosum* 2: 4, 6: 4, 10: 2; *M. stellare* 5: 2, 10: 3, 16: 0.9; *Mylia taylorii* 2: 1, 3: 0.8, 14: 4; *Orthodicranum montanum* 2: 1, 6: 2, 16: 0.9; *Pellia neesiana* 14: 2, 15: 5, 16: 3; *Plagiomnium undulatum* 10: 2, 13: 4, 14: 4; *P. platyphyllum* 2: 1, 11: 7, 14: 2; *P. undulatum* 9: 1, 14: 6, 16: 6; *Polytrichum strictum* 2: 2, 3: 0.8, 16: 2; *Rhizocarpon geographicum* 2: 2, 3: 0.8, 16: 0.9; *Rhizomnium magnifolium* 12: 7, 14: 4, 16: 0.9; *Sphagnum capillifolium* 2: 4, 3: 3, 16: 2; *S. cuspidatum* 1: 9, 3: 2, 11: 21; *S. russowii* 2: 2, 3: 2, 16. 0.9; *Tayloria serrata* 10: 2, 13: 9, 15: 3.

Species in two columns:

$E_2$: *Ulmus glabra* 6: 2, 7: 7.

$E_1$: *Aegopodium podagraria* 7: 7, 14: 4; *Alchemilla straminea* 5: 2, 10: 2; *A. xanthochlora* 6: 4; *Anemone nemorosa* 7: 27, 14: 6; *Botrychium lunaria* 6: 4, 12: 7; *Campanula bohemica* 2: 5, 6: 7; *C. scheuchzeri* 2: 6, 6: 9; *C. trachelium* 6: 13, 13: 4; *Cardamine flexuosa* 14: 6, 15: 3; *Carex flava* agg. 5: 5, 13: 4; *Carlina acaulis* 5: 2, 6: 6; *Cirsium rivulare* 5: 2, 15: 3; *Coeloglossum viride* 5: 2, 6: 2; *Conioselinum tataricum* 6: 2, 13: 4; *Epilobium nutans* 10: 2, 11: 21; *Eriophorum vaginatum* 1: 15, 11: 7; *Festuca altissima* 6: 2, 15: 3; *Galeopsis bifida* 5: 2, 12: 7; *Gentiana pannonica* 3: 3, 16: 5; *Geranium robertianum* 14: 2, 15: 14; *Chrysosplenium oppositifolium* 10: 2, 14: 11; *Juncus conglomeratus* 5: 2, 13: 4; *J. effusus* 14: 2, 16: 0.9; *Lamium maculatum* 10: 2, 15: 16; *Lathyrus pratensis* 5: 10, 7: 20; *Luzula pilosa* 9: 1, 15: 3; *Phyteuma orbiculare* 6: 6, 12: 7; *Poa annua* agg. 14: 2, 16: 0.9; *P. palustris* 10: 2, 16: 0.9; *P. remota* 14: 5, 16: 0.9; *Primula minima* 1: 3, 4: 3; *P. veris* 6: 2, 12: 13; *Prunella vulgaris* 5: 2, 13: 4; *Salix caprea* juv. 2: 2, 3: 0.8; *S. lapponum* juv. 10: 3, 11: 57; *Stachys sylvatica* 10: 2, 14:11; *Stellaria graminea* 5: 10, 6: 2; *Trichophorum cespitosum* 1: 3, 4: 6; *Veronica officinalis* 15: 5, 16: 2; *Vicia oreophila* 6: 2, 13: 4.

$E_0$: *Brachythecium salebrosum* 5: 2, 13: 9; *B. populeum* 6: 2, 13: 4; *Calliergon cordifolium* 3: 0.8, 5: 2; *Calypogeia azurea* 3: 0.8, 16: 3; *C. muelleriana* 12: 7, 16: 2; *Cetraria islandica* 1: 5, 2: 3; *Cladonia bellidiflora* 2: 1, 16: 2; *Conocephalum conicum* 10: 3, 14: 6; *Cratoneuron decipiens* 12: 7, 14: 2; *Ctenidium molluscum* 8: 8, 15: 3; *Eurhynchium angustirete* 2: 2, 10: 2; *Hygrohypnum ochraceum* 5: 2, 5: 8; *Hylocomium umbratum* 3: 0.8, 16: 0.9; *Isothecium myosuroides* 2: 1, 10: 2; *Lophozia ventricosa* 15: 8, 16: 3; *Mnium spinulosum* 12: 7, 13: 4; *Nardia scalaris* 1: 3, 3: 0.8; *Oligotrichium hercynicum* 10: 2, 14: 2; *Paraleucobryum longifolium* 15: 5, 16: 2; *Plagiomnium elatum* 8: 8, 13: 4; *Polytrichum piliferum* 3: 0.8, 6: 2; *Porella platyphylla* 6: 2, 15: 3; *Pseudotaxiphyllum elegans* 15: 3, 16: 4; *Racomitrium aciculare* 6: 2, 16: 0.9; *R. aquaticum* 6: 6, 16: 4; *R. fasciculare* 6: 2, 10: 2; *Radula complanata* 3: 0.8, 6: 4; *Rhizomnium pseudopunctatum* 13: 4, 15: 3; *Scapania subalpina* 11: 7, 3: 15; *S. uliginosa* 10: 2, 11: 14; *Sphagnum palustre* 1: 6, 16: 0.9; *S. papillosum* 1: 3, 16: 0.9; *S. riparium* 11: 7, 16: 0.9.

Species in one column:

$E_3$: *Fagus sylvatica* 14: 6.

$E_2$: *Corylus avellana* 6: 4; *Ribes alpinum* 15: 5; *Salix appendiculata* 16: 3; *Salix aurita* 14: 4; *Fagus sylvatica* 14: 9; *Lonicera nigra* 10: 2; *Populus tremula* 2: 1; *Salix aurita* 7: 7; *Sorbus sudetica* 2: 4; *Ulmus glabra* 15: 5.

$E_1$: *Agrostis canina* agg. 5: 2; *Alchemilla vulgaris* agg. 14: 8; *A. fissa* 10: 2; *A. impexa* 6: 2; *A. obtusa* 13: 4; *Alopecurus pratensis* 5: 2; *Anemone ranunculoides* 15: 3; *Arabis sudetica* 6: 7; *Campanula persicifolia* 6: 2; *Carex gracilis* 13: 4; *C. aterrima* 12: 7; *C. echinata* 1: 3; *C. rostrata* 11: 21; *C. vaginata* 1: 9; *Circaea* xintermedia 14: 2; *Cirsium arvense* 4: 3; *C. palustre* 10: 2; *Corydalis cava* 15: 5; *Crepis sibirica* 7: 13; *Dianthus carthusianorum* 6: 2; *Agropyron caninum* 6: 9; *Epilobium anagallidifolium* 10: 2; *Equisetum fluviatile* 11: 7; *E. palustre* 14: 4; *E. pratense* 5: 2; *Eriophorum angustifolium* 1: 3; *Euphorbia amygdaloides* 14: 2; *Euphrasia rostkoviana* 5: 2; *E. picta* 5: 5; *Gagea lutea* 15: 5; *Galeopsis pernhofferi* Wettst. in Kern. 5: 2; *G. speciosa* 7: 7; *G. tetrahit* 15: 11; *Galium anisophyllum* 6: 4; *G. pusillum* agg. 2: 1; *G. sudeticum* 6: 6; *G. uliginosum* 5: 10; *Gentiana punctata* 16: 0.9; *Geranium palustre* 14: 2; *Gnaphalium supinum* 4: 3; *G. sylvaticum* 5: 2; *Gymnadenia odoratissima* 2: 1; *Helianthemum grandiflorum* s. str. 6: 2; *Hieracium sylvaticum* 7: 7; *Holcus mollis* 3: 0.8; *Juncus trifidus* 3: 0.8; *Knautia arvensis* 6: 2; *Lapsana communis* 13: 4; *Leucanthemum vulgare* agg. 6: 2; *Linum catharticum* 6: 4; *Luzula multiflora* 5: 7; *Diphasium alpinum* 3: 0.8; *Lycopodium annotinum* 2: 1; *Matteuccia struthiopteris* 14: 2; *Parnassia palustris* 5: 2; *Phalaris arundinacea* 13: 17; *Phragmites australis* 7: 7; *Poa alpina* 5: 2; *P. pratensis* 12: 7; *Polystichum aculeatum* 15: 8; *Potentilla palustris* 11: 7; *Pteridium aquilinum* 16: 3; *Ranunculus polyanthemos* 6: 2; *Rhinanthus minor* 2: 1; *Rubus fruticosus* agg. 16: 0.9; *R. hirtus* s.l. 6: 2; *Rumex acetosa* 5: 2; *Scirpus sylvaticus* 7: 7; *Stellaria palustris* 5: 2; *Senecio* jacquinianus* 16: 0.1; *Thymus pulegioides* 6: 6; *Trifolium pratense* 6: 2; *Tussilago farfara* 6: 4; *Valeriana procurrens* 14: 2; *V. tripteris* 9: 2; *Veronica montana* 14: 2; *Vincetoxicum hirundinaria* 6: 2; *Viola reichenbachiana* 14: 8.

$E_0$: *Blepharostomum trichophyllum* 16: 0.9; *Brachythecium oedipodium* 14: 4; *Calliergonella cuspidata* 14: 2; *Calypogeia integristipula* 16: 0.1; *Campylopus flexuosus* 2: 1; *Cephalozia leucantha* 16: 0.9; *Cephaloziella divaricata* 14: 2; *Cladonia coniocraea* 15: 5; *C. ecmocyna* 2: 1; *C. rangiferina* 3: 0.8; *Climacium dendroides* 7: 7; *Dermatocarpon luridum* 15: 3; *Dicranodontium denudatum* 3: 2; *Dicranum leioneuron* 8: 8; *D. majus* 2: 2; *Diplophyllum taxifolium* 16: 0.9; *Distichium capillaceum* 13: 4; *Ditrichium flexicaule* 5: 2; *Drepanocladus aduncus* 13: 4; *Eurhynchium hians* 13: 4; *Grimmia hartmanii* 15: 5; *G. montana* 16: 0.9; *Herzogiella seligeri* 7: 7; *H. striatella* 16: 0.9; *Heterocladium dimorphum* 6: 2; *H. heteropterum* 3: 0.8; *Hypnum callichroum* 16: 0.9; *H. cupressiforme* 6: 2; *H. lindbergii* 16: 0.9; *Isothecium alopecuroides* 14: 2; *Jamesoniella autumnalis* 10: 2; *Jungermannia hyalina* 3: 0.8; *J. obovata* 10: 2; *Leptodictyum riparium* 14: 2; *Lescuraea saxicola* 5: 2;

*Lophozia sudetica* 3: 0.8; *Moerckia blyttii* 16: 0.9; *Paludella squarrosa* 11: 14; *Philonotis caespitosa* 10: 2; *Plagiomnium ellipticum* 13: 4; *P. medium* 14: 2; *Platydictya subtilis* 12: 7; *Pohlia cruda* 16: 0.9; *P. wahlenbergii* 10: 3; *Polytrichastrum sexangulare* 4: 3; *Porella cordaeana* 13: 4; *Ptilidium ciliare* 6: 4; *Ptychodium plicatum* 10: 2; *Racomitrium canescens* 15: 3; *Sphagnum denticulatum* 14: 2; *S. fallax* 3: 0.8; *S. fuscum* 3: 0.8; *S. inundatum* 1: 3; *S. rubellum* 1: 6; *S. subsecundum* 1: 3; *Tayloria tenuis* 10: 2.

and nutrient rich soils with a good water supply. These conditions are particularly characteristic for mountain cirques. The order *Calamagrostietalia villosae* includes two alliances: *Calamagrostion villosae* and *Calamagrostion arundinaceae*.

## *Calamagrostion villosae* Pawłowski, Sokołowski et Wallisch 1928

Species-poor tall grasslands of the subalpine belt on the siliceous bedrock

Syntax. syn.: *Poo-Deschampsion cespitosae* Jeník et al. 1980[2], *Phleo-Deschampsion cespitosae* Csűrös et al. 1985

D.S.: *Anthoxanthum alpinum*, *Calamagrostis villosa* (transgr.), *Gentiana asclepiadea*, *Geum montanum*, *Homogyne alpina*, *Hypochoeris uniflora*, *Ligusticum mutellina*, *Silene vulgaris*, *Trientalis europaea*

Species-poor communities of the subalpine belt, dominated mostly by *Calamagrostis villosa*. They are widespread on sheltered leeward slopes and ridges of E–SE aspect. The soils are acidic, but rich in nutrients and humus, deep, moderately wet and well-drained. The thick snow cover protects soils and plants from freezing, and serves as a source of moisture in spring.

### *Sphagno compacti-Molinietum caeruleae* Wagnerová ex Berciková 1976[3]

(Table 1, col. 1)

Syn.: *Molinietum alpinum corconticum* Válek 1961 p.p. (Art. 34), *Sphagno compacti-Molinietum caeruleae* Wagnerová 1970 (Art. 1, 3b)

Nomenclature type: Berciková (1976: Table 12, rel. 4), **lectotypus hoc loco designatus**

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[2] The alliance *Poo-Deschampsion cespitosae* was described by Jeník et al. (1980) from the Hrubý Jeseník Mts to include communities dominated by *Deschampsia cespitosa*, occurring in shallow wet depressions above the timberline. Because of the absence of the diagnostic species (the authors mention *Poa chaixii*, *Deschampsia cespitosa* which are widespread in the *Calamagrostion villosae*) I regard this alliance as unsupported (cf. Coldea 1991, 1997), and assign its communities to the *Calamagrostion villosae*. *Deschampsia cespitosa*, as well as *Molinia caerulea*, has a broad tolerance to ecological factors and lacks clear sociological relations (Berciková 1976, 1977, Csűrös et al. 1985). It shows relationships to different vegetation types, not only in the meadow vegetation of low altitudes, but also at high altitudes. In the latter, *Deschampsia cespitosa* is a common species of the *Nardo-Caricion fyllae* (*Carici-Nardetum deschampsietosum*), *Polygono-Trisetion* (*Phleo alpini-Melandrietum nardetosum* and *violetosum sudeticae*) (Krahulec et al. 1997) and, of course, of most of the *Mulgedio-Aconitetea* communities.

[3] The communities dominated by *Molinia caerulea* were first studied by Válek (1961). His syntaxon *Molinietum alpinum corconticum* was accepted neither by Hadač & Váňa (1967) nor by Berciková (1976), because of its broad definition. The syntaxonomical position of the *Sphagno-Molinietum* is not clear due to its peculiar species composition (e.g. *Nardus stricta*, *Carex bigelowii*, *Vaccinium uliginosum*, *Sphagnum* sp., *Juncus filiformis* etc.). It has close relations to the *Carici fyllae-Nardetum molinietosum* Berciková 1976 (*Nardo-Caricion rigidae*) and *Polytricho-Molinietum caeruleae* Hadač & Váňa 1967 (*Caricion canescentis-fuscae* Koch 1926). According to abundant presence of the species of higher syntaxa it is possible to order them to the *Mulgedio-Aconitetea*.

D.S.: *Homogyne alpina* (transgr.), *Molinia caerulea* (dom.), *Nardus stricta*, *Sphagnum compactum*, *Vaccinium uliginosum*; Const.: *Avenella flexuosa*, *Calamagrostis villosa* (subdom.), *Gentiana asclepiadea*, *Homogyne alpina*, *Polygonum bistorta*, *Potentilla erecta*, *Solidago virgaurea* subsp. *minuta*, *Vaccinium myrtillus*

Structure and species composition: *Sphagno-Molinietum* is a species-poor community (on average 15 sp./rel.) dominated by *Molinia caerulea*, which creates homogenous dense lawns 40–50 (–70) cm in height. Vascular plants cover about 100% of the surface, mosses, chiefly of the genus *Sphagnum* (Berciková 1976), about 5%. In the upper sub-layer, tall forbs, e.g. *Solidago virgaurea*, *Polygonum bistorta*, *Veratrum album* subsp. *lobelianum*, are present. The lower sub-layer is formed mostly by *Nardus stricta*, *Homogyne alpina*, *Potentilla erecta*, *Vaccinium uliginosum*, and *V. myrtillus*.

Ecology: This chionophilous and hygrophilous community is found in the leeward places of the cirques. It typically occupies their edges (Berciková 1976) in a narrow range at altitudes of (1270–) 1350–1400 (–1450) m, mostly of (NE–) SE (–SW) exposition. These places are, depending on wind conditions, covered by thick snow cover until the late spring. The soils are acid rankers on granite, with pH of 3.4–5.8 (Wagnerová 1970, Berciková 1976), about 30 cm deep with a high amount of humus.

Distribution: The community occurs in the Krkonoše Mts. In the Hrubý Jeseník Mts, similar vegetation is rare.

Threats: This rare, sparsely distributed community is not actually endangered. Threatened species *Bartsia alpina*, *Carex bigelowii*, *C. vaginata*, *Hieracium alpinum* agg., and *Luzula sudetica* can be found more frequently. *Anemone narcissiflora*, *Primula minima*, *Swertia perennis*, *Allium schoenoprasum* subsp. *alpinum*, *Arnica montana*, *Pulsatilla alpina* subsp. *alba*, *Trichophorum cespitosum*, *Crepis conyzifolia*, and *Huperzia selago* occur rarely.

*Crepido-Calamagrostietum villosae* (Zlatník 1925) Jeník 1961
(Table 1, col. 2)

Syn.: *Calamagrostietum villosae* Zlatník 1925 (Art. 36), *Calamagrostietum villosae* Hueck 1939 (Art. 31), *Calamagrostietum villosae sudeticum* Macko 1952 p.p. (Art. 34), *Molinietum alpinum corconticum* Válek 1961 *calamagrostietosum villosae* (Art. 34)
Non: *Calamagrostietum villosae tatricum* Pawłowski et al. 1928 (Art. 34)
Nomenclature type: Jeník (1961: Table 7, rel. 7), holotypus

D.S.: *Anemone narcissiflora*, *Calamagrostis villosa* (dom., transgr.), *Crepis conyzifolia*, *Homogyne alpina* (transgr.), *Melampyrum sylvaticum* agg., *Pulsatilla alpina* subsp. *alba*; Const.: *Avenella flexuosa*, *Anthoxanthum alpinum*, *Gentiana asclepiadea*, *Ranunculus platanifolius*, *Rumex alpestris*, *Silene vulgaris*, *Senecio nemorensis* subsp. *nemorensis*, *Solidago virgaurea* s.l., *Trientalis europaea*, *Veratrum album* subsp. *lobelianum*

Structure and species composition: Species-rich community (on average 25 sp./rel.) dominated mostly by *Calamagrostis villosa*, less frequently by *C. arundinacea* or *Molinia caerulea*. These closed grasslands are about 40–50 cm tall. The presence of *Crepis conyzifolia*, *Gentiana asclepiadea*, *Anemone narcissiflora*, *Silene vulgaris* is characteristic in the upper herb sub-layer. In the lower sub-layer *Trientalis europaea*, *Avenella flexuosa*, *Vaccinium myrtillus*, *Melampyrum sylvaticum* agg., and *Geum montanum* are abundant.

Ecology: The community is confined to the leeward (NE–) SE (–S) facing slopes, ranging in inclination between 20–30° (–45°), at altitudes of 1200–1400 m. Thick snow cover protects and mechanically influences the vegetation. The soil conditions were stud-

ied by several authors (Zlatník 1925, Wagnerová 1970, Berciková 1976, Burešová 1976). Dry and deep (30–50 cm) brown alpine soils are rich in nutrients and humus (Matuszkiewicz & Matuszkiewicz 1975, Berciková 1976), with pH of 3.5–5.5. Within the *Mulgedio-Aconitetea*, *Crepido-Calamagrostietum* is a community occupying the middle part of moisture gradient.

Distribution: In the Czech Republic, this community occurs in the Krkonoše Mts and less frequently in the Hrubý Jeseník Mts. The bulk of vegetation dominated by *Calamagrostis villosa* belongs to the species-poor *Sileno-Calamagrostietum villosae*. It includes, for example, the communities from the Králický Sněžník Mts, assigned to the *Crepido-Calamagrostietum villosae* by Jeník (1961).

Variability: Berciková (1976) described the subassociation *Crepido-Calamagrostietum molinietiosum*, based on the dominance of *Molinia caerulea*, and its two variants: typical – rich in species, and depleted. However, comparison in the large data set did not show significant differences in species composition between the typical and *Molinia* dominated subassociation, except for the dominance of *Molinia*. It seems reasonable to distinguish only between the species-rich and species-poor types (see Footnote no. 5). The *Crepido-Calamagrostietum* shows an additional variability along the moisture gradient. The most xerophilous type is characterized by *Gnaphalium norvegicum*, *Agrostis tenuis*, *Rhinanthus pulcher*, *Campanula bohemica*, *Arnica montana*, *Nardus stricta*, and *Poa chaixii*. It is very rich in species and represents a transition to the *Thesio alpini-Nardetum* Jeník et al. 1980 of the *Nardion* alliance. The mesophilous type is widespread and lacks differential species. The hygrophilous type is differentiated by a significant cover of moss layer (about 10%) and the presence of more hygrophilous species *Deschampsia cespitosa*, *Aconitum napellus* subsp. *hians*, *Adenostyles alliariae*, and *Geum montanum*.

Threats: The community is not directly endangered, however, nitrogen depositions and acid rain may result in decline of species diversity and development of the species-poor types (*Sileno-Calamagrostietum*). Threatened species *Pulsatilla alpina* subsp. *alba*, *Anemone narcissiflora*, *Crepis conyzifolia*, and *Hieracium alpinum* agg. occur frequently there. An endemic species of the Krkonoše Mts, *Sorbus sudetica*, has its optimum in the *Crepido-Calamagrostietum* (Jeník 1960, Kociánová & Štursová 1986). Other species occurring more rarely are *Arnica montana*, *Allium victorialis*, *Aconitum napellus* subsp. *hians*, *Thesium alpinum*, *Hieracium prenanthoides*, *Luzula sudetica*, *Campanula bohemica*, *Campanula barbata*, *Viola lutea* subsp. *sudetica*, and *Avenochloa planiculmis*.

*Sileno vulgaris-Calamagrostietum villosae* Jeník, Bureš et Burešová 1980[4, 5, 6, 7]
(Table 1, col. 3)

Incl.: *Deschampsio flexuosae-Calamagrostietum villosae* Šmarda 1950 (Art. 37)
Nomenclature type: Jeník et al. (1980: p. 10, rel. 84)

D.S.: *Calamagrostis villosa* (dom., transgr.); Const.: *Avenella flexuosa* (subdom.), *Luzula luzuloides* subsp. *cuprina* (subdom.), *Polygonum bistorta*, *Rumex alpestris*, *Vaccinium myrtillus*

Structure and species composition: Species-poor community (on average 11 sp./rel.), whose physiognomy and species composition are very close to the previous one. It differs significantly by the absence of many forbs; only *Silene vulgaris*, *Trientalis europaea*, and *Melampyrum sylvaticum* agg. are more common.

Ecology: The community is confined to the leeward (NE–) SE (–S) facing slopes with inclination ranging between 10–30 (–40)°, at altitudes of (1120–) 1200–1400 (–1475) m. Soil and climatic conditions are similar to those of the *Crepido-Calamagrostietum villosae*.

Distribution: This is widespread and the most common vegetation type of the *Calamagrostietalia villosae* in the Czech Republic. It occurs in the Krkonoše Mts, the Hrubý Jeseník Mts, the Králický Sněžník Mts, and the Šumava Mts. Sýkora (1972) published one similar relevé from the Lužické hory Mts.

Variability: Jeník et al. (1980) have described several subassociations based on the dominance of some species. *Sileno-Calamagrostietum trientalietosum* – typical subassociation; *Sileno-Calamagrostietum calamagrostietosum arundinaceae* – species-poor community dominated by *Calamagrostis arundinacea*; *Sileno-Calamagrostietum molinietosum* – occurring in wetter sites, dominated by *Molinia caerulea*; *Sileno-Calamagrostietum rubetosum* – confined mostly to the run-out zones of avalanches, with predominance of *Rubus idaeus*.

Threats: This widespread community is not directly endangered. On the contrary, due to acid rains, its area is increasing (Klimeš & Klimešová 1991). Threatened species occurring here include *Ligusticum mutellina*, rarely also *Hieracium alpinum* agg., *Gentiana pannonica* (Šumava Mts), *Aconitum napellus* subsp. *hians*, *Viola lutea* subsp. *sudetica*, *Huperzia selago*, and *Carex bigelowii*.

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[4] Besides the Hercynian ranges (Jeník 1961, Sofron & Štěpán 1971, Jeník et al. 1980, Krahulec 1990) the communities dominated by *Calamagrostis villosa* also occur in other mountain ranges of Europe. Karner & Mucina (1993) report the community *Campanulo scheuchzeri-Calamagrostietum villosae* Karner et Mucina 1993 from the Austrian Alps. The community *Hieracium aurantiacum-Calamagrostis villosa* Lippert 1966 is known from the Berchtesgaden Alps (Lippert 1966, Pott 1995, Ellenberg 1996). A number of communities were described from the Carpathians. *Fectuco pictae-Calamagrostietum villosae* Pawłowski et al. 1928 (Krajina 1933, Hadač 1956, Unar et al. 1984, 1985) and *Hypochoerido-Calamagrostietum villosae* Hadač et al. 1969 (Hadač 1969) occur in the Tatra and the Fatra Mts. *Allio victorialis-Calamagrostietum villosae* Kliment 1997 and *Jaceo elatioris-Calamagrostietum villosae* Kliment 1997 were recently described by Kliment (1997) from Slovakia. The community *Hyperico grisebachii-Calamagrostietum villosae* Pawłowski et Walas 1949 is known from the Czywczyń Mts (Pawłowski & Walas 1949) and from Romania (Coldea 1997). It is also reported from the Iremel Mts (Russia) by Ishbirdin et al. (1996).

[5] Jeník et al. (1980) consider the *Sileno-Calamagrostietum* from the Hrubý Jeseník Mts as a vicarious community of the *Crepido-Calamagrostietum* from the Krkonoše Mts. However, most of the *Calamagrostis villosa* dominated vegetation in the Krkonoše Mts is species-poor and its species composition is the same as in the *Sileno-Calamagrostietum*. I suggest assigning all the species-poor types to the *Sileno-Calamagrostietum villosae*. The species-poor type of the *Crepido-Calamagrostietum* with *Molinia caerulea* described by Berciková (1976) is very close to the subassociation "*molinietosum*" (Jeník et al. 1980). The community *Calamagrostietum villosae* from the Šumava Mts (Sofron & Štěpán 1971) differs by the absence of the tall-forb species *Rumex alpestris*, *Polygonum bistorta*, *Veratrum album* subsp. *lobelianum* and the presence of higher number of woodland species such as *Luzula sylvatica*, *Oxalis acetosella*, *Athyrium distentifolium*, *Dryopteris carthusiana*, and some mosses.

[6] The community *Deschampsio-Calamagrostietum villosae* Šmarda 1950 (see Moravec et al. 1995) was described on the basis of a single relevé by Šmarda (1950) from the summit area of the Hrubý Jeseník Mts. The species composition of the relevé is between the species-poor *Sileno-Calamagrostietum* and the *Cetrario-Festucetum supinae* (*Calluna vulgaris*, *Festuca supina*, *Hieracium alpinum* agg., *Cladonia fimbriata*, *Cetraria islandica*). *Avenella flexuosa* with *Calamagrostis villosa* are subdominants here. I suggest considering this name as a "nomen dubium".

[7] Karner & Mucina (1993) suggested rejecting the names *Calamagrostietum villosae* and *Calamagrostietum arundinaceae* as "nomina ambigua". In the current study I follow their proposal.

*Bistorto-Deschampsietum alpicolae* (Zlatník 1928) Burešová 1976
(Table 1, col. 4)

Syn.: *Deschampsietum cespitosi* Zlatník 1928 (Art. 36), *Deschampsietum cespitosae polygonosum bistorta* Zlatník 1928 (Art. 3d)
Non: *Deschampsietum cespitosae* Krajina 1933, *Deschampsietum cespitosae* auct. roman. (Borza 1934, Buia et al. 1962, Rațiu 1966, Rațiu & Gergely 1976 etc.)
Nomenclature type: Zlatník (1928: Table 9, rel. 36), holotypus

D.S.: *Deschampsia cespitosa* (dom.); Const.: *Avenella flexuosa*, *Calamagrostis villosa*, *Homogyne alpina*, *Polygonum bistorta* (subdom.), *Veratrum album* subsp. *lobelianum*

Structure and species composition: This extremely species-poor community (on average 10 sp./rel.) is dominated by *Deschampsia cespitosa* and *Polygonum bistorta*. The vegetation reaches 30–40 (50) cm in height, and the herb layer covers about 100% of the surface. The cover of mosses is up to 5%. Two sub-layers can be distinguished, the upper one with the above mentioned dominants and a few tall forbs (*Veratrum album* subsp. *lobelianum*, *Rumex alpestris*), the lower with *Homogyne alpina*, *Potentilla erecta*, and *Avenella flexuosa*.

Ecology: This community occupies mostly shallow, wet depressions on the ridges and moderate slopes (10–20°) above the timberline at altitudes of 1340–1450 m. The stands are mostly of NE–NW aspect. Unfavourable climatic conditions result in low species diversity. They are characterized by low temperatures during the growing period and long-lasting snow cover, which makes it shorter. On the contrary, the melting snow is a source of water and protects the soil profile against freezing. The soils are well-developed, deep, and rich in humus and nutrients. Zlatník (1925) and Rozsypalová (1969) report soil pH of 5.5–5.8. According to Burešová (1976) the soils are more productive than those of the other vegetation types at these altitudes, including even the communities occurring in the well-protected habitats above timberline (e.g. *Adenostyletalia* communities).

Distribution: The summit areas of the Krkonoše Mts, the Králický Sněžník Mts, and the Hrubý Jeseník Mts.

Variability: The community is quite homogeneous. The stands of the Krkonoše Mts differ by a higher constancy of *Carex bigelowii*.

Threats: This is local, sparsely distributed, but stable community adapted to the extreme environment of summit areas. Threatened species occur rarely, including *Carex bigelowii*, *Ligusticum mutellina*, *Aconitum napellus* subsp. *hians*, *Luzula sudetica*, *Hieracium alpinum* agg., *Viola lutea* subsp. *sudetica*, *Agrostis rupestris*, *Polytrichastrum sexangulare*, *Primula minima*, and *Gnaphalium supinum*.

***Violo sudeticae-Deschampsietum cespitosae* (Jeník et al. 1980) Kočí 2001 nom. nov.**[8, 9, 10]
(Table 1, col. 5)

Syn.: *Poo-Deschampsietum cespitosae* Jeník, Bureš et Burešová 1980 (Art. 31), *Avenastro planiculmis-Poetum chaixii* Šmarda 1950 (Art. 37)
Non: *Poo-Deschampsietum cespitosae* Pawłowski et Walas 1949
Nomenclature type: Jeník et al. (1980: p. 281, rel. 12)

D.S.: *Aconitum napellus* subsp. *hians* (transgr.), *Avenochloa planiculmis*, *Deschampsia cespitosa* (dom.), *Poa chaixii* (subdom., transgr.), *Viola lutea* subsp. *sudetica*; Const.: *Geranium sylvaticum*, *Hypericum maculatum*, *Luzula luzuloides* subsp. *cuprina*, *Myosotis nemorosa*, *Polygonum bistorta*, *Potentilla erecta*, *Rumex alpestris*, *Senecio nemorensis* subsp. *nemorensis*

Structure and species composition: Species-rich community (on average 26 sp./rel.), whose physiognomy is determined by the dominant *Deschampsia cespitosa* and subdominant *Poa chaixii*. Other tall forbs, e.g. *Senecio nemorensis* subsp. *nemorensis*, *Phyteuma spicatum*, *Aconitum napellus* subsp. *hians*, *Rumex alpestris*, and *Geranium sylvaticum* are abundant. The herb layer covers 100% of the surface, mosses occur rarely with small cover.

Ecology: Most of the localities are confined to the slopes of inclination less than 25°, predominantly of (NE–) E–S (–SE) aspect, at altitudes of 1300–1460 m. They are found particularly in terrain depressions, near springs and in shaded places around the timberline. The soils are deep, with permanent supply of percolating ground water; draining can be impeded in small depressions.

Distribution: The community occurs typically in the Hrubý Jeseník Mts, scarcely in the Krkonoše Mts and the Králický Sněžník Mts.

Variability: Two variants were distinguished – the *Violo-Deschampsietum* typical variant, whose description is the same as above, and the *Violo-Deschampsietum* variant with *Molinia caerulea* which is differentiated by the presence of meadow species *Galium boreale*, *Festuca rubra* agg., *Veronica chamaedrys*, *Agrostis stolonifera* agg., *Vicia cracca*, *Stellaria graminea*, *Lathyrus pratensis*, *Pimpinella saxifraga*, and *Molinia caerulea*. There are also some ecological differences, e.g. occurrence at altitudes 1110–1300 m, on slopes of

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[8] The communities dominated by *Deschampsia cespitosa* are reported frequently from the Carpathians. It is possible to find some types (cf. Krajina 1933, Pawłowski & Walas 1949, Csűrös et al. 1985, Coldea 1997) very close in their species composition and habitat. They occupy shallow, wet depressions, often trampled and grazed by wild animals. Krajina (1933) described the *Deschampsietum cespitosae* from the Vysoké Tatry Mts and assigned it together with the community *Rhodiolo-Deschampsietum* to the alliance *Trisetion fuscae* Krajina 1933. From the Retezat Mts, the alliance *Deschampsion cespitosae* was described by Borza (1934), who synonymized it with the previous one. The communities named *Deschampsietum cespitosae* have been often quoted in Romanian literature (Borza 1934, Buia et al. 1962, Rațiu 1966, Rațiu & Gergely 1976). Csűrös et al. (1985) described the alliance *Phleo alpini-Deschampsion cespitosae* from the mountains of Romania. Coldea (1991, 1997) defined the association *Phleo alpini-Deschampsietum cespitosae* (Krajina 1933) Coldea 1983 which included most of the "*Deschampsietum*" communities of Romania. He ordered this community to the *Calamagrostion villosae*. The association *Poo-Deschampsietum cespitosae* Pawłowski et Walas 1949 was described from the Czywczyń Mts. The authors ordered the community to the *Calamagrostion villosae*. The same community was reported from the Iremel Mts (Ishbirdin et al. 1996). Horvat et al. (1974) reported *Deschampsietum subalpinum* Horvat 1956 from the former Yugoslavia. From the Bukovské vrchy Mts in eastern Slovakia, Hadač et al. (1988) described the *Acetoso carpaticae-Deschampsietum cespitosae* Hadač et al. 1988 and assigned it to the suballiance *Achilleenion strictae* within the *Calamagrostion arundinaceae*. In the Alps these communities are probably rare or neglected; only Karner & Mucina (1993) have mentioned the community "*Deschampsia cespitosa-(Rumicion alpini)*".

[9] Jeník et al. (1980) described the *Poo-Deschampsietum*, whose name must be rejected according to Art. 31 of the Code as a younger homonym. The same name was already published by Pawłowski & Walas (1949) from the Czywczyń Mts. It seems to be a vicarious community in the same habitats. The species composition is close too, e.g. *Deschampsia cespitosa*, *Poa chaixii*, *Hypericum maculatum*, *Leontodon hispidus*, *Avenochloa planiculmis* are present., on the other hand some of the Carpathian species differentiate it significantly from the Hercynic community (e.g. *Viola declinata*, *Achillea tanacetifolia*, *Festuca violacea* subsp. *picta*, *Phyteuma speciforme*, *Senecio subalpinus*).

[10] Probably transitional vegetation type is the *Avenastro-Poetum chaixii* Šmarda 1950 described from the Hrubý Jeseník Mts by Šmarda (1950). The species composition of the single relevé of the original diagnosis is close to the communities *Violo-Deschampsietum* (*Deschampsia cespitosa*, *Poa chaixii*, *Ranunculus acris*, *Viola lutea* subsp. *sudetica*), *Thesio alpini-Nardetum* (*Campanula barbata*, *Crepis conyzifolia*, *Festuca supina*, *Leontodon hispidus*), *Trollio-Geranietum* (*Cerastium fontanum*, *Trollius europaeus*). Due to the complexity of the relevé it is suggested to regard this name as a "nomen dubium".

SE–SSE aspect and inclination of 10–30°. This variant is mainly found in the Malá Kotlina cirque in the Hrubý Jeseník Mts. It shows some transitional features to the *Polygono-Trisetion* communities such as *Melandrio-Phleetum alpini violetosum sudeticae*, *Melandrio-Phleetum alpini nardetosum* (Blažková in Krahulec et al. 1997) and to the *Nardo-Agrostion* community *Sileno vulgaris-Nardetum* Krahulec 1990.

Threats: This is a scattered but not endangered community. Commonly found threatened species include *Viola lutea* subsp. *sudetica*, *Aconitum napellus* subsp. *hians*, *Ligusticum mutellina*, *Crepis mollis*, *Allium schoenoprasum*, *Avenochloa planiculmis*, *Thesium alpinum*, *Campanula barbata*, *Cerastium fontanum*, *Crepis conyzifolia*, *Dianthus superbus* subsp. *alpestris*, and *Scabiosa lucida* subsp. *lucida*. Other threatened species occur rarely, e.g. *Epilobium alsinifolium*, *Aconitum variegatum*, *Luzula sudetica*, *Bryum schleicheri*, *Anemone narcissiflora*, *Swertia perennis*, *Hieracium aurantiacum*, *Euphrasia picta*, *Hieracium prenanthoides*, *Salix hastata*, *Gymnadenia conopsea*, *Lescurea saxicola*, *Poa alpina*, *Brachythecium mildeanum*, *Coeloglossum viride*, *Delphinium elatum*, and *Parnassia palustris*.

## *Calamagrostion arundinaceae* (Luquet 1926) Jeník 1961

Species-rich communities of the upper forest (supramontane) and subalpine belts

Syn.: *Calamagrostion atlanticum* Luquet 1926 (Art. 34), *Calamagrostion arundinaceae* Oberdorfer 1949 (phantom, Eggler 1952), *Calamagrostion arundinaceae* Oberdorfer 1950 (phantom, Karner & Mucina 1993)

D.S.: *Anemone narcissiflora*, *Bupleurum longifolium* subsp. *vapincense*, *Calamagrostis arundinacea* (dom.), *Digitalis grandiflora*, *Lilium martagon*, *Pimpinella major*, *Pleurospermum austriacum*, *Rosa pendulina*, *Salix silesiaca*, *Thesium alpinum*, *Thymus pulcherrimus* subsp. *sudeticus*

This alliance includes species-rich communities dominated by *Calamagrostis arundinacea*. They are distributed very locally in cirques, where they occupy steep, dry and sunny slopes of SE aspect on avalanche paths. *Calamagrostion arundinaceae* differs from *Calamagrostion villosae* mostly by the presence of woodland and sligtly thermophilous species.

*Bupleuro-Calamagrostietum arundinaceae* (Zlatník 1928) Jeník 1961[11, 12]
(Table 1, col. 6)

Syn.: *Calamagrostietum arundinaceae* Zlatník 1925 (Art. 31, 36)
Non: *Sorbo-Calamagrostietum arundinaceae* Oberdorfer 1936, *Centaureo montanae-Calamagrostietum arundinaceae* J. Bartsch et M. Bartsch 1940
Nomenclature type: Jeník (1961: Table 8, rel. 1), holotypus

D.S. are identical with those of the alliance (see above). Const.: *Calamagrostis villosa* (subdom.), *Gentiana asclepiadea*, *Geranium sylvaticum*, *Hypericum maculatum*, *Luzula luzuloides* subsp. *cuprina*, *Polygonatum verticillatum*, *Ranunculus platanifolius*, *Rubus idaeus*, *Rumex alpestris*, *Senecio nemorensis* subsp. *nemorensis*, *Silene vulgaris*, *Vaccinium myrtillus*, *Veratrum album* subsp. *lobelianum*

Structure and species composition: Species-rich community (on average 38 sp./rel.) dominated by *Calamagrostis arundinacea*, reaching a height of 40–60 (80) cm and cover of up to 90 %. The moss layer is absent or weakly developed. In the communities of the Hrubý Jeseník Mts. *Dactylis slovenica* (Domin) Domin occurs frequently. A number of forb species such as *Bupleurum longifolium* subsp. *vapincense*, *Lilium*

martagon, *Digitalis grandiflora*, *Rosa pendulina*, *Ranunculus nemorosus*, *Scabiosa lucida* subsp. *lucida*, *Campanula latifolia* or *Geranium sylvaticum* forms a typical aspect of the community.

Ecology: The community is confined to the steep slopes with inclination of (20–) 30 (–40)° and E–SE aspect, in a narrow range of altitudes between 1100–1270 (1370) m in the subalpine (supramontane) belt. These sites are dry and sunny, mostly located on the footslopes of the cirques and on avalanche paths. During the winter a thick snow layer protects vegetation against the frost, though the snow melts rapidly in the spring. The soils vary from deep to shallow and stony; often they are developed on rock debris. These conditions result in the occurrence of many sligthly thermophilous and woodland species, e.g. *Thymus pulcherrimus* subsp. *sudeticus*, *Lilium martagon*, *Pimpinella major*, and *Mercurialis perennis* (Jeník 1961).

Distribution: *Bupleuro-Calamagrostietum* occurs in the Krkonoše Mts, the Hrubý Jeseník Mts, and fragmentarily in the Králický Sněžník Mts.

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[11] *Calamagrostis arundinacea* dominated communities were first mentioned by Luquet (1926) and Zlatník (1928). They have a broad distribution range like the communities of the *Calamagrostion villosae*. They are best developed in the Hercynian mountain ranges (Massif Central, Vosges, Black Forest, High Sudeten), the western Carpathians (Nízké and Vysoké Tatry Mts, Velká and Malá Fatra Mts, Bukovské vrchy Mts), and eastwards (Ishbirdin et al. 1996). In the Alps only a few types are known. Karner & Mucina (1993) report the *Centaureo montanae-Calamagrostietum arundinaceae* J. Bartsch et M. Bartsch 1940 from the Austrian Alps (the Ötztal Alps, and probably also in some other places of the Tyrolian Alps). *Sorbo-Calamagrostietum arundinaceae* Oberdorfer 1936 is known from the Vosges (Carbienier 1969, Oberdorfer 1957, 1993). Schaminée (1993) reports the *Sorbo-Calamagrostietum*, *Senecioni cacaliastri-Calamagrostietum arundinaceae* Schaminée et Jansen 1993, and *Senecioni doronici-Calamagrostietum arundinaceae* Carbienier 1969 from the Mont du Forez (Massif Central). The latter association was described by Carbienier (1969) from the Monts Dore and the Puy-de-Dôme. According to Carbienier (1969) this association unites the *Bupleuro-Calamagrostietum*, *Centaureo-Calamagrostietum*, and Luquet's (1926) "community with *Calamagrostis arundinacea*". *Centaureo-Calamagrostietum* was described by Bartsch & Bartsch (1940) from the Black Forest. It is also quoted by Oberdorfer (1993) as *Sorbo-Calamagrostietum*. Oberdorfer (1957) mentions the community *Calamagrostis-Digitalis grandiflora* from Germany, which was later incorrectly synonymized by Pott (1995) with the *Digitali ambiguae-Calamagrostietum arundinaceae* Sillinger 1933 [syn. *Calamagrostio arundinaceae-Digitalietum grandiflorae* (Sillinger 1933) Oberdorfer 1957]. However, German community [*Calamagrostio arundinaceae-Digitalietum grandiflorae* (Sillinger 1933) Oberdorfer 1957] belongs to the *Epilobion angustifolii* (cf. Kliment 1995), unlike the community described by Sillinger (1933). *Digitali ambiguae-Calamagrostietum arundinaceae* Sillinger 1933 occurs in the Nízké Tatry Mts and Velká Fatra Mts (Kliment 1995). Another communities of the *Calamagrostion arundinaceae – Senecioni fuchsii-Calamagrostietum arundinaceae* (Sillinger 1933) Hadač in Mucina et Maglocký 1985 is known from the Nízké Tatry Mts (Sillinger 1933) and the Velká Fatra Mts (Kliment 1998), *Potentillo aurei-Calamagrostietum arundinaceae* Kliment 1993 described Kliment (1993) from the Velká Fatra Mts. Finally, the *Helianthemo-Calamagrostietum arundinaceae* Hadač 1969 is reported from the Belianské Tatry Mts, although it is ordered to the *Seslerion tatrae* (Hadač 1969). Hadač (in Hadač et al. 1988) described the community *Achilleo strictae-Calamagrostietum arundinaceae* Hadač 1988 from the Bukovské vrchy Mts, which is assigned to the suballiance *Achilleenion strictae* Hadač 1988. The community *Calamagrostietum arudinaceae* Zlatník 1928 from Romania is reported by Rațiu (1966) and Rațiu & Gergely (1976). All the communities dominated by *Calamagrostis arundinacea* also show close relations in habitats and species composition.

[12] Sýkora (1972) described the *Cynancho-Calamagrostietum arundinaceae* from the Klíč Mt (the Lužické hory Mts) and assigned it to the *Calamagrostion arundinaceae*. Kolbek in Moravec et al. (1983) reclassified this community to the *Trifolion medii* Th. Müller 1962. Although *Calamagrostion arundinaceae* communities are remarkable for the presence of slightly thermophilous species, montane species are lacking in the *Cynancho-Calamagrostietum*; for this reason I support Kolbek's view. However, as Sýkora (1972) suggests, this community can be considered a relict of the *Bupleuro-Calamagrostietum*.

Variability: Transitional stands between the *Bupleuro-Calamagrostietum* and the *Daphno-Dryopteridetum* can be often found. Such transitions are characterized by occurrence of *Daphne mezereum*, *Delphinium elatum*, *Carduus personata*, *Petasites albus*, *Pulmonaria obscura*, *Aconitum variegatum*, *Scrophularia nodosa*, *Dryopteris filix-mas*, and others. They have a very high species diversity (on average 50 sp./rel.).

Threats: The community is distributed only locally and sparsely, but represents a stable vegetation type, which is not directly endangered. However, nitrogen depositions and acid rains may result in decline of species diversity. The community harbours a lot of threatened species: common ones include *Thesium alpinum*, *Aconitum napellus* subsp. *hians*, *Anemone narcissiflora*, *Pleurospermum austriacum*, *Bupleurum longifolium* subsp. *vapincense*, *Delphinium elatum*, *Gymnadenia conopsea*, *Allium schoenoprasum*, *Crepis conyzifolia*, *Aconitum variegatum*, *Hieracium prenanthoides*, *Crepis mollis*, *Sorbus sudetica*, *Dianthus superbus* subsp. *alpestris*, *Campanula latifolia*, and *Campanula bohemica*, rarely occuring species include *Galium sudeticum*, *Laserpitium archangelica*, *Phyteuma orbiculare* subsp. *montanum*, *Prunus padus* subsp. *borealis*, *Ribes petraeum*, *Conioselinum tataricum*, *Dianthus carthusianorum* subsp. *sudeticus*, and *Vicia oreophila*.

## *Alnetalia viridis* Rübel ex Rejmánek in Huml et al. 1979

Communities of small-leaved shrubs of the subalpine belt

Syn.: *Alnetalia viridis* Rübel 1933 (Art. 8), *Mugo-Alnetalia viridis* (Br.-Bl. 1918) p.p. (phantom, Eggler 1952)

D.S.: *Betula carpatica*, *Daphne mezereum*, *Lonicera nigra*, *Milium effusum*, *Paris quadrifolia*, *Prenanthes purpurea*, *Rosa pendulina*, *Salix silesiaca*, *Sorbus aucuparia* subsp. *glabrata*, *Streptopus amplexifolius*

The order *Alnetalia viridis* includes subalpine shrub communities occurring above the timberline or in those places below the timberline where the existence of forest is not possible. Avalanches and sliding snow masses are the most important factors preventing forest development in the supramontane belt. Communities of the order are distributed in the supramontane and subalpine belts of European mountains. The order includes two alliances: western and southern European *Alnion viridis* Aichinger 1933, occurring in the Alps, southern and eastern Carpathians, and the Dinaric Mts, with dominating *Alnus viridis* and a number of *Salix* species (Huml et al. 1979, Karner & Mucina 1993, Oberdorfer 1993, Ishbirdin et al. 1996), and the *Salicion silesiacae* Rejmánek et al. 1971, which includes the communities of the High Sudeten Mts and the western Carpathians (Rejmánek et al. 1971, Parusel 1991, Veselá 1995).

## *Salicion silesiacae* Rejmánek, Sýkora et Štursa 1971[13]

Communities of shrubs on avalanche paths of the High Sudeten Mts and the western Carpathians

Non: *Alnion viridis* Rübel 1933, *Alnion viridis* Aichinger 1933, *Betulo-Alnion viridis* Gams 1936

D.S. are identical with those of the order (see above).

The alliance *Salicion silesiacae* includes communities of subalpine small-leaved shrubs, occurring on steep, SE–NE facing slopes, on the bottoms of the cirques or in rocky ravines above the timberline. The herb layer consists of a mixture of *Calamagrostietalia* and

*Adenostyletalia* species and some forest (mostly *Fagetalia*) species. The stands are mainly mesotrophic, with deep, stony soils, rich in water and nutrients.

*Salici silesiacae-Betuletum carpaticae* Rejmánek, Sýkora et Štursa 1971
(Table 1, col. 7)

Nomenclature type: Rejmánek et al. (1971: p. 33-34. Table 1, rel. 5), lectotypus (Jeník et al. 1980)

D.S.: *Aruncus dioicus*, *Asarum europaeum*, *Betula carpatica* (dom. $E_2$), *Crepis sibirica*, *Equisetum sylvaticum*, *Daphne mezereum* (transgr.), *Laserpitium archangelica*, *Luzula sylvatica*, *Rosa pendulina* (transgr.), *Salix silesiaca* (subdom. $E_2$, transgr.); Const.: *Aconitum napellus* subsp. *hians*, *Adenostyles alliariae*, *Calamagrostis villosa* (dom. $E_1$), *C. arundinacea* (dom. $E_1$), *Chaerophyllum hirsutum*, *Geranium sylvaticum*, *Senecio nemorensis* subsp. *nemorensis*, *Polygonatum verticillatum*, *Rumex alpestris*, *Vaccinium myrtillus*, *Veratrum album* subsp. *lobelianum*

Structure and species composition: This association includes the subalpine open shrubberies, with a cover of 60–80% and height of 2–5 m. The dominating species are usually *Betula carpatica*, *Salix silesiaca*, and *Rosa pendulina*, rarely also *Daphne mezereum*, *Sorbus aucuparia* subsp. *glabrata*, *Salix caprea*, and *Salix hastata*. The community is rich in species (on average 39 sp./rel.). The herb layer is dominated mostly by species of the *Calamagrostion arundinaceae* or *Calamagrostion villosae*. However, types dominated by the tall forbs of the *Adenostylion* are also occasionally encountered.

Ecology: The community occurs mostly on steep, SE facing slopes of the cirques. The most important ecological factor is snow, which inhibits the existence of true forest. Sliding snow and sporadical avalanches eliminate timber species and high-grown individuals of shrubs. The effect of snow often results in different ecomorphoses of the shrubs (Jeník 1958). The community is a stable successional stage of shrub vegetation occurring azonally in the forest belt. The species composition of the herb layer is particularly influenced by soil moisture. At drier sites, primarily species of the *Calamagrostion villosae* and *Calamagrostion arundinaceae* occur.

Distribution: *Salici-Betuletum* can be found in the Hrubý Jeseník Mts and the Krkonoše Mts, while fragmentary stands have been reported from the cirque of the Morava River in the Králický Sněžník Mts (Krahulec 1990).

[13] The position of the subalpine shrub communities in the phytosociological system has been discussed by Rejmánek (1977). The authors who studied this vegetation in the past varied in their understanding of the importance of vegetation structure as a classification criterion. Alpine shrub vegetation has traditionally been assigned to the *Alnion viridis* (Aichinger 1933, Rübel 1933, Huml et al. 1979, Karner & Mucina 1993), or to the *Adenostylion* (Braun-Blanquet 1950, Oberdorfer 1957, 1993, Horvat et al. 1974, Pott 1995, Ellenberg 1996, Coldea 1997). Rejmánek et al. (1971) classified the shrub communities of the High Sudeten Mts to the *Salicion silesiacae*, which was understood as a vicarious alliance of the *Alnion viridis* (cf. Huml et al. 1979, Karner & Mucina 1993). Including the shrub vegetation in the *Adenostylion* (or some other herbaceous alliance) is not a good solution, because of its distinct physiognomy and species composition. On the contrary, recognizing a unit of the class level (*Betulo-Alnetea viridis* Rejmánek in Huml et al. 1979) seems to be exaggerated, and this is not accepted by most authors (Mucina & Maglocký 1985, Karner & Mucina 1993, Oberdorfer 1993, Pott 1995, Coldea 1997, Mucina 1997). I suggest a compromise in assigning the shrub communities to the class *Mulgedio-Aconitetea* and order *Alnetalia viridis* (cf. Rübel 1933, Huml et al. 1979). The main reason is the physiognomy and species composition, with a mixture of *Calamagrostietalia*, *Adenostyletalia*, and *Fagetalia* species. Assigning the *Salicion silesiacae* to the *Adenostyletalia* (Karner & Mucina 1993) is not appropriate, as the species composition of the *Salicion silesiaceae* communities is closer to the *Calamagrostietalia villosae* (Rejmánek et al. 1971, Jeník et al. 1980, Veselá 1995).

Variability: Jeník et al. (1980) described two subassociations differring in the herb layer composition: *Salici-Betuletum calamagrostietosum arundinaceae* Jeník et al. 1980 and *Salici-Betuletum calamagrostietosum villosae* Jeník et al. 1980, the latter being poorer in species. Communities dominated by hygrophilous tall forbs in the herb layer could also be evaluated on the level of subassociation; however, they are extremely rare.

Threats: Currently the community is not endangered. The potential threat is succession resulting from an absence of avalanches. A number of threatened species occur there, e.g. *Aconitum napellus* subsp. *hians*, *Laserpitium archangelica*, and *Pleurospermum austriacum*, rarely also *Hieracium prenanthoides*, *Delphinium elatum*, *Sorbus sudetica* (Krkonoše) or *Salix hastata*. *Crepis sibirica* (only in the Hrubý Jeseník Mts) has an optimum in this community.

*Pado-Sorbetum* W. Matuszkiewicz et A. Matuszkiewicz 1975[14]
(Table 1, col. 8)

Syn.: *Pado-Sorbetum* Matuszkiewicz 1965 (Art. 3b), *Pado-Sorbetum* (Hueck 1939) Matuszkiewicz 1965 (phantom, Matuszkiewicz & Matuszkiewicz 1975)
Nomenclature type: Matuszkiewicz & Matuszkiewicz (1975: p. 82–83, Table 6, rel. 6), **lectotypus hoc loco designatus**

D.S.: *Dryopteris dilatata*, *Gymnocarpium dryopteris*, *Lonicera nigra*, *Prunus avium*, *Prunus padus* subsp. *borealis*, *Ribes petraeum*; Const.: *Adenostyles alliariae*, *Athyrium distentifolium* (dom. $E_1$), *Calamagrostis arundinacea*, *C. villosa*, *Cicerbita alpina*, *Dryopteris filix-mas*, *Gentiana asclepiadea*, *Rubus idaeus*, *Rumex alpestris*, *Salix silesiaca*, *Senecio nemorensis* subsp. *nemorensis*, *Sorbus aucuparia* subsp. *glabrata* (dom. $E_2$), *Veratrum album* subsp. *lobelianum*

Structure and species composition: Open shrub layer is formed mostly by *Sorbus aucuparia* subsp. *glabrata*, *Betula carpatica*, and *Salix silesiaca*, and to a lesser extent by *Prunus avium*, *P. padus* subsp. *borealis*, *Ribes petraeum*, and *Lonicera nigra*. The vegetation reaches 1.5–5 m in height and a cover of 60%. Species richness is high (on average 31 sp./rel.), and the composition of the herb layer is close to the *Adenostylion* (*Athyrium distentifolium*, *Adenostyles alliariae*, *Senecio nemorensis* ssp. *nemorensis*, *Veratrum album* subsp. *lobelianum*, *Cicerbita alpina*, *Calamagrostis villosa*). The moss layer generally covers around 10% of the surface.

Ecology: This vegetation is confined to the bottoms of the cirques and to moist stream ravines between 1060–1280 m a.s.l. The slopes are mostly of (NE) E–SE aspect with an inclination 10–20° (30°). Sufficient soil moisture seems to be an important ecological factor (Hueck 1939, Matuszkiewicz & Matuszkiewicz 1975). The soils are shallow, stony and acid rankers of pH around five (Zlatník 1925).

Distribution: *Pado-Sorbetum* occurs in the Krkonoše Mts, mostly on the Polish side of the state boundary.

Threats: Rare vegetation requiring protection. Threatened species *Aconitum napellus* subsp. *hians*, *Ribes petraeum*, *Prunus padus* subsp. *borealis*, and *Hieracium prenanthoides* can be found.

[14] Communities with *Prunus padus* subsp. *borealis* and *Ribes petraeum* were first mentioned by Schustler (1918). Zlatník (1925) published one relevé. Hueck (1939) named this vegetation as the association of *Ribes petraeum* and *Prunus petraea* and described its habitat. Macko (1952) understood this vegetation as a facies of *Pinus mugo* krummholz (*Pinetum mughi sudeticum*). Further remarks were given by Jeník (1961), who preferred species composition rather than vegetation structure, and did not distinguish it from herb-dominated communities.

*Piceo-Salicetum silesiacae* Rejmánek, Sýkora et Štursa 1971
(Table 1, col. 9)

Nomenclature type: Rejmánek et al. (1971: p. 35, Table 2, rel. 3), **lectotypus hoc loco designatus**

D.S.: *Dryopteris dilatata, Lonicera nigra, Picea abies, Polytrichum commune, Prenanthes purpurea, Sphagnum girgensohnii, Thelypteris phegopteris, Valeriana tripteris*; Const.: *Athyrium distentifolium, Calamagrostis villosa, Salix silesiaca, Sorbus aucuparia, Vaccinium myrtillus, Veratrum album* subsp. *lobelianum, Viola biflora*

Structure and species composition: Open shrub layer is dominated mostly by *Salix silesiaca* and *Picea abies*. In the herb layer ferns and woodland species such as *Dryopteris dilalata, Prenanthes purpurea*, and *Athyrium distentifolium* predominate. The species composition of the herb layer is very close to the *Chaerophyllo-Cicerbitetum*, which is not dominated by shrubs. The moss layer is usually well developed.

Ecology: Rejmánek et al. (1971) characterized the community as riverine vegetation with contact to the subalpine tall-forb vegetation. The crucial ecological factor is snow accumulation together with spring floods (Rejmánek et al. 1971), inhibiting the development of trees. Percolating ground water is probably also of importance.

Distribution: The community is known from the Hrubý Jeseník Mts (the springs of the Bělá River) and the Jizerské hory Mts (upper part of the Bílá Smědá River valley).

Threats: Very rare, threatened by succession and wood-cutting.

## *Adenostyletalia* G. Br.-Bl. et J. Br-Bl. 1931

Broad-leaved tall-forb and fern-rich communities distributed from the montane to the subalpine belt

Syn.: *Aconitetalia* Nordhagen 1936 pro syn. (Art. 8), *Betulo-Aconitetalia* Br.-Bl. 1950 (Art. 8)

D.S.: *Aconitum napellus* subsp. *hians, Adenostyles alliariae, Angelica sylvestris, Carduus personata, Cicerbita alpina, Epilobium montanum, Heracleum sphondylium, Millium effusum, Petasites albus, Silene dioica, Stellaria nemorum, Viola biflora*

The order *Adenostyletalia* includes species-rich tall-forb and low-shrub communities, which mostly occupy sheltered habitats on the leeward slopes and bottoms of the valleys, often around streams and springs. Such stands are covered by a significant snow layer during the winter. The soils are often moist, rich in nutrients and humus. Two alliances have been distinguished in the Czech Republic – *Adenostylion alliariae*, dominated by tall forbs, and *Dryopterido-Athyrion*, dominated by ferns.

## *Adenostylion* Br.-Bl. 1926, Luquet 1926[15]

Tall-forb vegetation occurring from the montane to subalpine belts predominantly on the moist, nutrient-rich soils

Syn.: *Adenostylion alliariae* Pawłowski, Sokołowski et Wallisch 1928 (Art. 31), *Alno-Adenostylion* (Br.-Bl. 1926) Horvat 1962 p. p. (Art. 29)
Incl.: *Eu-Adenostylenion alliariae* Sýkora et Štursa 1973

D.S.: *Alchemilla glabra, Cirsium heterophyllum, Crepis paludosa, Delphinium elatum, Epilobium alpestre, Geum rivale, Chaerophyllum hirsutum, Chrysosplenium alternifolium, Myosotis nemorosa, Thalictrum aquilegiifolium, Valeriana sambucifolia*

[15] In the case of the name *Adenostylion* it is not possible to decide whose description (Braun-Blanquet 1926 or Luquet 1926) has the priority. The same issue concerns the *Nardion* (Krahulec 1983). The name *Adenostylion* Br.-Bl. 1926 is used more often in the literature.

Species-rich communities of broad-leaved forbs occur locally from the montane to the subalpine belt. They occupy sheltered stands, bottoms of valleys and cirques, wet places around springs and streams, and shaded and moist places around the timberline. The communities occurring in the montane belt are mostly confined to the bottoms of V-shaped valleys and canyons or to forest gaps. During the winter the stands are covered by a thick snow cover, which is an additional source of water in spring. The soils are deep, well supplied with nutrients and water.

### *Ranunculo platanifolii-Adenostyletum alliariae* (Krajina 1933) Dúbravcová et Hadač ex Kočí hoc loco[16, 17]

(Table 1, col. 10)

Syn.: *Adenostyletum alliariae* Pawłowski, Sokołovski et Wallisch 1928 (Art. 36), *Adenostyletum alliariae tatricum* Krajina 1933 (Art. 34), *Adenostyletum alliariae* Šmarda 1950 (Art. 31), *Adenostyletum alliariae* Macko 1952 (Art. 31), *Ranunculo platanifolii-Adenostyletum* (Krajina 1933) Dúbravcová et Hadač in Mucina et Maglocký 1985 (Art. 2b)

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[16] A number of syntaxa named "*Adenostyletum*" were described for *Adenostyles alliariae* dominated vegetation. They are distributed in most of the European mountain ranges, which possess a subalpine belt. Karner & Mucina (1993) gave a detailed overview of the distribution and a literature review concerning this community (under the name *Cicerbitetum alpinae* Bolleter 1921) in the Austrian Alps. In Germany the community was reported as *Cicerbitetum alpinae* Beger 1922 (syn. *Adenostylo-Cicerbitetum* Br.-Bl. 1950) by Oberdorfer (1957, 1993) and Pott (1995), in the Berchtesgaden Alps by Lippert (1966), in the Rhaetian Alps by Braun-Blanquet (1950), and in the Schwarzwald by Bartsch & Bartsch (1940). The community *Adenostylo-Doronicetum austriaci* Horvat 1956 is recognized in southern Europe (Horvat et al. 1974, Huml et al. 1979, Coldea 1991, 1997). The community *Ranunculo platanifolii-Adenostyletum* (Krajina 1933) Dúbravcová in Mucina et Maglocký 1985 is known in Slovakia (Tatra Mts – Šeffer & Šefferová 1989, Šeffer et al. 1989), the Ukraine (Solomacha 1995), and Russia (Iremel Mts – Ishbirdin et al. 1996). The *Adenostyletum alliariae* was studied in the Polish western Carpathians (Kornaś & Medwecka-Kornaś 1967, Stuchlik 1968). In the Czech Republic the communities dominated by *Adenostyles alliariae* were first mentioned by Zlatník (1925). However, *Adenostyletum alliariae* was described in the Vysoké Tatry Mts by Pawłowski et al. (1928). The community of the same name was later described in the Hrubý Jeseník Mts (Šmarda 1950) and the Krkonoše Mts (Macko 1952). As the habitat and species composition of these communities are very close, Karner & Mucina (1993) synonymized a number of them to the *Cicerbitetum alpini* Bolleter 1921. However, according to Wörz (1989), the *Adenostyles* dominated communities show a distinct geographical pattern with independent associations in different mountain ranges of Europe.

[17] I agree with the broad association concept proposed by Karner & Mucina (1993). I understand *Mulgedietum alpini* Kästner 1938, however, as a different vegetation type not identical with the *Cicerbitetum alpinae* Bolleter 1921. The former community occurs at lower altitudes in the central European mountains, whereas the latter is associated primarily with the subalpine belt, although it occasionally descends to lower altitudes. Karner & Mucina (1993) proposed the name *Adenostyletum* as "nomen ambiguum". They identified *Cicerbitetum alpinae* Bolleter 1921 as a valid name, but synonymized it with both the *Adenostyletum alliariae* Pawłowski et al. 1928 and *Mulgedietum alpini* Kästner 1938. The latter name, however, definitely belongs to a different vegetation type than Bolleter's (1921) *Cicerbitetum*. It is therefore confusing to use the name *Cicerbitetum alpinae* for *Adenostyles* dominated vegetation, and I propose the name *Cicerbitetum alpini* (*Mulgedietum alpini*) as a "nomen ambiguum". The names *Cicerbito-Adenostyletum* Br.-Bl. 1926 and *Adenostylo-Cicerbitetum* Br.-Bl. 1950, respectively, should be also rejected as "nomina ambigua" (Art. 32d, 36). The former is connected with the community *Arabido cebennensis-Adenostyletum alliariae* Br.-Bl. (1926) 1950 of the mountain forest belt of southern France; the latter belongs to the vegetation of the subalpine belt of the Alps, the Hercynian Mts, and the Carpathians (*Cicerbitetum alpini* Bolleter 1921 sensu Karner & Mucina 1993, *Adenostyletum* auct.). *Ranunculo platanifolii-Adenostyletum* (Krajina 1933) Dúbravcová et Hadač in Mucina et Maglocký 1985 can, after validation, be used as a correct name for this community. This name has not been validly published in Mucina & Maglocký (1985) since it lacked a nomenclature type. It has been typified and validated in this paper.

Non: *Adenostyletum alliariae* Braun 1915, *Cicerbitetum alpinae* Bolleter 1921 (Art. 36), *Adenostyletum alliariae* Luquet 1926 (Art. 36), *Cicerbito alpinae-Adenostyletum alliariae* Br.-Bl. 1926, *Mulgedietum alpini* Kästner 1938, *Adenostylo-Cicerbitetum* Br.-Bl. 1950 (Art. 36), *Senecioni-Adenostyletum alliariae* Hadač 1969

Nomenclature type: Krajina (1933: Table 28, rel. 4), **lectotypus hoc loco designatus**

D.S.: *Adenostyles alliariae* (dom., transgr.); Const.: *Deschampsia cespitosa* (subdom.), *Chaerophyllum hirsutum*, *Polygonum bistorta*, *Rumex alpestris*, *Senecio nemorensis* subsp. *nemorensis*, *Stellaria nemorum*, *Veratrum album* subsp. *lobelianum*

Structure and species composition: This community belongs to the species-rich vegetation types of the *Mulgedio-Aconitetea* (on average 24 sp./rel.). The herb layer covers 100% of the surface and reaches a height of 60–80 (120) cm. The dominant species is *Adenostyles alliariae*, other tall-herbs, e.g. *Aconitum napellus* subsp. *hians*, *Thalictrum aquilegiifolium*, *Cicerbita alpina*, *Valeriana sambucifolia*, and *Athyrium distentifolium* are also frequently found. In the lower sub-layer, *Deschampsia cespitosa*, *Chaerophyllum hirsutum*, *Myosotis nemorosa*, *Rumex alpestris*, and *Viola biflora* are common. The moss layer mostly covers around 20% of the surface. This association represents the central vegetation type of the *Adenostylion* alliance.

Ecology: The community is confined to moderate (5–25°), mostly (N–) NE (–E) facing slopes. The distribution range of the community is fairly broad due to its azonal nature. It ranges from 1000 to 1475 m a.s.l. The stands are mostly located around and above the timberline, along banks of streams, in the surroundings of springs, in shaded places, and wet depressions. Stream corridors enable this vegetation to descend to lower altitudes of the forest belt, where the *Ranunculo-Adenostyletum* is confined to gaps in spruce (*Athyrio-Piceetum*) and maple (*Aceri-Fagetum*) forests. The soils are moist, sufficiently supplied with water whole year round, rich in humus, often developed on gravel and not too deep. Thick snow cover protects the vegetation, but northern aspect of slopes often causes delayed snow melting and shortening of the growing season.

Distribution: The Krkonoše Mts and the Hrubý Jeseník Mts.

Variability: Two types differing in species richness were distinguished. The species-rich type (on average 30 sp./rel.) is characterized by tallherbs, e.g. *Valeriana sambucifolia*, *Heracleum sphondylium*, *Carduus personata*, *Epilobium angustifolium*, *Lilium martagon*, *Phyteuma spicatum*, and *Anthriscus nitida*. These are mostly confined to sheltered stands of the cirques of the Krkonoše Mts. The second, species-poorer (on average 20 sp./rel.) type lacks the above mentioned tallforbs and occurs mostly in sites adjacent to spruce forest (indicated by *Luzula sylvatica*, *Plagiomnium affine*, *Oxalis acetosella*, and *Doronicum austriacum*) or at higher altitudes (1300–1400 m a.s.l.). It was found in the Hrubý Jeseník Mts and the Krkonoše Mts.

Threats: The community is not endangered. Only a few threatened species can be found, e.g. *Aconitum napellus* subsp. *hians*, *Ligusticum mutellina*, and *Hieracium prenanthoides*, mosses *Bryum schleicheri*, *Tayloria serrata*, and *T. tenuis*.

*Salicetum lapponum* Zlatník 1928[18]
(Table 1, col. 11)

Syn.: *Salicetum lapponum deschampsiosum cespitosae* Zlatník 1928 (Art. 3d), *Salicetum lapponum* Matuszkiewicz 1965 (Art. 31)

Non: *Salicetum lapponum tatricum* Krajina 1933 (Art. 34), *Calamagrostio villosae-Salicetum helveticae* Dúbravcová et Šeffer 1992, *Deschampsio cespitosae-Salicetum helveticae* (Krajina 1933) Dúbravcová in Mucina et Maglocký 1985
Nomenclature type: Zlatník (1925: p. 132, Table 7, rel. 30), **lectotypus hoc loco designatus**

D.S.: *Rhizomnium punctatum*, *Salix lapponum* (dom. $E_2$); Const.: *Deschampsia cespitosa* (dom. $E_1$), *Polygonum bistorta*, *Crepis paludosa*, *Calamagrostis villosa*, *Viola biflora*, *Veratrum album* subsp. *lobelianum*

Structure and species composition: *Salix lapponum* and *S. silesiaca* are low shrubs reaching a height of 0.5–2 m. The shrub and herb layers cover around 80% and 70% of the surface, respectively. *Deschampsia cespitosa*, along with tall forbs of the *Adenostyletalia* (*Cicerbita alpina*, *Adenostyles alliariae*, *Chaerophyllum hirsutum*, *Veratrum album* subsp. *lobelianum*, *Rumex alpestris*, *Senecio nemorensis* subsp. *nemorensis*, *Aconitum napellus* subsp. *hians*, and *Viola biflora*), form a herb layer. Species confined to springs (*Crepis paludosa*, *Swertia perennis*, *Epilobium nutans*, *Sphagnum squarrosum*, *Dicranella palustris*) are often found. In general the moss layer is well-developed and covers around 30 (80) % of the surface. The community has, on average, 22 species per relevé.

Ecology: This community occurs primarily in the cirques. It is confined to shallow wet depressions, to the surroundings of springs and mires, and to the upper edges of cirques (Matuszkiewicz & Matuszkiewicz 1975, Hadač & Štursa 1983). The slopes mostly face to N–E and the altitudes range between (1200–) 1270–1320 (–1410) m. Permanent soil moisture is probably a crucial ecological factor. The soils are shallow, often peaty and acidic. Hadač & Štursa (1983) recorded pH 4.8–5.5.

Distribution: Communities with *Salix lapponum* are found in the Krkonoše Mts and fragmentarily in the Hrubý Jeseník Mts.

Threats: The community is probably not endangered. Threatened species such as *Salix lapponum*, *Aconitum napellus* subsp. *hians*, *Swertia perennis*, *Epilobium nutans*, *Ligusticum mutellina*, and *Paludella squarrosa* are common.

*Trollio altissimi-Geranietum sylvatici* Jeník, Bureš et Burešová 1980[19]
(Table 1, col. 12)

Nomenclature type: Jeník et al. (1980: str. 15, rel. 131), holotypus

D.S.: *Alchemilla subcrenata*, *Cardamine pratensis*, *Cerastium fontanum*, *Crepis mollis*, *Phleum alpinum*, *Primula elatior*, *Ranunculus acris*, *Trollius europaeus* (subdom.); Const.: *Aconitum napellus* subsp. *hians*,

[18] The *Salix lapponum* dominated communities were described in the Krkonoše Mts by Zlatník (1928) as *Salicetum lapponum deschampsiosum cespitosae* (see also Hueck 1939). Matuszkiewicz & Matuszkiewicz (1975) described the *Salicetum lapponum* from the Polish part of the mountains. They assigned this community to the *Adenostylion*. Conversely, Hadač & Štursa (1983) ordered this community to the *Poo-Deschamsion*. In the Vysoké Tatry Mts, Krajina (1933) described the *Salicetum lapponum tatricum*, which he assigned to the alliance *Trisetion fusci*. This community was also reported by Hadač (1956). Dúbravcová & Šeffer (1992) divided communities with *Salix helvetica* Vill. (the Alpine and Carpathian populations of *S. lapponum* were distinguished as *S. helvetica* Vill.) into two associations in Slovakia – *Calamagrostio villosae-Salicetum helveticae* Dúbravcová et Šeffer 1992 and *Deschampsio cespitosae-Salicetum helveticae* (Krajina 1933) corr. Dúbravcová in Mucina et Maglocký 1985.

[19] The *Violo-Deschampsietum* is very close to this community, although it lacks some of the broad-leaved species. There is some similarity to the *Thesio alpini-Nardetum* Jeník et al. 1980, which is confined to drier habitats. A similar community dominated by *Trollius europaeus* (*Trollietum europaei* Šmarda 1950) was described in the Hrubý Jeseník Mts (Šmarda 1950). However, its species composition is somewhere between the *Trollio-Geranietum* and *Laserpitio-Dactylidetum*. Some other communities similar to *Trollio-Geranietum* were quoted by Ishbirdin et al. (1996) from the Iremel Mts, and Koroleva (1994) from the Kola Peninsula.

*Calamagrostis villosa*, *Deschampsia cespitosa*, *Geranium sylvaticum* (subdom.), *Hypericum maculatum*, *Ligusticum mutellina*, *Polygonum bistorta*, *Potentilla erecta*, *Poa chaixii*, *Rumex alpestris*, *Viola biflora*

Structure and species composition: Species-rich community (on average 30 sp./rel.) composed of broad-leaved herbs *Trollius europaeus*, *Geranium sylvaticum*, *Chaerophyllum hirsutum*, *Phyteuma spicatum* etc. Some grasses such as *Deschampsia cespitosa*, *Poa chaixii*, and *Calamagrostis villosa* are also present. Hygrophilous species such as *Primula elatior*, *Ranunculus acris*, *Cardamine pratensis*, *Alchemilla* sp. div., *Cerastium fontanum* are found in the herb sub-layer. The moss layer is developed only rarely.

Ecology: The community is confined to the surrounding of streams and springs in the upper part of cirques, at their upper edges at altitudes of 1300–1420 m. The slopes are mostly SE facing, with an inclination of 20–25°. The soil is moist. The stands are located outside avalanche tracks, although the protective effect of snow is required (Jeník et al. 1980).

Distribution: The community occurs only in the Hrubý Jeseník Mts.

Threats: Very rare, locally distributed community, endangered due to small area of distribution. Threatened species, e.g. *Aconitum napellus* subsp. *hians*, *Ligusticum mutellina*, *Crepis mollis* subsp. *mollis*, *Cerastium fontanum*, *Allium schoenoprasum* subsp. *alpinum* are common, *Delphinium elatum*, *Laserpitium archangelica*, and *Viola lutea* subsp. *sudetica* sparsely occur as well.

*Laserpitio-Dactylidetum glomeratae* Jeník, Bureš et Burešová 1980
(Table 1, col. 13)

Nomenclature type: Jeník et al. (1980: p. 13, rel. 58)

D.S.: *Aconitum vulparia*, *Campanula latifolia*, *Carduus personata*, *Cirsium oleraceum*, *Dactylis slovenica* (Domin) Domin (subdom.), *Delphinium elatum*, *Laserpitium archangelica*, *Mercurialis perennis*, *Scrophularia scopolii*, *Stachys alpina*; Const.: *Aconitum napellus* subsp. *hians*, *Deschampsia cespitosa* (subdom.), *Geranium sylvaticum*, *Heracleum sphondylium*, *Hypericum maculatum*, *Chaerophyllum hirsutum*, *Myosotis nemorosa*, *Rumex alpestris*, *Senecio nemorensis* subsp. *nemorensis*

Structure and species composition: This community is characterized by a high species diversity (on average 35 sp./rel.) and by presence of a number of tall forbs (*Aconitum vulparia*, *A. napellus* subsp. *hians*, *A. variegatum*, *Carduus personata*, *Cirsium heterophyllum*, *C. oleraceum*, *Delphinium elatum*, *Geranium sylvaticum*, *Laserpitium archangelica*) and grasses (*Dactylis slovenica* and *Deschampsia cespitosa*). The vegetation reaches a height of 80–100 (140) cm, the herb layer covers around 100% of the surface. In the lower herb sub-layer hygrophilous species *Chaerophyllum hirsutum*, *Rumex alpestris*, *Hypericum maculatum*, *Viola biflora*, *Ajuga reptans*, and *Myosotis nemorosa* are mostly found. Mosses are often present, covering 5–10 (30) % of the surface.

Ecology: The community is confined mostly to the bottoms of the cirques, where it occurs on slopes of inclination of 5–35°, mostly of (E–) SE (–S) aspect. The range of altitudes is from 1100 to 1200 (1300) m. The soil-water regime is a considerable ecological factor. An abundance of soil moisture comes from percolating ground water and from melting snow. A thick snow cover is accumulated each winter. Nutrients are supplied by aeolic sedimentation (Jeník 1961), avalanches, and percolating ground water. The soils are deep, loamy sediments without gravel, transported by avalanches. Besides this, vegetation is also confined to the gravelly alluvial cones (Bureš et al. 1989).

Distribution: The community is best developed in the Velká Kotlina cirque in the Hrubý Jeseník Mts. *Laserpitio-Dactylidetum* is an endemic association of the Velká Kotlina cirque and the Malá Kotlina cirque in the Hrubý Jeseník Mts (Jeník et al. 1980).

Variability: Jeník et al. (1980) distinguished two subassociations: *Laserpitio-Dactylidetum carduetosum* as the typical one, occuring mostly in wet places, *Laserpitio-Dactylidetum phalaridetosum*. The latter association is species-poor and characterized by the dominance of *Phalaris arundinacea*, which is probably expanding into the vegetation of *Laserpitio-Dactylidetum carduetosum*.

Threats: This valuable community harbours many threatened species (*Aconitum napellus* subsp. *hians*, *Laserpitium archangelica*, *Aconitum variegatum*, *Delphinium elatum*, *Campanula latifolia*, and *Crepis mollis*, less frequently *Ligusticum mutellina*, *Viola lutea* subsp. *sudetica*, *Bupleurum longifolium* subsp. *vapincense*, *Scabiosa lucida* subsp. *lucida*, *Pleurospermum austriacum*, *Avenochloa planiculmis*, *Anemone narcissiflora*, *Dianthus superbus* subsp. *alpestris*, *Conioselinum tataricum*, and *Vicia oreophila*). Threatened bryophytes include *Tayloria serrata*, *Rhizomnium pseudopunctatum*, *Brachythecium mildeanum*, and *Porella cordaeana*.

*Chaerophyllo-Cicerbitetum alpinae* (Kästner 1938) Sýkora et Hadač 1984[20, 21]
(Table 1, col. 14)

Syn.: *Petasitetum albi* Zlatník 1928 (Art. 36), *Petasito albi-Mulgedietum* R. Tx. 1937 (Art. 3b), *Mulgedietum alpini montanum* Kästner 1938 (Art. 31, 34), *Mulgedio-Petasitetum albi* Kästner 1938 (phantom, Karner & Mucina 1993), *Ranunculo platanifoliae-Mulgedietum* Kästner 1938 (phantom, Niemann et al. 1973), *Petasitetum albi* Šmarda 1950 (Art. 34), *Petasitetum albi sudeticum* Macko 1952 (Art. 31, 34)
Syntax. syn.: *Adenostylo-Athyrietum alpestris petasitetosum albi* Kopecký et Hejný 1971, *Chaerophyllo-Petasitetum albi* Sýkora et Hadač 1984 p.p.
Non: *Petasitetum albi* (Koch et von Gaisberg 1938) Th. Müller 1973
Nomenclature type: Kästner (1938: p. 84, Table 12, rel. 2), lectotypus (Sýkora & Hadač 1984)

[20] This community was first mentioned in the Czech Republic by Zlatník (1928) as *Petasitetum albi*. Later on, Kästner (1938) described vegetation with *Petasites albus* and *Cicerbita alpina* as *Mulgedietum alpini montanum* from the German part of the Krušné hory Mts. Some relevés were also published by Prinz (1937) from the Adršpašsko-Teplické skály rocks. *Petasitetum albi* was published by Šmarda (1950) and Jeník et al. (1980) from the Hrubý Jeseník Mts and by Macko (1952) from the Krkonoše Mts. Sýkora (1972) published one relevé from the Lužické hory Mts and other two relevés (Sýkora & Hadač 1984) from the Adršpašsko-Teplické skály rocks. A similar community was described as the *Philonoti seriatae-Petasitetum albi* by Wagnerová (1992) in the Krkonoše Mts. However, it shows close relation to the spring vegetation of the *Montio-Cardaminetea*. *Chaerophyllo-Petasitetum albi* was first mentioned by Sýkora (1972) and validly described in the same paper as the *Chaerophyllo-Cicerbitetum* (Hadač et Sýkora 1984); it has often been ordered to the *Cardaminion amarae* Maas 1959 (Hadač in Moravec et al. 1995). However, species composition of the original relevés is close to the *Chaerophyllo-Cicerbitetum*, so I prefer to unite both communities into a single association. The habitat and species composition of *Chaerophyllo-Cicerbiteteum* are intermediate between the classes *Mulgedio-Aconitetea*, *Galio-Urticetea* (*Petasito-Chaerophylletalia*) and *Montio-Cardaminetea*. Some authors (e.g. Hejný in Moravec et al. 1995) preferred to order this vegetation to the *Galio-Urticetea*. Due to a number of mountain tall-forb species I assign it to the *Mulgedio-Aconitetea*. The same syntaxonomic solution was suggested by e.g. Tüxen (1937), Macko (1952), Kopecký & Hejný (1971), Kopecký (1971), Matuszkiewicz & Matuszkiewicz (1975) or Jeník et al. (1980). Kopecký (1971) classified this vegetation as a subassociation of the *Adenostylo-Athyrietum alpestris* (Zlatník 1928) Jeník 1961. Some authors (Mucina & Maglocký 1985, Kliment & Jarolímek 1995) suggested to involve *Petasito-Chaerophylletalia* directly to the *Mulgedio-Aconitetea*.

[21] I suggest rejecting the name *Petasitetum albi* as "nomen ambiguum". This name belongs to different vegetation types and could cause misinterpretation. It is used both for the tall-forb vegetation of the *Adenostylion* (Zlatník 1928, Šmarda 1950, Stuchlik 1968) and for the vegetation of alpine screes of the *Petasition paradoxi* Zollitsch ex Lippert 1966 (Müller 1973, Pott 1995).

D.S.: *Athyrium filix-femina, Lamiastrum montanum, Chrysosplenium alternifolium, Impatiens noli-tangere, Petasites albus* (dom.), *Prenanthes purpurea, Senecio fuchsii, Thelypteris phegopteris*; Const.: *Cicerbita alpina* (subdom.), *Crepis paludosa, Oxalis acetosella, Rubus idaeus, Stellaria nemorum*

Structure and species composition: This species-rich community (on average 23 sp./rel.) is dominated by *Petasites albus* and *Cicerbita alpina* (subdom.). Forest species are common, e.g. *Prenanthes purpurea, Athyrium filix-femina*, and *Senecio fuchsii*. Tall forbs of the *Mulgedio-Aconitetea*, such as *Aconitum napellus* subsp. *hians*, *Chaerophyllum hirsutum*, *Rumex alpestris*, *Ranunculus platanifolius*, *Valeriana sambucifolia*, and *Doronicum austriacum* typically occur in the upper herb sub-layer. The lower sub-layer is mostly characterized by *Chrysosplenium alternifolium* (*C. oppositifolium*), *Stellaria nemorum*, *Viola biflora*, *Oxalis acetosella* etc. The moss layer is well-developed, it covers around 30% of the surface.

Ecology: The community is confined to shaded and wet places, typically in the surroundings of springs, mostly on the bottoms of V-shaped valleys and canyons. The stands are located azonally in the montane and supramontane belts at altitudes of (500–) 700–1140 m. Above the timberline it is mainly replaced by *Ranunculo-Adenostyletum*. Sufficient soil moisture is an important factor influencing the vegetation during the whole year. According to Bureš et al. (1989) the community represents a stable successional stage stabilized by percolating ground water.

Distribution: The community occurs in most Czech mountain ranges – Hrubý Jeseník Mts, Orlické hory Mts, Adršpašsko-Teplické skály rocks, Jizerské hory Mts, Lužické hory Mts, Krkonoše Mts, Krušné hory Mts, Šumava Mts and Beskydy Mts, rarely in the Javorníky Mts.

Threats: The community is probably not endangered. Threatened species, e.g. *Aconitum napellus* subsp. *hians*, and *A. variegatum*, *Bryum schleicheri* and *Brachythecium oedipodium* can be found in the stands.

## *Dryopterido-Athyrion distentifolii* (Holub ex Sýkora et Štursa 1973) Jeník et al. 1980

Fern-rich communities occurring on the slopes and bottoms of the cirques above the timberline

Syn.: *Dryopterido-Athyrion distentifolii* Holub in Holub et al. 1967 (Art. 8)
Incl.: *Dryopterido-Athyrienion distentifolii* Holub ex Sýkora et Štursa 1973

D.S.: *Athyrium distentifolium, Dryopteris filix-mas, Oxalis acetosella, Rubus idaeus, Streptopus amplexifolius*

Species-poor communities of the montane and subalpine belts, dominated by ferns *Athyrium distentifolium* and *Dryopteris filix-mas*. The habitats are sheltered leeward slopes, cirques, and forest gaps near the timberline. The soils range from shallow to deep, well-drained, with a sufficient amount of nutrients. They are often developed on talus slopes, covered with a thick layer of litter. There is a distinct snow cover in winter. This vegetation is widespread in the supramontane and subalpine belt.

*Daphno mezerei-Dryopteridetum filicis-maris* Sýkora et Štursa 1973[22, 23]
(Table 1, col. 15)

Nomenclature type: Sýkora & Štursa (1973: Table 1, rel. 13), **lectotypus hoc loco designatus**

D.S.: *Actaea spicata, Corydalis intermedia, Daphne mezereum, Dicranum scoparium, Dryopteris filix-mas* (dom.), *Lamiastrum galeobdolon, Mercurialis perennis, Paris quadrifolia, Racomitrium sudeticum, Scrophularia nodosa*; Const.: *Athyrium distentifolium, Calamagrostis arundinacea, C. villosa, Millium effusum, Rubus idaeus, Rumex alpestris, Senecio nemorensis* subsp. *nemorensis*

Structure and species composition: Species-rich community (on average 30 sp./rel.) dominated by *Dryopteris filix-mas* along with the shrub *Daphne mezereum* and stunted individuals of *Acer pseudoplatanus*. Its species composition is close to the subalpine beech forest of *Daphno-Aceretum* Jeník et al. 1980. The herb layer covers around 90% of the surface and reaches the height of 70–100 (–120) cm. Several beech-forest species are present, e.g. *Asarum europaeum, Lamium maculatum, Urtica dioica, Lamiastrum galeobdolon, L. montanum, Scrophularia scopolii, Athyrium filix-femina, Actaea spicata, Galium odoratum, Lunaria rediviva*, and *Myosotis sylvatica*. The moss layer is mostly well-developed, and covers (5–) 10–20% of the surface. The most common mosses are *Dicranum scoparium* and *Racomitrium sudeticum*.

Ecology: *Daphno-Dryopteridetum* occurs at a narrow range of altitudes from 1000 to 1300 m. It occupies screes and screes-cones with shallow soil. The habitats are mostly E–SE facing foots of steep (25–40°) slopes in the cirques. Thick snow cover is accumulated there during winter, but the snow melts quickly in the spring, due to the local microclimatic conditions in the scree (cf. Kučerová & Jeník 1963, Kubát 1972). The habitats are dry and warm in summer (Sýkora & Štursa 1973).

Distribution: The community occurs in the Krkonoše Mts, Jizerské hory Mts (Bukovec Mt.), Králický Sněžník Mts (rather fragmentarily), and Hrubý Jeseník Mts.

Variability: Two types were distinguished. The typical variant corresponds to the description above. The other type is differentiated by the presence of *Petasites albus, Geranium robertianum, Pulmonaria obscura, Urtica dioica, Myosotis sylvatica, Polystichum aculeatum*, and *Impatiens noli-tangere*. It is confined to lower altitudes in the forest belt. Its species composition is close to the *Chaerophyllo-Cicerbitetum alpinae*.

Threats: The community is a sparsely distributed type found in specific environments. It is not endangered by human activities. It harbours several threatened species, e.g. *Aconitum napellus* subsp. *hians, Aconitum variegatum, Delphinium elatum, Campanula latifolia, Pleurospermum austriacum*, and *Sedum alpestre*.

[22] This rare vegetation type is known only from the High Sudeten mountains (Sýkora & Štursa 1973). A similar community (*Athyrietum filicis-feminae* Höfer et Wendelberger 1960) is reported by Karner & Mucina (1993) from the Austrian Alps. Its species composition (*Dryopteris filix-mas, Daphne mezereum, Lamiastrum galeobdolon*) and the habitat seem to be very similar. According to Karner & Mucina (1993), these communities are geographical vicariants.

[23] Chytrý (1993) and Sádlo & Kolbek (1994) assigned some low-altitudinal fern-dominated communities without mountain species to the alliance *Dryopterido-Athyrion*. The species composition of those communities is, however, too different from the subalpine tall-forb vegetation, and it is hardly possible to assign it to the *Mulgedio-Aconitetea*.

*Adenostylo-Athyrietum alpestris* (Zlatník 1928) Jeník 1961[24]
(Table 1, col. 16)

Syn.: *Athyrietum alpestris* Schmid 1923 (Art. 36), *Athyrietum alpestris* Zlatník 1925 (Art. 31), *Athyrietum alpestris tatricum* Hadač 1956 (Art. 34)
Syntax. syn.: *Gentiano pannonicae-Athyrietum alpestris* Sofron et Štěpán 1971, *Acetoso alpestris-Athyrietum alpestris* (Hadač 1956) Hadač in Mucina et Maglocký 1985 (Art. 2b)
Incl.: community *Athyrium alpestre-Vaccinium myrtillus* Šmarda 1950 (Art. 3d)

D.S.: *Athyrium distentifolium* (dom.); Const.: *Adenostyles alliariae*, *Avenella flexuosa*, *Calamagrostis villosa*, *Oxalis acetosella*, *Rubus idaeus*, *Rumex alpestris*, *Senecio nemorensis* subsp. *nemorensis*, *Stellaria nemorum*, *Trientalis europaea*, *Vaccinium myrtillus*, *Veratrum album* subsp. *lobelianum*

Structure and species composition: This species-poor community (on average 17 sp./rel.) is dominated by *Athyrium distentifolium*; the subdominant is *Adenostyles alliariae*. The vegetation covers around 100% of the surface and the herb layer reaches a height of 60–100 (–140) cm. In the lower herb sub-layer *Stellaria nemorum*, *Streptopus amplexifolius*, *Calamagrostis villosa* and *Oxalis acetosella* predominate. Mosses are only weakly represented, with the most common species being *Plagiothecium denticulatum*, *P. laetum*, and *Polytrichum formosum*. Due to the thick layer of fern litter, mosses cover only around 5% of the surface.

Ecology: The community is confined to the slopes of different inclination (10–40°) and of predominantly (NW–) N–E (–SE) aspect. The altitude ranges between 1250–1380 m. Like the *Ranunculo-Adenostyletum* it is found in shaded wet places around the timberline. This vegetation continuously changes to spruce forest of the association *Athyrio alpestris-Piceetum* (*Athyrio-Piceion*) and frequently occur in the canopy gaps of this forest. Snow accumulation and soil moisture are assumed to be important factors (Odland 1991). Protection against freezing and mechanical action of the thick snow layer is particulary important for chionophilous *Athyrium distentifolium*, which is very sensitive to late frost in the spring. The soils are deep and well developed (Jeník 1961, Sýkora & Štursa 1973) with high microbial activity and a significant number of soil microflora (Kubátová-Kořínková 1972).

Distribution: In the Czech Republic the community is widespread in the High Sudeten Mts (Krkonoše Mts, Hrubý Jeseník Mts, Králický Sněžník Mts) and in the cirques of the Šumava Mts. The *Adenostylo-Athyrietum* also occurs at the highest altitudes of the Beskydy and Javorníky Mts.

Variability: Two variants were distinguished – the typical variant, which corresponds to the description above, and the variant with *Gentiana pannonica* (syn. *Gentiano*

[24] The communities dominated by *Athyrium distentifolium* are distributed from the western and northern Europe as far as to southern Siberia. They show considerable homogeneity in their habitats and species composition. It is possible to find them in most of the European mountains, which possess the subalpine belt. They are reported from, e.g., the Austrian Alps (Karner & Mucina 1993), the Mont du Forez in the Massif Central (Schaminée 1993), Scandinavia (Nordhagen 1943, Odland 1991, Dierßen 1996), Germany (Pott 1995) and the Altai Mts (Ermakov et al. 2000).

In the Czech Republic this community was first described by Zlatník (1928) in the Krkonoše Mts. Šmarda (1950) published the community *Athyrium alpestre-Vaccinium myrtillus* from the Hrubý Jeseník Mts, which he assigned to the *Piceetalia excelsae*. Jeník (1961) described the *Adenostylo-Athyrietum alpestris* in the Krkonoše Mts, while Matuszkiewicz & Matuszkiewicz (1975) reported the community *Athyrietum alpestris* Hadač 1956 from the Polish part of the Krkonoše Mts. Sofron & Štěpán (1971) described it as the *Gentiano-Athyrietum alpestris* from the Šumava Mts.

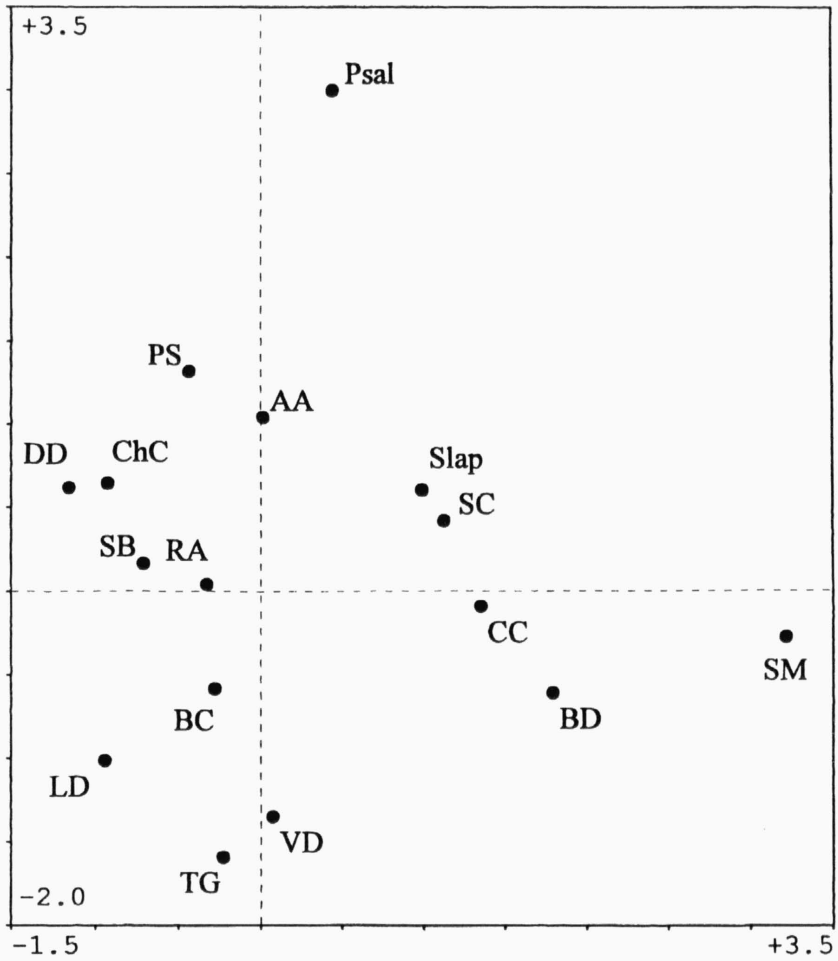


Fig. 3. – Correspondence analysis ordination diagram of communities based on $\log_2$-transformed percentage constancy matrix. AA: *Adenostyli-Athyrietum*, BC: *Bupleuro-Calamagrostietum*, BD: *Bistorto-Deschampsietum*, CC: *Crepido-Calamagrostietum*, DD: *Daphno-Dryopteridetum*, LD: *Laserpitio-Dactylidetum*, ChC: *Chaerophyllo-Cicerbitetum*, PS: *Pado-Sorbetum*, Psal: *Piceo-Salicetum*, RA: *Ranunculo-Adenostyletum*, SB: *Salici-Betuletum*, SC: *Sileno-Calamagrostietum*, Slap: *Salicetum lapponum*, SM: *Sphagno-Molinietum*, TG: *Trollio-Geranietum*, VD: *Violo-Deschampsietum*. Axis 1 – horizontal, axis 2 – vertical.

pannonicae-Athyrietum alpestris Sofron et Štěpán 1971). The latter includes vegetation occurring in the cirques of the Šumava Mts. It is a geographical variant differentiated by the absence of some subalpine species (*Adenostyles alliariae*, *Veratrum album* subsp. *lobelianum*, *Rumex alpestris*), and higher constancy of mosses and woodland species (*Luzula sylvatica*, *Dryopteris dilatata*, *Dryopteris carthusiana*, *Gentiana pannonica*). The woodland species reflect its adjacent position to the spruce forest, resulting from the absence of the subalpine belt in the Šumava Mts. The communities of forest gaps in the other lower mountains, e.g. in the Javorníky and Moravskoslezské Beskydy Mts, have a similar species composition.

T h r e a t s : The community is not endangered. Threatened species do not occur frequently in this vegetation type. *Aconitum napellus* subsp. *hians*, *Gentiana pannonica*, and *Salix appendiculata* can be found in the Šumava Mts.

## Ordination

The CA ordination of communities based on percentage constancy matrix (Fig. 3) revealed the moderately outlying position of the *Sphagno-Molinietum* (SM) and *Piceo-Salicetum* (PSal). The former case is due to species composition of the community which shows close relations to the *Nardion* (see above). The position of the *Piceo-Salicetum* results from the character of the data (low number of relevés). The communities of the alliance *Calamagrostion villosae* are placed together in the bottom right part of the diagram. The communities of *Adenostyletalia* and *Alnetalia viridis* are situated in the left part of the diagram. The relationship of the *Violo-Deschampsietum* (VD) to *Adenostylion* communities (the left bottom part) is conspicuous. The communities *Laserpitio-Dactylidetum* (LD), *Trollio-Geranietum* (TG), and *Bupleuro-Calamagrostietum* (BC) situated in this part of the diagram are heliophilous, closely related to the altitudes above the timberline. On the contrary, relationships to the forest vegetation and shaded habitats are evident in the communities of the left upper part. They are shrub communities of the *Salicion silesiacae* (SB, PS, PSal) and the communities of *Dryopterido-Athyrion* (DD, Adis) where ferns dominate. These occur together with those communities of the *Adenostylion* which prefer wet, shaded places (RA, MP). The intermediate position of the *Bupleuro-Calamagrostietum* (BC) in the centre of the diagram results from its high species richness. In contrast, the close position of the *Salicetum lapponum* (Slap) to the communities in the right part of the table is probably caused by its low species richness.

## Acknowledgements

I am very grateful to Milan Chytrý for his comments on earlier versions of the paper and Viera Horáková for improving the English of an earlier draft of the manuscript. Preparatory stage of this research was carried out in the Unit of Vegetation Science, Lancaster University; the author greatly appreciated the help of John S. Rodwell and his team. This work was supported by grant nr. 206/99/1523 of the Grant Agency of the Czech Republic.

## Souhrn

Syntaxonomická revize subalpínské vysokobylinné vegetace třídy *Mulgedio-Aconitetea* vychází z analýzy přibližně 800 fytocenologických snímků původně autory řazených k této vegetaci. Snímky byly získány excerpcí literatury nebo v terénu autorem. Snímkový materiál byl uložen v databázi TURBO(VEG) a zpracován pomocí programu TWINSPAN. Celkem bylo identifikováno 16 vegetačních typů na úrovni asociací náležejících do 3 řádů a 5 svazů: *Calamagrostion villosae* (*Sphagno compacti-Molinietum caeruleae*, *Crepido-Calamagrostietum villosae*, *Sileno vulgaris-Calamagrostietum villosae*, *Bistorto-Deschampsietum alpicolae*, *Violo sudeticae-Deschampsietum cespitosae*), *Calamagrostion arundinaceae* (*Bupleuro-Calamagrostietum arundinaceae*), *Salicion silesiacae* (*Salici silesiacae-Betuletum carpaticae*, *Piceo-Salicetum silesiacae*, *Pado-Sorbetum*), *Adenostylion* (*Laserpitio-Dactylidetum glomeratae*, *Trollio altissimi-Geranietum sylvatici*, *Ranunculo platanifolii-Adenostyletum alliariae*, *Chaerophyllo-Cicerbitetum alpinae*, *Salicetum lapponum*), *Dryopterido-Athyrion distentifolii* (*Daphno mezerei-Dryopteridetum filicis-maris*, *Adenostylo-Athyrietum alpestris*). Bylo navrženo nové členění společenstev do vyšších syntaxonomických jednotek. Společenstva svazu *Poo-Deschampsion cespitosae* byla zařazena do svazu *Calamagrostion villosae* a společenstva úzce pojaté třídy *Betulo-Alnetea viridis* jsou v rámci třídy *Mulgedio-Aconitetea* řazena do řádu *Alnetalia viridis*. Jména syntaxonů byla opravena v souladu

s Mezinárodním kódem fytocenologické nomenklatury. Každý vegetační typ je charakterizován z hlediska struktury, druhového složení, ekologie, rozšíření na našem území a ohrožení. Četné poznámky mají charakter diskuse; jsou zde řešeny převážně syntaxononomické, synchorologické, nomenklatorické a další problémy.

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Received 12 May 2000
Accepted 1 June 2001

**Appendix 1.** – Relevé data used for synthesis.

1. *Sphagno-Molinietum*
Berciková (1976: Tab. 10, rels. 4, 9, 10, 12–20; Tab. 12, rels. 1–5); Bureš & Burešová (1991a: 1 rel., p. 9); Jeník et al. (1980: p. 11, rel. 220); Kočí (ined., 2 rels.); Matuszkiewicz & Matuszkiewicz (1975: Tab. 11, rel. 19); Wagnerová (1970: Tab. 10, rels. 1–12)

2. *Crepido-Calamagrostietum*
Berciková (1976: Tab. 10, rels. 1–3, 5–8, 11); Jeník (1960: 3 rels., p. 17–19); Jeník (1961: Tab. 7, rels. 1–11); Jeník et al. (1980: p. 11, rel. 110); Kociánová & Štursová (1986: Tab. 3, rels. 7–12); Kočí (ined., 2 rels.); Matuszkiewicz & Matuszkiewicz (1975: Tab. 11, rels. 3–7, 9, 10, 12–15, 17, 18, 22, 23, 25–27, 29, 30, 32, 33, 35; Tab. 12, rels. 1–4, 8–10, 12, 14, 15); Rozsypalová (1969: 1 rel., p. 76); Slavík (1974: 1 rel., p. 65); Wagnerová (1970: Tab. 9, rels. 1–4, 6–8, 10–12; Tab. 12, rels. 3, 4); Zlatník (1925: Tab. 1, rel. 78); Zlatník (1928: Tab. 12, rels. 48–52)

3. *Sileno-Calamagrostietum*
Bednář (1956: p. 107, rels. 2, 5–8); Bednář (1958: Tab. 4, rels. 1–10); Bureš & Burešová (1973: Tab. 5, rels. 18–24; Tab. 6, rels. 29–33; p. 28, rel. 25; p. 29, rels. 26, 27; p. 30, rel. 28; p. 32, rel. 34); Bureš & Burešová (1990b: 1 rel., pp. 14, 31, 37; 2 rels., p. 38); Bureš et Burešová (1990a: 1 rel., pp. 7, 9, 10, 14); Bureš & Burešová (1991b: 2 rels., p. 14); Burešová (1976: tab. 4, rels. 1–10); Jeník et al. (1980: p. 11, rel. 172; p. 10, rel. 84); Kočí (ined., 39 rels.); Krahulec (1990: Tab. 21–25); Matuszkiewicz & Matuszkiewicz (1975: Tab. 11, rels. 1, 2, 8, 11, 16, 20, 21, 24, 28, 31, 34); Sofron & Štěpán (1971: Tab. 4, rels. 37–41); Sýkora (1972: 1 rel., p. 74); Šmarda (1950: 1 rel., p. 108); Wagnerová (1970: Tab. 9, rels. 5, 9); Zlatník (1925: Tab. 1, rel. 80); Zlatník (1928: Tab. 12, rel. 53)

4. *Bistorto-Deschampsietum*
Bureš & Burešová (1990a: 1 rel., p. 5); Bureš & Burešová (1991a: 1 rel., p. 8); Bureš & Burešová (1991b: 5 rels., p. 16); Burešová (1976: Tab. 5, rels. 1–10); Kočí (ined., 12 rels.); Krahulec (1990: Tab. 4, rels. 27–29); Wagnerová (1970: Tab. 11, rels. 1–3); Zlatník (1928: Tab. 9, rel. 36)

5. *Violo-Deschampsietum*
Bednář (1956: p. 97, rels. 1–5, 7–9, 11); Bureš & Burešová (1973: p. 34, rel. 40); Bureš & Burešová (1989: 1 rel., p. 11); Bureš & Burešová (1990b: 1 rel., p.13; Tab. 4, rels. 169, 172, 181, 184; Tab. 6, rels. 191, 227); Bureš & Burešová (1991b: 1 rel., p. 15); Jeník et al. (1980: p.12, rel. 281); Kočí (ined., 13 rels.); Krahulec (1990: tab. 3, rel. 20; Tab. 4, rel. 26); Matuszkiewicz & Matuszkiewicz (1975: Tab. 9, rel. 11); Šmarda (1950: 1 rel., pp. 100, 101, 104); Wagnerová (1970: Tab. 6, rel. 1); Zlatník (1928: Tab. 10, rel. 40)

6. *Bupleuro-Calamagrostietum*
Jeník (1960: 1 rel., p. 18); Jeník (1961: Tab. 8, rels. 1–8, 10); Kociánová & Štursová (1986: Tab. 3, rels. 13, 14); Kočí (ined., 18 rels.), Krahulec (1990: p. 317, rel. 45); Matuszkiewicz & Matuszkiewicz (1975: Tab. 12, rels. 5–7, 11, 13, 16–25); Šmarda (1950: 1 rel., p. 101); Wagnerová (1970: Tab. 12, resl. 1, 2, 5–7); Zlatník (1925: Tab. 1, rels. 48, 50); Zlatník (1928: Tab. 11, rel. 44)

7. *Salici-Betuletum*
Jeník et al. (1980: p. 17, rel. 35; p. 18, rel. 197); Kociánová & Štursová (1986: Tab. 3, rel. 15); Kočí (ined., 4 rels.); Krahulec (1990: p. 317, rel. 42); Rejmánek et al. (1971: Tab. 1, rels. 1–7)

8. *Pado-Sorbetum*
Jeník (1961: Tab. 9, rels. 3, 9); Matuszkiewicz & Matuszkiewicz (1975: tab. 6, rels. 1–8); Zlatník (1925: Tab. 1, rels. 35, 51, 52)

9. *Piceo-Salicetum*
Rejmánek et al. (1971: Tab. 2, rel. 1–4)

10. *Ranunculo-Adenostyletum*
Kočí (ined., 14 rels.); Bednář (1956: p. 102, rels. 1–7); Bureš & Burešová (1973: p. 69, rel. 80, 81; p. 70, rel. 82; p. 81, rel. 83; p. 82, rel. 84); Bureš & Burešová (1990a: 2 rels., p. 9, 10); Jeník (1961: Tab. 9, rel. 1); Matuszkiewicz & Matuszkiewicz (1975: Tab. 7, rel. 4; Tab. 9, rels. 1–10, 12–18); Sýkora & Štursa (1973: Tab. 2, rel. 3); Šmarda (1950: 1 rel., p. 98, 1. rel. p.103); Wagnerová (1970: Tab. 6, rels. 2–5); Zlatník (1925: Tab. 1, rels. 45–47); Zlatník (1928: Tab. 10, rels. 41, 43)

11. *Sallicetum lapponum*
Kočí (ined., 4 rels.); Matuszkiewicz & Matuszkiewicz (1975: Tab. 7, rels. 1–3, 5–9); Zlatník (1928: Tab. 7, rels. 30, 29)

12. *Trollio-Geranietum*
Kočí (ined., 5 rels.); Bednář (1956: p. 98, rel. 6, 10; p. 111, rel. 1–4); Bureš & Burešová (1990b: Tab. 6, rel. 194); Jeník et. al. (1980: p. 14, rel. 131); Šmarda (1950: 1 rel., p. 95)

13. *Laserpitio-Dactylidetum*
Kočí (ined., 15 rels.); Bureš & Burešová (1990a: Tab. 3, rels. 178, 219; Tab. 4, rel. 218; Tab. 6, rels. 187, 222); Jeník (1961: Tab. 8, rel. 9); Jeník et al. (1980: p. 14, rel. 49; p. 13, rel. 58)

14. *Chaerophyllo-Cicerbitetetum*
Kočí (ined., 21 rels.); Kästner (1938: Tab. 12, rels. 1–5, 10, 11; Tab. 13, rels. 1–7); Kopecký (1990: Tab. 1, rel. 1); Kopecký & Hejný (1971: Tab. 4, rels. 1–6, 9, 11, 13, 19); Prinz (1937: 1 rel., p. 100); Rejmánek et al. (1971: 1 rel., p. 37); Šmarda (1950: 1 rel., p. 99); Wagnerová (1970: Tab. 7, rel. 1–3; Zlatník (1928: Tab. 10, rel. 38)

15. *Daphno-Dryopteridetum*
Kočí (ined., 6 rels); Burda (1973: 1 rel., p. 203); Krahulec (1990: Tab. 5, rels. 31–32); Sýkora & Štursa (1973: Tab. 1, rels. 1–4, 6–21, 23; Tab. 2, rels. 1, 8); Wagnerová (1970: Tab. 6, rekl. 10); Zlatník (1925: Tab. 1, rels. 44, 49); Zlatník (1928: Tab. 10, rel. 42)

16. *Adenostyli-Athyrietum alpestris*
Bednář (1956: p. 113, rels. 1–5); Bureš & Burešová (1989: 1 rel., p. 11); Bureš & Burešová (1990a: 2 rels., p. 11); Bureš et Burešová (1991a: 1 rel., p. 10); Jeník (1961: Tab. 9, rels. 2, 4–8); Kočí (ined., 37 rels.); Krahulec (1990: Tab. 5, rels. 33–36; p. 316, rel. 41); Matuszkiewicz & Matuszkiewicz (1975: Tab. 10, rels. 1–39); Sofron & Štěpán (1971: Tab. 3, 29–36; Sýkora & Štursa (1973: Tab. 1, rel. 5; Tab. 2, rels. 2–7); Wagnerová (1970: Tab. 6, rels. 6–9); Zlatník (1925: Tab. 1, rel. 36)

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**Elsevier's dictionary of plant names and their origin**

Elsevier Science B. V., Amsterdam etc. 2000, 30+1001 str.

Národní (lidová, vernakulární) jména rostlin představují kulturně-historické a jazykové bohatství každého národa, obraz lidové moudrosti a historické zkušenosti z dob těsného sepětí přírody a člověka. Slovník jmen rostlin v jazyce anglickém, sestavený sběratelem a etnobotanikem D. C. Wattsem, je svým hlavním účelem etymologický. Jazykově nebo národopisně zaměření čtenáři mohou ve slovníku například nalézt vysvětlení, proč se (v hrabství Wiltshire) říká vlčímu máku Blind Man. Pro čtenáře orientované spíše botanicky je to především neocenitelná příručka k identifikaci anglicky psaných jmen rostlin, protože anglický název rostliny (heslo) obsahuje vždy převod do vědecké (latinské) nomenklatury. Pátráme-li po nějakých kriteriích výběru hesel do tohoto slovníku, zjistíme, že obsah je zcela bezbřehý. Snad jediným pojítkem zde je, že jména jsou v angličtině, tj. jsou původem anglická, nebo pocházejí z jiných jazyků a byla v dávné či nedávné minulosti poangličtěna a prošla v písemné či slovesné formě nějakým způsobem územím Velké Británie. Všeobsažnost ovšem není ke škodě díla typu klasického slovníku. Jádrem jsou vernakulární (hovorová, lidová) jména rostlin domácích na území Velké Británie, a to i jména stará, dávno zapomenutá (samozřejmě také Shakespearovská), značný podíl tvoří jména rostlin ve Velké Británii pěstovaných, včetně pokojových. Ve slovníku najdeme také množství jmen z celého světa pro rostliny jakýmkoliv způsobem užitkové (okrasné, jedovaté, léčivé, technické, zemědělské, drogy, koření, čaje, biblické, symbolické, folklorních rituálů a obyčejů), jsou zde i jména čistě literární, v lidové slovesnosti nepoužívaná. Vedle jmen pro rostliny jsou zařazeny i názvy vztahující se jen na některé jejich části (zpravidla plody), pokud se odlišují; v naší mateřštině obdobné případy jsou jabloň – jablko, buk – bukvice. Nejlepší představu o tom, co všechno bylo do slovníku vneseno, si čtenář může utvořit z přehledu excerpované literatury (str. IX–XXX). Obsahuje bezmála 600 titulů jak speciálních studií, tak encyklopedií sahajících hluboko do minulosti a čerpajících někdy i ze zdánlivě nesouvisejících oborů. Ve slovníku jsem nenalezl houby, vzácně však lze nalézt lišejníky. Hesla obsahují odkazy na literární zdroj, z něhož bylo převzato jméno a především jeho identifikace v určitém smyslu; u lokálně užívaných jmen je uvedeno hrabství, odkud původní lidová jména pocházejí. Nějaký informativní úvod ke slovníku chybí, je zde jen krátká předmluva.

Při sestavování slovníku bylo třeba se vypořádat s hnízdováním (grupováním) jmen, vypracovat systém kategorií a odkazů, a vytvořit tak určité jednotné uživatelské prostředí. Provázanost v systému hesel a odkazů je však