

Bryofloristic material from the central part of Muránska planina (Western Carpathians)

**Bryofloristický materiál z centrální části Muránské planiny
(Západní Karpaty)**

Tomáš Herben and Zdeněk Soldán

HERBEN T.¹⁾ et SOLDÁN Z.²⁾ (1987): Bryofloristic material from the central part of Muránska planina (Western Carpathians). — *Preslia, Praha, 59 : 65–85.*

A bryofloristic survey of central part of Muránska planina is given. A list of species, containing 202 mosses and 79 hepatics is compiled from the literature and authors' own collections. Herbarium specimens of doubtful records from the literature were revised and commented together with the already published revisions. Geography and ecology of the bryophyte flora of the study area is discussed.

1) *Botanical Institute of the Czechoslovak Academy of Sciences, 252 43 Práhonice, Czechoslovakia*

2) *Department of Botany, Charles University, Benátská 2, 128 01 Praha 2, Czechoslovakia.*

INTRODUCTION

Muránska planina is a limestone area of ca. 160 sq. km in the central part of the Slovenské Rudohorie Mountains in the Western Carpathians. It is well known for its floristic richness, which is mainly due to highly diverse relief and range of altitudes (380—1409 m above sea level). The necessary information on geology, geomorphology and climatology may be found in papers of POUBA (1958), LUKNIŠ (1974) and QUITT (1971). The published flora of vascular plants (HENDRYCH 1968) lists 1170 taxa. Yet comparatively little is known about the bryophyte flora; though many bryologists, especially from Czechoslovakia, have visited the area so far, only a few localities have been studied in greater detail.

The present paper presents the results of the authors' own collections in the area in years 1982 to 1984, together with the unpublished records of Ivan Novotný, Lenka Pujmanová and Jiří Váňa. These collections were done to study the bryologically most important habitats of the mountain karst. Because they are confined mostly to the central part of the orographic unit of Muránska planina, we deliberately concentrated on this area (Fig. 1 and list of localities). Therefore, not all the Muránska planina habitat types were investigated to the same extent; most importantly, xeric localities in the SW part (area of Suché Doly) have been omitted altogether.

HISTORY OF BRYOLOGICAL RESEARCH IN THE AREA

A comprehensive study on the bryoflora of Muránska planina is still lacking. In spite of its extraordinary floristic richness, the area was largely ignored by bryologists in the past: except for isolated record of HAZSLINSZKY (1885), the first bryological records from that area were

published by SUZA (1930) in his work on *Daphne arbuscula*, endemic plant of Muránska planina. Later this author wrote a floristic study on lichens of Muránska planina (SUZA 1950) with some further data on bryophytes as well. The majority of literature records was published by ŠMARDÁ and PEČIAR (ŠMARDÁ 1938, 1939–40, 1940a, b, 1948, 1961a, b, ŠMARDÁ et VANĚK 1955, PEČIAR 1970, 1973, 1974a, 1976). Further, a group of bryologists visited Muránska planina during the XII. International Phytogeographic Excursion in 1958 and published their records in two papers (BOROS 1959, BOROS et al. 1961).

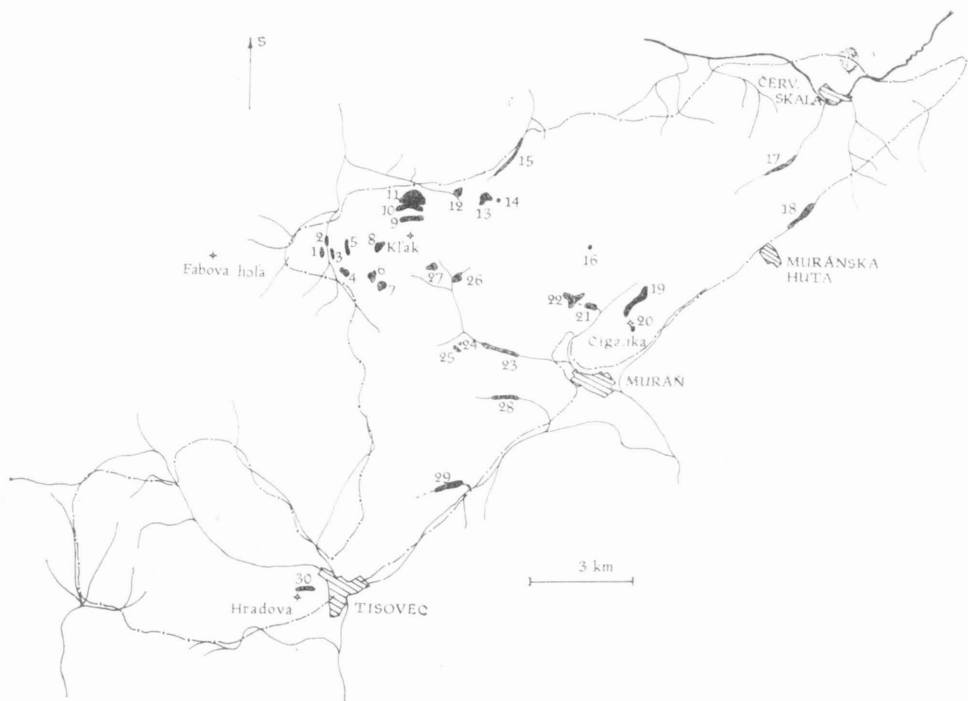


Fig. 1. — Map of Muránska planina with numbers of localities. Delimitation of the area follows LUKNIŠ (1974).

Moreover, many important data on the distribution of bryophytes in Muránska planina were reported in monographs and published distribution maps of individual taxa from Czechoslovakia. The most comprehensive is the series by DUDA at VÁŇA on hepatics distribution in Czechoslovakia, containing revisions of all available herbarium specimens, together with complete literature excerpts. Few other records are included in similar works on mosses (e.g. POSPÍŠIL 1963, 1967, 1968, 1976, 1980, 1981, PILLOUS 1950, 1956, 1958, 1971, ORBÁN 1974, 1975, ZEMANOVÁ 1968). Some bryological data were published in phytosociological papers (PEČIAR 1965, MĀDOK 1976, ŠOLTÉS 1976).

Areas adjacent to Muránska planina but outside the limestone region were also bryologically explored, especially by PEČIAR, who studied the flora of the nearby Stolica-mountain range (PEČIAR 1974b, 1984). Further, the only reliable locality of *Orthotrichum gymnostomum* is reported from a close vicinity of Muránska planina (aspen tree trunks at Muránska Huta) by PILLOUS (1961) and confirmed by POSPÍŠIL (in litt.).

BRYOPHYTE HABITATS CHARACTERISTIC OF MURÁNSKA PLANINA

(1) Cold shaded rocks, especially of northern exposition. The characteristic microclimate of these habitats is due to a rather stable regime of temperature in summer and a constant high air humidity. They are occupied

by a pronounced group of species with a high percentage of arctic-alpine species. Among them, *Cololejeunea calcarea*, *Scapania aequiloba*, *S. aspera*, *S. calcicola*, *Campyllum halleri*, *Distichium inclinatum*, *Platydictya* sp. div., *Hypnum recurvatum*, *Orthothecium rufescens*, *Seligeria* sp. div., *Plagiopus oederi*, *Gymnostomum aeruginosum*, *Hymenostylium recurvirostre*, *Mnium ambiguum*, *Barbula crocea*, *Plagiobryum zieri* etc. are characteristic. These habitats are developed in the most typical way in the northern part of Velká Stožka (loc. 9 and 10); further at Hrdzavá dolina-valley (loc. 25), Hradová-hill (loc. 30), Poludnica (loc. 22), Skalná brána (loc. 7) to name some. Most of them lie in the cold climatic zone of CH 3 or CH 7 (Quitt 1971).

When compared with other limestone areas of Central and East Slovakia not exceeding timberline, Muránska planina is rich in this type of habitats, mostly owing to extreme topography and high altitude. In contrast, the highly diverse area of the Slovenský raj is much richer, because these habitats are developed there in narrow and deep limestone gorges, which do not occur in Muránska planina. The only such gorge of Muránska planina (Javorníková dolina - gorge) differs from those in Slovenský raj in its open mouth and SE orientation. Consequently, these cold habitats are missing almost completely from it (with the exception of a single cushion of *Orthothecium rufescens* in the upper part of the gorge). There are even more subarctic-alpine species in the Slovenský raj-area (e.g. *Encalypta raptocarpa*, *Myurella julacea* etc., cf. HERBEN et al. 1982).

(2) Warm light limestone rocks (e.g. loc. 1, 5, 29). These habitats complexes occur mostly in peripheral and warmer areas on rocks with west or east exposure. They dry out more regularly in summer and probably have a more extreme temperature regime, even when shaded. The bryophyte diversity is greater in the shaded parts; they support species such as *Gymnostomum calcareum*, *Encalypta vulgaris*, *Anomodon longifolius*, *Pseudoleskeella catenulata*, apart from a lot of generalist species. Insolated places are much poorer; their most characteristic species are *Grimmia* sp. div., *Orthotrichum anomalum*, *O. cupulatum* etc.

(3) Deeply shaded rocks, occurring mostly in narrow, though often not deep, forested valleys. Only species tolerating very low illumination grow here, e.g. *Thamnobryum alopecurum*, *Taxiphyllum wissgrillii*, *Anomodon rostratus*, *Mnium marginatum*, *Neckera besseri*, *Timmia bavarica*.

(4) Rotten logs in wet places, especially under constant high air humidity. The major determinant of their bryophyte flora composition is the degree of wood decomposition and the humidity regime; characteristic species are e.g. *Sphenobolus hellerianus*, *Mylia taylorii*, *Anastrophyllum michauxii*, *Riccardia palmata*, *R. latifrons*, *Scapania apiculata*, *S. umbrosa*, *Cephalozia leucantha*, *Lophozia ascendens*, *Harpanthus scutatus*, *Calypogeia suecica* etc. These habitats occur mainly in remnants of primeval forests, e.g. in localities 1, 9, 11, 21, 22, 25.

(5) Decalcified places with northern exposition are probably the most surprising habitats of Muránska planina from the bryological point of view. The most prominent one is the mire „V machoch“ in the Hrdzavá dolina-valley (loc. 24). Though it lies on a limestone bedrock with a great slope, its hydrological, hydrochemical and temperature regimes are balanced enough to support an abundance of acidophilic species characteristic of peat bogs, such as *Cephalozia connivens*, *Mylia anomala*, *Polytrichum strictum*, *Sphag-*

num magellanicum. Probably owing to hydrochemical gradients within the mire, they grow together with more basiphilic species, e.g. *Drepanocladus revolvens*, *D. sendtneri*, *Sphagnum palustre*, *S. fallax*, *S. flexuosum* etc. Further, a group of species characteristic of drier decalcified humus is present, e.g. *Kurzia trichoclados*, *Cephalozia lunulifolia*, *Calypogeia muelleriana*, *C. integristipula*. The mire is surrounded by an acidophilic spruce forest accompanied by some of its constant species, such as *Bazzania trilobata*, *Dicranum congestum*, *Ptilidium ciliare*, *Sphagnum capillifolium*, *Lophozia obtusa*.

Decalcified places on exposed rock tops at higher altitudes are much smaller and drier; their ecology and floristic composition is similar to decalcified northern slopes of mountains above the timberline. They occur mainly at the locality 9 and support e.g. *Meesia uliginosa*, *Dicranum elongatum*, *Kurzia trichoclados*, *Anastrepta orcadensis*, *Polytrichum strictum*, *Sphenobolus minutus*, *Barbilophozia attenuata*, *Bazzania tricrenata*, *Jungermannia leiantha* etc.

(6) Places exposed to microclimatic influence of low lying cave openings. In summer their microclimatic conditions are maintained at a constant level by cold and humid air leakage from the cave systems. Their occurrence is limited to the karst parts of Muránska planina; the most pronounced ones are in the Hrdzavá dolina near and at the mire (loc. 24), in Velká Stožka (loc. 9) and elsewhere. A number of characteristic species such as

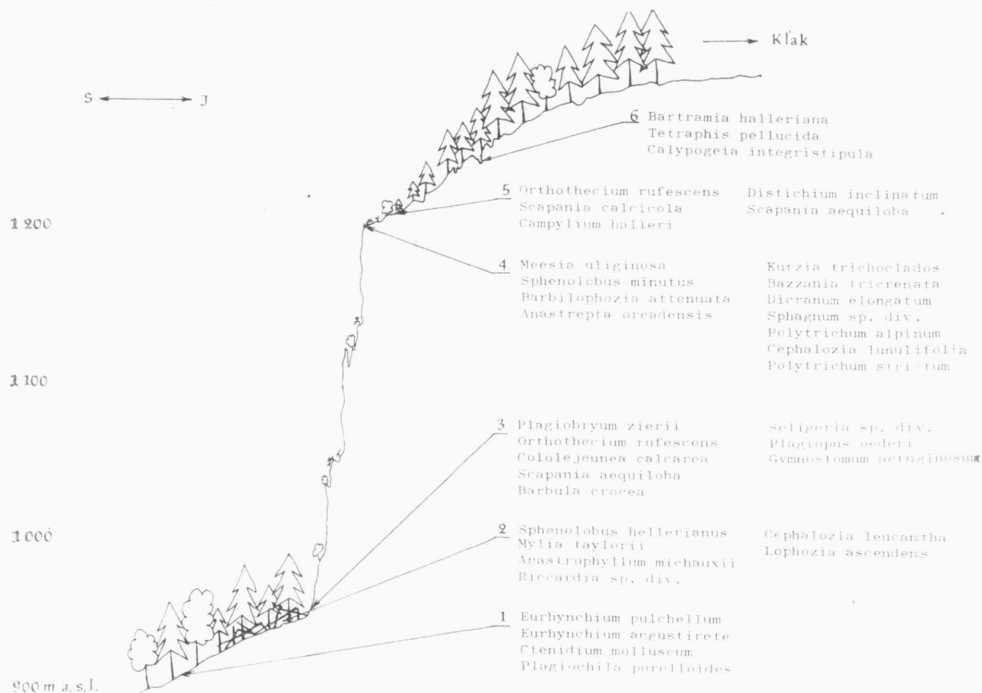


Fig. 2. — Distribution of species representative of different ecological groups at the N slope of Velká Stožka (loc. 9, 10, 11). 1 — common forest species; 2 — species of rotten logs in stable air humidity; 3 — species of cold shaded limestone rocks; 4 — species of decalcified places above the vertical rocks; 5 — species of exposed limestone rocks; 6 — species typical places of with summer cold air leakage.

Bartramia halleriana, *Pohlia cruda*, *P. elongata*, *Polytrichum alpinum*, *Platydictya jungermannoides*, grow here; moreover, some species of silicate substrates colonize a thin layer of humus at these habitats (e.g. *Calypogeia integristipula*, *Tetraphis pellucida*, *Cephalozia bicuspadata*).

BRYO GEOGRAPHIC ANALYSIS

To demonstrate bryofloristic relationships of the Muránska planina flora, we divided all the bryophyte species collected here so far into groups of geographic elements, mostly using the classification of DÜLL (1980, 1983). Taxa not included here were classified into the same system of categories using the data in AMMAN (1928), PODPĚRA (1954), and BOROS (1968). We used the following groups of geographic elements:

1. species with subatlantic or euryatlantic distribution
 - a) proper
 - b) with submediterranean tendency
2. species with (sub-)arctic-alpine distribution
3. species with distribution centre in the boreal zone
 - a) proper
 - b) with dealpine distribution
 - c) with suboceanic tendency
4. species with distribution centre in the temperate zone
 - a) proper
 - b) with submediterranean tendency
 - c) with suboceanic tendency
5. species with submediterranean distribution
 - a) proper
 - b) with suboceanic tendency
6. species with continental distribution

Tab. 1. Percentage of groups of geographic elements.

geographic element	subdivision of element	% (subdivision)	% (group)
sub- or euryatlantic	proper	11	12
	submediterranean	1	
(sub-)arctic-alpine		4	4
boreal	proper	24	29
	dealpine	4	
	suboceanic	1	
temperate	proper	33.5	44.5
	submediterranean	3	
	suboceanic	8	
submediterranean	proper	7	10
	suboceanic	3	
continental		0.5	0.5

These groups expressed in percent are listed in table 1. The group of subatlantic species is rather abundant in the area (ca. 12 % from the total species number) and they exhibit strong substrate preference for decalcified organic matter, especially in cold habitats, e.g. decalcified humus on calcareous rocks (*Anastrepta orcadensis*, *Barbilophozia attenuata*), mire in Hrdzavá dolina (*Cephalozia connivens*, *Calyptogeia integristipula*, *Mylia taylorii*), rotten logs (*Mylia taylorii*, *Nowellia curvifolia*, *Scapania umbrosa*) or soil humus in spruce forests (*Plagiothecium undulatum*, *Rhytidiadelphus loreus*).

Though Muránska planina does not exceed the timberline, there is an abundance of species with (sub-)arctic-alpine type of distribution. The ecology of this group is quite pronounced: they occur mainly on cold limestone rocks (*Plagiobryum zieri*, *Platydictya jungermannoides*, *Dicranum elongatum*, *Sauteria alpina*) and comprise ca. 4 % of the total flora.

Species with the distribution centre in the boreal zone comprise 29 % of the total species number. They grow in rather diverse habitats (rotten logs, cold rocks, climax spruce forests), though some species of more specialized ecology belong here, e.g. *Meesia uliginosa*, *Bazzania tricrenata*, *Sphenobolus hellerianus*, *Campylium halleri*, *Pohlia elongata*, *Mnium ambiguum* etc.

The most numerous group comprises species with distribution centre in the temperate zone (ca. 44.5 % of the total species number). They are mostly generalist species widely distributed over the area.

Submediterranean species (10 % of the total flora) growing in Muránska planina are mostly epilithic, occurring mainly on insolated rocks or on light but shaded rocks (*Grimmia tergestina*, *Grimmia pulvinata*, *Homalothecium philippeanum*, *Gymnostomum calcareum*, *Trichostomum crispulum*, *T. brachydontium*).

LIST OF LOCALITIES

1. Limestone rocks at the E slope of Malá Stožka hill, ca. 8 km S of village Závadka nad Hronom, ca. 900–950 m a.s.l.
2. Banks of the Dudlavka-brook ca. 500 m N of the forester's house Mezi Stožkami, ca. 8 km S of village of Závadka nad Hronom, ca. 840 m a.s.l.
3. Limestone rocks along the road N of the forester's house Mezi Stožkami, ca. 8 km S of the village of Závadka nad Hronom, ca. 870 m a. s.l.
4. Flooded meadows SE of the forester's house Mezi Stožkami, ca. 8 km S of the village of Závadka nad Hronom, ca. 880 m a.s.l.
5. SW exposed rocks at the SW part of the Velká Stožka nature reserve, ca. 1.5 NW of the forester's house Nižná Klaková, ca. 8.5 km SSE of the village of Závadka nad Hronom, ca. 1150–1200 m a.s.l.
6. Spruce forest ca. 1 km W of the forester's house Nižná Klaková, ca. 9 km SSE of the village of Závadka nad Hronom, ca. 1050 m a.s.l.
7. Limestone rocks at the Kamenná brána hill (sometimes called Skalní brána), ca. 800 m WSW of the forester's house Nižná Klaková, ca. 9 km SSE of the village of Závadka nad Hronom, ca. 1100–1120 m a.s.l.
8. Forest meadows at summit plateau between Zadné hory and Klak hills, ca. 7 km NW of the village of Muráň, ca. 1300 m a.s.l.
9. Upper part of the N exposed limestone rocks of the Velká Stožka nature reserve, 1 km N of the Klak hill, ca. 8 km SE of the village of Závadka nad Hronom, ca. 1200–1350 m a.s.l.
10. Lower part of the N exposed limestone rocks of the Velká Stožka nature reserve, 1.5 km N of the Klak hill, ca. 8 km SE of the village Závadka nad Hronom, ca. 950–1000 m a.s.l.
11. Forests at the valley Za Nehovým, S of the brook, ca. 2 km ESE of the forester's house Klatná, ca. 7 km SE of the village of Závadka nad Hronom, ca. 850–950 m a.s.l.
12. Spruce forests at the W slope, ca. 500 m W of the Sitárovo saddle, ca. 7.5 km SSE of the village Helpa, ca. 1000–1100 m a.s.l.

13. Meadows and forest margins around the forester's house Studňa, ca. 6 km WNW of the village Muráň, ca. 1150–1180 m a.s.l.
14. Nature reserve Čadová jama na Muráni gorge close to the forester's house Studňa, ca. 6 km WNW of the village Muráň, ca. 1180 m a.s.l.
15. Banks of the Rakov brook NE of the Sitárovo saddle, ca. 7 km SE of the village of Helpa, ca. 800–900 m a.s.l.
16. Forests around Jaskova Muka hill, ca. 3.5 km N of the village Muráň, ca. 1050 m a.s.l.
17. Valley of the Trsteník brook, ca. 3 km SW of the village of Červená skala, ca. 850–950 m a.s.l.
18. Locality Tesná skala: limestone rocks NW of the road from Muránska Huta to Červená Skala, ca. 1 km NW of the village Muránska huta, ca. 750–900 m a.s.l.
19. Limestone rocks of NW exposition in the forest NW of Muránsky hrad, and limestone rocks of N exposition in the forest WNW of a triangulation point 1041 m NE of the village Muráň, ca. 800–1000 m a.s.l.
20. Limestone rocks with SE exposition at the Cigánka hill, ca. 1.5 km NE of the village Muráň, ca. 900 m a.s.l.
21. Upper part of a small valley with SE orientation in the N part of the valley of the Dolinský potok brook, ca. 2 km N of Muráň, ca. 500–650 m a.s.l.
22. Locality Poludnica: the upper part of the rocks with SE exposition in the NW part of the valley of the Dolinský potok brook, and limestone rocks along a periodic brook between the rocks and the forester's house Maretkina, ca. 3 km NNW of the village Muráň, ca. 900 to 1000 m a.s.l.
23. The lowest part of the Hrdzavá dolina valley (along the Hrdzavý potok brook between the first and third foot bridges), ca. 4 km WNW of the village Muráň, ca. 550–750 m a.s.l.
24. A mire and a surrounding spruce forest at the N slope at the central part of the Hrdzavá dolina valley, ca. 4 km WNW of the village Muráň, ca. 750–800 m a.s.l.
25. Limestone rocks of NE exposition in the forest at the central part of the Hrdzavá dolina valley, ca. 4 km WNW of the village Muráň, ca. 850–950 m a.s.l.
26. Bottom of the Hrdzavá dolina valley near the forester's house, ca. 5.5 km NW of the village Muráň, ca. 800–850 m a.s.l.
27. Beech forest in the upper part of the Hrdzavá dolina valley, ca. 700 m ENE of the forester's house Nižná Klaková, ca. 7.5 km WNW of the village Muráň, ca. 1050–1100 m a.s.l.
28. Javorníková dolina valley, ca. 4.5 km NE of the village Muráň, ca. 550–750 m a.s.l.
29. Martinová dolina valley, between the ridges of Šarkanica and Strelnica, ca. 4.5 NE of Tisovec, ca. 550–750 m a.s.l.
30. Limestone rocks of N exposition at the hill Hradová, ca. 1 km W of Tisovec, ca. 800–850 m a.s.l.

LIST OF SPECIES

The following list contains our collections and collections by Ivan Novotný, Lenka Pujmanová and Jiří Váňa, together with the published records from Muránska planina. The entries are arranged in the following way: name of species (infraspecific taxa were not distinguished), number of locality, where it was collected by us, followed by symbols of present collectors in parentheses (H — Tomáš Herben, private herbarium, N — Ivan Novotný, BRNM, P — Lenka Pujmanová, private herbarium, S — Zdeněk Soldán, private herbarium, V — Jiří Váňa, private herbarium; when our record at a particular locality is not based on a herbarium specimen, it is denoted A). The list of papers reporting the particular species from the area is at the end of each entry (papers only citing earlier record without specimen revision were not included). When in doubt about the identification of a specimen already reported, we have either relied on the already published revision or revised source specimen, if it was available. After these revisions, the species *Cephalozia macounii*, *Cladopodiella francisci* and *Porella cordaeana* should be excluded from the flora of Muránska planina; these species are marked + in the species list. Was the record considered doubtful and the herbarium

specimen was not available, the species is marked?. Consequently, we assume that the following species do not grow in the study area: *Calypogeia neesiana*, *Dicranum majus*, *Drepanocladus aduncus*, *Eurhynchium striatum*, *Mnium spinulosum*, *Peltolepis quadrata*, *Plagiobryum demissum* and *Timmia megapolitana*.

The list contains 281 species (202 mosses and 79 hepatics). We failed to confirm (apart from doubtful records) 22 mosses and 13 hepatics; conversely, 69 mosses and 23 hepatics were recorded for the first time.

Hepaticae

- Anastrepta orcadensis* (HOOK.) SCHIFFN.: 9 (HS).
Anastrophyllum michauxii (F. WEB.) EVANS: 9 (H), 11 (HS), 25 (S); ŠMARDÁ 1940b, DUDA et VÁŇA 1984a.
Aneura pinguis (L.) DUM.: 7 (S), 10 (S), 19 (V); ŠMARDÁ 1940b.
Apometzgeria pubescens (SCHRANK) KUWAH.: 1 (A), 5 (HS), 7 (HS), 9 (A), 10 (A), 14 (H), 18 (V), 23 (N), 25 (N), 29 (A); ŠMARDÁ 1940b, ŠMARDÁ 1961a, BOROS et al. 1961, PECIAR 1974a.
Barbilophozia attenuata (MART.) LOESKE: 9 (HS), 25 (S).
Barbilophozia barbata (SCHREB.) LOESKE: 7 (S), 9 (H), 19 (A), 21 (S); ŠMARDÁ 1940b, PECIAR 1974a.
Barbilophozia lycopodioides (WALLR.) LOESKE: ŠOLTÉS 1976.
Bazzania tricrenata (WAHLENB.) LINDB.: 9 (HS).
Bazzania trilobata (L.) S. GRAY: 9 (A), 10 (S), 24 (N).
Blasia pusilla L.: 6 (S); ŠMARDÁ 1940b, DUDA et VÁŇA 1984b.
Blepharostoma trichophyllum (L.) DUM.: 1 (A), 9 (HS), 11 (N), 24 (HPS), 28 (N), 29 (H), 30 (A); SUZA 1930, ŠMARDÁ 1940b, BOROS et al. 1961, PECIAR 1974a.
Calypogeia integristipula STEPH.: 9 (H), 24 (HNPS); ŠMARDÁ 1940b (sub *C. neesiana*), ŠMARDÁ 1961a, BOROS et al. 1961.
Calypogeia muelleriana (SCHIFFN.) K. MÜLL.: 24 (H).
? *Calypogeia neesiana* (MASS. et CAREST.) K. MÜLL.: ŠMARDÁ (1940b) published records from localities Nos. 10 and 11, but the only specimen in his herbarium is *C. integristipula*, which was not distinguished at the specific level at the time of publication of his paper.
Calypogeia suecica (H. ARNELL et J. PERSS.) WARNST.: 9 (HS), 11 (H), 29 (A); ŠMARDÁ 1940b, BOROS 1959, BOROS et al. 1961, ŠMARDÁ 1961a.
Cephalozia bicuspидata (L.) DUM.: 9 (HS), 11 (H), 24 (H).
Cephalozia connivens (DICKS.) LINDB.: 24 (HS).
Cephalozia lammersiana (HÜB.) CARRING.: 24 (HV).
Cephalozia leucantha SPRUCE: 9 (H), 11 (HN); BOROS 1959, BOROS et al. 1961.
Cephalozia lunulifolia (DUM.) DUM.: 9 (HS), 11 (HS), 24 (HNPSV); ŠMARDÁ 1940b, BOROS et al. 1961.
+ *Cephalozia macounii* (AUST.) AUST.: BOROS et al. (1961) and ŠMARDÁ (1961a) published records from locality No. 24, but the specimen in Šmardá's herbarium is *C. leucantha* (Duda et Váňa 1985a).
Cephalozia pleniceps (AUST.) LINDB.: 24 (NPV).
Cephaloziella divaricata (SM.) SCHIFFN.: 4 (H).
Chiloscyphus pallescens (HOFFM.) DUM.: ŠMARDÁ 1940b, ŠMARDÁ 1961a.
Chiloscyphus polyanthos (L.) CORDA: ŠMARDÁ 1940b, BOROS et al. 1961, PECIAR 1974a.

- + *Cladopodiella francisci* (HOOK.) JOERG.: Revision of PECIAR's (1974a) record from Muránska planina was published by DUDA et VÁŇA (1981). The herbarium specimen is *Lophozia badensis*.
- Cololejeunea calcarea* (LIB.) SCHIFFN.: 1 (A), 7 (H), 9 (H), 10 (NS), 19 (A), 25 (N), 28 (HN); SUZA 1930, ŠMARDA 1040b, DUDA 1960, BOROS et al. 1961, ŠMARDA 1961a, PECIAR 1974a, DUDA et VÁŇA 1975.
- Cololejeunea rossettiana* (MASS.) SCHIFFN.: 29 (H), ŠMARDA (1940b) published a record from locality No. 10, but the specimen in his herbarium is *C. calcarea*. He often confused the two species (cf. HERBEN et al. 1982). In this area, they seem to have different ecology. *C. calcarea* grows in cold places (esp. rocks) concomitantly with subarctic-alpine species, while *C. rossettiana* grows on humus in a light oak forest in a broad valley exposed to the south. Its ecology corresponds well with the general distribution of this subatlantic-submediterranean species (DUDA et VÁŇA 1975).
- Conocephalum conicum* (L.) COGNIAUX: 1 (S), 9 (H), 10 (A), 14 (A), 19 (A), 28 (A), 29 (S); ŠMARDA 1940b, BOROS et al. 1961, DUDA et VÁŇA 1973b. In the studied area there are two morphologically different types of this species, which do not intergrade. In addition to the common one, which grows on wet humose places, there is a smaller morphotype differing in less prominent diamond-shaped areas of upper epidermis as well as air pores. It colonizes rather dry sinter at the feet of the rocks and in small caves (localities Nos. 1 and 29).
- Diplophyllum obtusifolium* (HOOK.) DUM.: 23 (V).
- Frullania dilatata* (L.) DUM.: 1 (H), 9 (S), 10 (A), 11 (HS), 21 (H), 23 (N), 28 (HN), 29 (HS), 30 (H); ŠMARDA 1940b, PECIAR 1965, PECIAR 1974a, DUDA et VÁŇA 1977a.
- Frullania tamarisci* (L.) DUM.: 10 (H).
- Harpanthus scutatus* (WEB. et MOHR) SPRUCE: BOROS et al. 1961, ŠMARDA 1961a, DUDA et VÁŇA 1978a.
- Jamesoniella autumnalis* (DC.) STEPH.: 10 (NS), 25 (N).
- Jungermannia atrovirens* DUM.: 9 (H), 10 (HNS), 25 (H), 28 (N); ŠMARDA 1940b.
- Jungermannia gracillima* SM.: ŠMARDA 1940b, DUDA et VÁŇA 1971a.
- Jungermannia leiantha* GROLLE: 9 (H); ŠMARDA 1940b, ŠMARDA 1961a, DUDA et VÁŇA 1969.
- Kurzia trichoclados* (K. MÜLL.) GROLLE: 9(H), 24 (NSV). In Czechoslovakia, this species has been recorded only in Šumava, Vysoké Tatry, Belianské Tatry, and Nizké Tatry mountains (DUDA et VÁŇA 1971b, DUDA et VÁŇA 1985b). The ecology of its localities in Muránska planina is similar to those published previously: in the locality No. 9, it grows on decalcified humus in stands with floristic composition strongly resembling those published by DUDA et VÁŇA. Conversely, its stands at locality No. 26 tend to be of a peat bog type. The identity of this species has been confirmed by Duda and Pócs (Duda pers. comm.).
- Lejeunea cavifolia* (EHRH.) LINDB.: 28 (N); ŠMARDA 1940b, DUDA et VÁŇA 1976.
- Lepidozia reptans* (L.) DUM.: 1 (A), 7 (A), 9 (HS), 11 (HNS), 24 (NP), 29 (A), 30 (A); SUZA 1930, ŠMARDA 1940b, BOROS et al. 1961.
- Lophocolea bidentata* (L.) DUM.: PECIAR 1974a.

- Lophocolea heterophylla* (SCHRAD.) DUM.: 1 (A), 7 (A), 9 (H), 11 (N), 19 (A), 25 (A), 28 (A), 29 (A), 30 (A); BOROS et al. 1961, PECIAR 1974a.
- Lophocolea minor* NEES: 19 (V), 21 (S).
- Lophozia ascendens* (WARNST.) SCHUST.: 9 (HS), 11 (H), 24 (H), 25 (H).
- Lophozia badensis* (GOTT.) SCHIFFEN.: PECIAR 1974a (sub n. *Cladopodiella francisci*), DUDA et VÁŇA 1981.
- Lophozia collaris* (NEES) DUM.: 9 (A), 10 (HN), 14 (A), 19 (V), 28 (HN), 29 (S), 30 (H); ŠMARDÁ 1940b, BOROS et al. 1961, ŠMARDÁ 1961a, PECIAR 1974a.
- Lophozia guttulata* (LINDB.) EVANS: 9 (H), 11 (HN), 22 (V), 24 (HNPS).
- Lophozia incisa* (SCHRAD.) DUM.: 9 (HS), 11 (HN), 25 (H); ŠMARDÁ 1940b, BOROS et al. 1961, ŠMARDÁ 1961a.
- Lophozia obtusa* (LINDB.) EVANS: 24 (H).
- Lophozia ventricosa* (DICKS.) DUM.: 9 (H), 24 (HN); ŠMARDÁ 1940b, PECIAR 1974a.
- Marchantia polymorpha* L.: 2 (S).
- Metzgeria conjugata* LINDB.: 1 (S), 11 (H), 19 (P), 28 (NS); SUZA 1930, ŠMARDÁ 1940b, BOROS et al. 1961, ŠMARDÁ 1961a.
- Metzgeria furcata* (L.) DUM.: 1 (S), 10 (HS), 18 (V), 22 (P), 25 (N), 27 (H), 28 (S), 29 (HS), 30 (A); ŠMARDÁ 1940b, SUZA 1950, BOROS et al. 1961, PECIAR 1974a.
- Moerckia hibernica* (HOOK.) GOTT.: 26 (S).
- Mylia anomala* (HOOK.) S. GRAY: 24 (HV); DUDA et VÁŇA 1973a.
- Mylia taylorii* (HOOK.) S. GRAY: 9 (H), 11 (HN), 24 (H), 25 (H); ŠMARDÁ 1940b, BOROS et al. 1961, ŠMARDÁ 1961a.
- Nowellia curvifolia* (DICKS.) MITT.: 1 (A), 5 (A), 9 (HS), 11 (HS), 28 (N), 29 (A), 30 (A); ŠMARDÁ 1940b, BOROS et al. 1961, DUDA et VÁŇA 1983b.
- Pedinophyllum interruptum* (NEES) KAAL.: 1 (A), 9 (A), 10 (NS), 14 (A), 19 (A), 22 (P), 23 (H), 28 (HN), 29 (HS), 30 (A); SUZA 1930, ŠMARDÁ 1940b, BOROS et al. 1961, ŠMARDÁ 1961a, DUDA et VÁŇA 1983a.
- Pellia endiviifolia* (DICKS.) DUM.: 9 (S), 10 (A), 19 (A).
- ? *Peltolepis quadrata* (SAUT.) K. MÜLL.: BOROS 1959, BOROS et al. 1961, ŠMARDÁ 1961a, PECIAR 1974a. This species of a pronounced arctic-alpine distribution does not probably grow in the Muránska planina. Its published records are based on two independent collections. BOROS et al. (1961) were the first to publish it, but it was due to misidentification. We failed to find any specimen in Šmardá's herbarium, but the specimen in BOROS's herbarium is *Reboulia hemisphaerica* (DUDA et VÁŇA 1973b); Szweykowski did not collect this species at all (Szweykowski pers. comm.). Second independent collection was done by PECIAR (1974a), however, this specimen in his herbarium is also *Reboulia hemisphaerica* (Váňa pers. comm.).
- Plagiochila asplenioides* (L. emend. TAYL.) DUM.: 1 (H), 8 (A), 11 (A), 19 (A); SUZA 1930. The record of Suza may be due to confusion with *Plagiochila porelloides*, which is much commoner in the area and which was not distinguished at the specific level at the time of publication of his paper.
- Plagiochila porelloides* (NEES) LINDENB.: 7 (A), 8 (S), 10 (A), 11 (A), 19 (S), 25 (A), 28 (A), 29 (S), 30 (A); POSPÍŠIL 1980.
- Porella arboris-vitae* (WITH.) GROLLE: DUDA et VÁŇA 1978b.
- + *Porella cordaeana* (HÜB.) MOORE: The record of PECIAR (1970) is due to *Porella platyphylla* (DUDA et VÁŇA 1979b).

- Porella platyphylla* (L.) PFEIFF.: 1 (S), 5 (A), 19 (V), 21 (H), 28 (N), 29 (H), 30 (A); BOROS et al. 1961, PECIAR 1970 (sub n. *P. cordaeana*), PECIAR 1974a, DUDA et VÁŇA 1979a.
- Preissia quadrata* (SCOP.) NEES: 19 (V); ŠMARDÁ 1940b.
- Ptilidium ciliare* (L.) HAMPE: 9 (HS), 24 (NP); SUZA 1950.
- Ptilidium pulcherrimum* (G. WEB.) VAIN.: 1 (A), 5 (A), 9 (H), 11 (HN), 21 (P), 29 (A); SUZA 1930, ŠMARDÁ 1940b, BOROS et al. 1961, PECIAR 1974a.
- Radula complanata* (L.) DUM.: 1 (A), 7 (S), 9 (HS), 10 (S), 11 (A), 19 (A), 21 (H), 22 (PS), 23 (H), 28 (A), 29 (A), 30 (A); SUZA 1930, ŠMARDÁ 1940b, SUZA 1950, BOROS et al. 1961, PECIAR 1965, DUDA et VÁŇA 1978a.
- Reboulia hemisphaerica* (L.) RADDI: 10 (S); ŠMARDÁ 1940b, BOROS 1959 (sub n. *Peltolepis quadrata*) BOROS et al. 1961 (etiam sub n. *Peltolepis quadrata*), ŠMARDÁ 1961a (sub n. *Peltolepis quadrata*), DUDA et VÁŇA 1973a, PECIAR 1974a (sub n. *Peltolepis quadrata*).
- Riccardia latifrons* (LINDB.) LINDB.: 11 (H); ŠMARDÁ 1940b, DUDA et VÁŇA 1982a. According to DUDA et VÁŇA (1982a), the Šmarda's specimen from the locality No. 11 is *Riccardia palmata*.
- Riccardia palmata* (HEDW.) CARRUTH.: 9 (S), 11 (HN); ŠMARDÁ 1940b (sub n. *R. latifrons*), BOROS et al. 1961, DUDA et VÁŇA 1982b.
- Sauteria alpina* (NEES) NEES: ŠMARDÁ 1940b, SUZA 1950, DUDA et VÁŇA 1973b. Probably the only locality in Czechoslovakia at the altitude lower than 1300 m a.s.l.; in Muránska planina it grows at the altitude of ca. 950 m a.s.l.
- Scapania aequiloba* (SCHWAEGR.) DUM.: 9 (HS), 10 (HS), 18 (V), 19 (SV), 22 (V), 23 (HN), 25 (S); ŠMARDÁ 1940b, BOROS et al. 1961, DUDA et VÁŇA 1970.
- Scapania apiculata* SPRUCE: ŠMARDÁ 1940a, b, BOROS 1959, BOROS et al. 1961, ŠMARDÁ 1961a. According to BOROS et al. (1961), the specimen in Boros's herbarium (BOROS 1959) is *Scapania mucronata*. However, the identity of the specimen in Šmarda's herbarium has been confirmed by Duda (pers. comm.).
- Scapania aspera* H. BERN.: DUDA et VÁŇA 1970.
- Scapania calcicola* (H. ARNELL et J. PERSS.) INGH.: 9 (H), 10 (H), 34 (H); BOROS et al. 1961.
- Scapania mucronata* BUCH: BOROS et al. 1961, DUDA et VÁŇA 1968.
- Scapania umbrosa* (SCHRAD.) DUM.: ŠMARDÁ 1940b.
- Sphenolobus hellerianus* (NEES) STEPH.: 11 (HS); ŠMARDÁ 1940b, DUDA 1960, 1960, DUDA et VÁŇA 1984a.
- Sphenolobus minutus* (SCHREB.) BERGGR.: 9 (HS).
- Trichocolea tomentella* (EHRH.) DUM.: 10 (S); ŠMARDÁ 1940b, DUDA et VÁŇA 1977b.
- Tritomaria exsecta* (SCHRAD.) LOESKE: 1 (H), 11 (HNS), 25 (HN), 30 (H); ŠMARDÁ 1940b, BOROS et al. 1961, DUDA et VÁŇA 1982b.
- Tritomaria quinquentata* (HUDS.) BUCH: 7 (A), 9 (HS), 10 (A), 24 (S), 25 (N); ŠMARDÁ 1940b, DUDA et VÁŇA 1982c.

Musci

- Amblystegium juratzkanum* SCHIMP.: SUZA 1930.
- Amblystegium serpens* (HEDW.). B.S.G.: 23 (N).

- Anomodon attenuatus* (HEDW.) HÜB.: 1 (A), 21 (HS), 23 (N), 28 (A), 29 (A), 30 (H); SUZA 1930.
- Anomodon longifolius* (BRID.) HARTM.: 1 (S), 30 (H); BOROS et al. 1961.
- Anomodon rostratus* (HEDW.) SCHIMP.: 28 (HN), 29 (H); BOROS et al. 1961.
- Anomodon viticulosus* (HEDW.) HOOK. et TAYL.: 1 (A), 5 (H), 10 (A), 19 (A), 21 (HP), 22 (P), 28 (H), 29 (S), 30 (A); SUZA 1930, ŠMARDÁ 1948, PEČIAR 1965, PEČIAR 1973.
- Atrichum undulatum* (HEDW.) P. BEAUV.: 6 (H), 11 (A), 12 (A); ŠMARDÁ 1948.
- Aulacomnium palustre* (HEDW.) SCHWAEGR.: 24 (H).
- Barbula convoluta* HEDW.: 17 (N), 22 (P), 27 (H).
- Barbula crocea* (BRID.) WEB. et MOHR: 9 (H), 10 (HS), 21 (H), 28 (H); ŠMARDÁ 1940b, ŠMARDÁ 1948.
- Barbula unguiculata* HEDW.: 29 (H); PEČIAR 1974a.
- Bartramia halleriana* HEDW.: 9 (A), 25 (HN).
- Brachythecium albicans* (HEDW.) B.S.G.: 8 (S), 30 (H).
- Brachythecium glareosum* (SPRUCE) B.S.G.: 28 (N).
- Brachythecium populeum* (HEDW.) B.S.G.: 1 (H), 11 (S), 29 (S); ŠMARDÁ 1948, BOROS et al. 1961, ŠMARDÁ 1961b.
- Brachythecium rivulare* B.S.G.: 11 (A), 17 (N), 19 (H); ŠMARDÁ 1940b, ŠMARDÁ 1948.
- Brachythecium rutabulum* (HEDW.) B.S.G.: 19 (H), 21 (S), 23 (H), 28 (NS), 29 (S).
- Brachythecium salebrosum* (WEB. et MOHR) B.S.G.: 8 (S), 11 (H); BOROS et al. 1961.
- Brachythecium starkei* (BRID.) B.S.G.: 9 (H).
- Brachythecium velutinum* (HEDW.) B.S.G.: 1 (A), 5 (H), 7 (A), 8 (S), 9 (H), 10 (A), 24 (H), 25 (A), 29 (A), 30 (A); SUZA 1930, BOROS et al. 1961.
- Bryoerythrophyllum recurvirostre* (HEDW.) CHEN: 1 (A), 5 (H), 7 (A), 9 (HS), 19 (H), 28 (H); ŠMARDÁ 1948, BOROS et al. 1961, ŠMARDÁ 1961b.
- Bryum algovicum* C. MÜLL.: 9 (H); ŠMARDÁ 1940b.
- Bryum caespiticium* HEDW.: ŠMARDÁ 1948.
- Bryum capillare* HEDW.: 5 (H), 10 (S), 23 (N); ŠMARDÁ 1940b, ŠMARDÁ 1948.
- Bryum flaccidum* BRID.: 27 (H).
- Bryum inclinatum* (BRID.) BLAND.: 9 (S).
- Bryum pallens* SW.: 3 (H), 9 (HS), 13 (S), 17 (N), 19 (S); ŠMARDÁ 1940b, ŠMARDÁ 1948.
- Bryum pseudotriquetrum* (HEDW.) GAERTN. et al.: 10 (H); ŠMARDÁ 1940b.
- Buxbaumia viridis* (LAM. et DC.) MOUG. et NESTL.: SUZA 1930, ŠMARDÁ 1940b, ŠMARDÁ 1948, BOROS 1959, BOROS et al. 1961.
- Calliergonella cuspidata* (HEDW.) LOESKE: 8 (A), 10 (A); PEČIAR 1973.
- Campyllum chrysophyllum* (BRID.) J. LANGE: SUZA 1930, PEČIAR 1974a.
- Campyllum halleri* (HEDW.) LINDB.: 7 (A), 10 (HN), 19 (A), 28 (A); ŠMARDÁ 1940b.
- Campyllum protensum* (BRID.) KINDB.: 3 (H), 9 (H), 13 (S), 16 (N), 17 (N).
- Campyllum stellatum* (HEDW.) C. JENS.: 16 (N), 17 (N); ŠMARDÁ 1940b, ŠMARDÁ 1948, BOROS et al. 1961.
- Ceratodon purpureus* (HEDW.) BRID.: 4 (A), 10 (A), 27 (H); ORBÁN 1974.
- Cinclidotus aquaticus* (HEDW.) B.S.G.: PILOUS 1950, ŠMARDÁ et VANĚK 1955.

- Cirriphyllum crassinervium* (TAYL.) LOESKE et FLEISCH.: 19 (S), 28 (N), 29 (S), 30 (H); ŠMARDÁ 1948.
- Cirriphyllum piliferum* (HEDW.) GROUT: 8 (S).
- Cirriphyllum tenuinerve* (LINDB.) WIJK et MARG.: 1 (H), 9 (H), 11 (H), 21 (S), 22 (S), 28 (HN), 29 (HS); BOROS et al. 1961, ŠMARDÁ 1961b.
- Climacium dendroides* (HEDW.) WEB. et MOHR: 21 (S), 29 (A).
- Cratoneuron commutatum* (HEDW.) G. ROTH: 2 (S), 10 (N), 28 (N); ŠMARDÁ 1948.
- Cratoneuron decipiens* (DE NOT.) LOESKE: 29 (S).
- Cratoneuron filicinum* (HEDW.) SPRUCE: ŠMARDÁ 1940b.
- Ctenidium molluscum* (HEDW.) MITT.: 1 (H), 5 (A), 7 (A), 9 (A), 10 (NP), 11 (A), 19 (A), 22 (P), 23 (N), 25 (A), 28 (N), 29 (A), 30 (A); SUZA 1930, ŠMARDÁ 1940b, ŠMARDÁ 1948, BOROS et al. 1961.
- Dichodontium pellucidum* (HEDW.) SCHIMP.: 11 (N), 14 (H), 23 (N); ŠMARDÁ 1940b.
- Dicranella heteromalla* (HEDW.) SCHIMP.: 4 (H), 6 (A), 12 (A).
- Dicranella varia* (HEDW.) SCHIMP.: 3 (H).
- Dicranodontium denudatum* (BRID.) BRITT.: 9 (H).
- Dicranum congestum* BRID.: 24 (H).
- Dicranum elongatum* SCHWAEGR.: 9 (HS). Probably the lowest locality of this subarctic-alpine species in Czechoslovakia; in Muránska planina it grows at the altitude of ca. 1200 m a.s.l. (ZEMANOVÁ 1968).
- Dicranum flagellare* HEDW.: 24 (HS).
- Dicranum fuscescens* SM.: 9 (H).
- ? *Dicranum majus* SM.: SUZA 1930. We consider this record dubious, but we were not able to find any specimen in Suza's herbarium. We hold that this record is due to confusion with *Dicranum scoparium*. *Dicranum majus*, which has boreal (subatlantic?) type of distribution, has been recorded in Czechoslovakia only in Bohemian mountains and at isolated localities in Hrubý Jeseník and Bratislava (PILOUS 1958, ZEMANOVÁ 1968).
- Dicranum montanum* HEDW.: 1 (H), 5 (A), 9 (H), 10 (H), 21 (H), 22 (P), 24 (HN), 27 (H), 29 (H); ŠMARDÁ 1940b, SUZA 1950, BOROS et al. 1961.
- Dicranum scoparium* HEDW.: 1 (A), 7 (A), 8 (S), 9 (A), 10 (H), 12 (A), 24 (NS), 25 (A), 29 (A), 30 (A); SUZA 1930, ŠMARDÁ 1940b, SUZA 1950, ZEMANOVÁ 1968.
- Didymodon fallax* (HEDW.) ZANDER: 30 (H); BOROS et al. 1961.
- Didymodon ferrugineus* (BESCH.) M. HILL: 3 (H), 9 (H).
- Didymodon sinuosus* (MITT.) DELOGNE: PILOUS 1956.
- Distichium capillaceum* (HEDW.) B.S.G.: 1 (A), 5 (A), 9 (H), 10 (A), 25 (S); SUZA 1930, ŠMARDÁ 1940b, 1948, ORBÁN 1974, PEČIAR 1974a.
- Distichium inclinatum* (HEDW.) B.S.G.: 9 (H), 10 (H), 28 (HNS); ORBÁN 1974.
- Ditrichum cylindricum* (HEDW.) GROUT: 22 (S); ŠMARDÁ 1948.
- Ditrichum flexicaule* (SCHWAEGR.) HAMPE: 1 (A), 5 (A), 7 (A), 9 (A), 20 (A), 22 (P), 28 (N), 29 (A), 30 (A); SUZA 1930, ORBÁN 1974, PEČIAR 1974a.
- ? *Drepanocladus aduncus* (HEDW.) WARNST.: SUZA 1950. We consider this record dubious, but we were not able to find any specimen in Suza's herbarium. We hold that this record from tree bole is due to confusion with *Drepanocladus uncinatus*.
- Drepanocladus revolvens* (SW.) WARNST.: 24 (HN).

- Drepanocladus sendtneri* (H. MÜLL.) WARNST.: 24 (H).
- Drepanocladus uncinatus* (HEDW.) WARNST.: 1 (H), 9 (A), 11 (A), 19 (A), 28 (A); ŠMARDA 1940b.
- Encalypta streptocarpa* HEDW.: 1 (A), 5 (A), 9 (A), 10 (NS), 17 (N), 19 (A), 23 (N), 28 (A), 29 (A), 30 (A); ŠMARDA 1940b, PECIAR 1974a.
- Encalypta vulgaris* HEDW.: 1 (H), 5 (H), 7 (A), 29 (HS); SUZA 1930.
- Eucladium verticillatum* (BRID.) B.S.G.: 21 (S), 23 (H), 28 (HNS), 29 (H); ŠMARDA 1940b.
- Eurhynchium angustirete* (BROTH.) T. KOP.: 1 (A), 3 (H), 7 (A), 9 (S), 10 (S), 11 (A), 25 (A), 29 (A); BOROS et al. 1961, POSPÍŠIL 1980.
- Eurhynchium hians* (HEDW.) SANDE LAC.: 8 (S); ŠMARDA 1940b.
- Eurhynchium praelongum* (HEDW.) B.S.G.: 9 (S), 10 (S), 13 (S).
- Eurhynchium pulchellum* (HEDW.) JENN.: 1 (HS), 9 (H), 11 (S), 14 (H), 29 (S); POSPÍŠIL 1980.
- Eurhynchium schleicheri* (HEDW. f.) MILDE: 9 (S), 10 (S), 25 (S), 28 (HNS), 29 (S).
- ? *Eurhynchium striatum* (HEDW.) SCHIMP.: SUZA 1930. We did not find any collection of this species from Muránska planina in Suza's herbarium. This subatlantic species is very rare in Slovakia (POSPÍŠIL 1980) and this record is probably due to confusion with common *Eurhynchium angustirete*, which was not recognized then as a separate species.
- Fissidens cristatus* MITT.: 1 (A), 7 (A), 9 (A), 10(A), 19 (A), 23 (N), 25 (A), 28 (A), 29 (S), 30 (A); SUZA 1930, ŠMARDA 1940b, ŠMARDA 1948, BOROS et al. 1961, PECIAR 1974a.
- Fissidens exilis* HEDW.: 23 (N); ŠMARDA 1940b, ŠMARDA 1948. The specimen in Šmarda's herbarium belongs to *Fissidens pusillus* (POSPÍŠIL 1963). It cannot be ruled out that the two Šmarda's records are based on confusion of these species.
- Fissidens pusillus* (WILS.) MILDE: 10 (NS), 29 (HS); ŠMARDA 1940b (sub n. *Fissidens exilis*), ŠMARDA 1948, PECIAR 1974a.
- Fissidens taxifolius* HEDW.: 10 (S), 23 (N), 29 (S).
- Grimmia anodon* B.S.G.: 1 (S).
- Grimmia pulvinata* (HEDW.) SM.: SUZA 1930.
- Grimmia tergestina* B.S.G.: 1 (H), 22 (S), 25 (S), 30 (H); ŠMARDA 1939—1940, ŠMARDA 1948.
- Gymnostomum aeruginosum* SM.: 1 (S), 5 (S), 10 (HS), 21 (S), 23 (HN), 29 (HS), 30 (H).
- Gymnostomum calcareum* NEES et HORNSCH.: 1 (H).
- Herzogiella seligeri* (BRID.) IWATS.: 1 (A), 5 (A), 7 (A), 9 (H), 11 (A), 19 (A), 23 (A), 28 (A); SUZA 1930, ŠMARDA 1948.
- Homalia trichomanoides* (HEDW.) B.S.G.: 21 (H), 23 (H).
- Homalothecium lutescens* (HEDW.) ROBINS.: 29 (H); SUZA 1930, POSPÍŠIL 1968.
- Homalothecium philippeanum* (SPRUCE) B.S.G.: 1 (A), 5 (A), 7 (A), 9 (A), 14 (A), 19 (A), 22 (A), 25 (A), 28 (A), 29 (HS), 30 (A); SUZA 1930, ŠMARDA 1940b, ŠMARDA 1948, ŠMARDA 1961b, BOROS et al. 1961.
- Homalothecium sericeum* (HEDW.) B.S.G.: 5 (A), 10 (A), 11 (A), 19 (S), 29 (A); SUZA 1930.
- Homomallium incurvatum* (BRID.) LOESKE: 5 (H), 8 (S), 23 (N); ŠMARDA 1948.

- Hygroamblystegium tenax* (HEDW.) JENN.: 2 (S); ŠMARDÁ 1948.
- Hygrohypnum luridum* (HEDW.) JENN.: 10 (H), 21 (S), 23 (H), 28 (H), 29 (H); ŠMARDÁ 1948.
- Hylacomium splendens* (HEDW.) B.S.G.: 1 (H), 5 (A), 7 (A), 8 (A), 9 (A), 11 (A), 19 (A), 24 (A), 29 (A); SUZA 1930, ŠMARDÁ 1940b, SUZA 1950, ŠOLTÉS 1976.
- Hylacomium umbratum* (HEDW.) B.S.G.: ŠMARDÁ 1948.
- Hymenostylium recurvirostre* (HEDW.) DIX.: 1 (HS), 9 (H), 10 (HS), 23 (H), 28 (N).
- Hypnum cupressiforme* HEDW.: 1 (H), 5 (H), 7 (A), 9 (HS), 10 (A), 11 (A), 19 (H), 21 (H), 23 (N), 29 (H), 30 (A); SUZA 1930.
- Hypnum lindbergii* MITT.: 16 (N); ŠMARDÁ 1948.
- Hypnum pallescens* (HEDW.) P. BEAUV.: 22 (P); BOROS et al. 1961.
- Hypnum recurvatum* (LINDB. et H. ARNELL) KINDB.: 9 (S), 10 (H); ŠMARDÁ 1940b.
- Hypnum vaucheri* LESQ.: 21 (H), 22 (P); BOROS et al. 1961.
- Isopterygium pulchellum* (HEDW.) JAEG.: 23 (H).
- Isothecium alopecuroides* (DUBOIS) ISOW.: 1 (A), 9 (H), 10 (A), 11 (A), 19 (A), 25 (A), 28 (HN), 29 (A), 30 (A); ŠMARDÁ 1940b.
- Leptobryum pyriforme* (HEDW.) WILS.: ŠMARDÁ 1940b, ŠMARDÁ 1948.
- Lescuraea incurvata* (HEDW.) LAWY.: 5 (H), 19 (H).
- Leskea polycarpa* HEDW.: PECIAR 1965, PECIAR 1974a.
- Leucodon sciuroides* (HEDW.) SCHWAEGR.: 1 (HS), 10 (A), 21 (HS), 29 (A), 30 (A); SUZA 1950, PECIAR 1965.
- Meesia uliginosa* HEDW.: 9 (HS); ŠMARDÁ 1948.
- Mnium ambiguum* H. MÜLL.: 9 (H), 14 (HN); BOROS et al. 1961, ORBÁN 1975. In Western Carpathians, this subarctic-alpine species grows only in mountains exceeding the timberline (ORBÁN 1975). The plants from Muránska planina differ from the description (KOPONEN 1980) in their intensive red pigmentation of the cell walls.
- Mnium marginatum* (WITH.) P. BEAUV.: 8 (S), 21 (S), 23 (N), 28 (HN); ŠMARDÁ 1948, ORBÁN 1975.
- Mnium spinosum* (VOIT.) SCHWAEGR.: 5 (H); ORBÁN 1975.
- ? *Mnium spinulosum* B.S.G.: BOROS et al. 1961. We consider this record doubtful since this species does not grow in Western Carpathians at all (POSPÍŠIL 1981). Orbán (pers. comm.) did not find any specimen from Muránska planina in the Boros's herbarium.
- Mnium stellare* HEDW.: 1 (H), 10 (H), 19 (S), 21 (S), 23 (HN), 28 (H); ŠMARDÁ 1940b, ŠMARDÁ 1948, BOROS et al. 1961, ŠMARDÁ 1961b, ORBÁN 1975.
- Mnium thomsonii* SCHIMP.: ŠMARDÁ 1948.
- Neckera besseri* (LOBAR.) JUR.: 1 (A), 5 (A), 21 (PS), 23 (H), 28 (S), 29 (A), 30 (A).
- Neckera complanata* (HEDW.) HÜB.: 1 (A), 5 (A), 10 (A), 11 (H), 23 (N), 28 (N), 29 (A); SUZA 1930, ŠMARDÁ 1948, BOROS et al. 1961, PECIAR 1973.
- Neckera crispa* HEDW.: 1 (A), 5 (A), 7 (A), 9 (A), 10 (A), 14 (A), 19 (A), 23 (H), 25 (A), 28 (A), 29 (A), 30 (A); SUZA 1930, ŠMARDÁ 1940b, ŠMARDÁ 1948, ŠMARDÁ et VANĚK 1955, BOROS et al. 1961.
- Neckera pennata* HEDW.: 1 (H), 23 (HN), 29 (H).
- Neckera pumila* HEDW.: ŠMARDÁ 1948.

- Orthothecium intricatum* (HARTM.) B.S.G.: 1 (A), 9 (S), 10 (S), 19 (A), 25 (HN), 28 (HN), 29 (A), 30 (A); SUZA 1930, ŠMARDA 1940b.
- Orthothecium rufescens* (BRID.) B.S.G.: 9 (H), 10 (NS), 28 (HN); ŠMARDA 1940b, ŠMARDA 1948, PECIAR 1974a.
- Orthotrichum affine* BRID.: 22 (S).
- Orthotrichum anomalum* HEDW.: 1 (HS), 22 (PS), 25 (S), SUZA 1930.
- Orthotrichum cupulatum* BRID.: 22 (S).
- Orthotrichum pallens* BRID.: 16 (N), 23 (H), 29 (H), 30 (H).
- Orthotrichum pumilum* SW.: PECIAR 1965.
- Orthotrichum speciosum* NEES: 22 (S).
- Orthotrichum striatum* HEDW.: PECIAR 1974a.
- Orthotrichum tenellum* BRID.: ŠMARDA 1948.
- Philonotis calcarea* (B.S.G.) SCHIMP.: 17 (N).
- Philonotis fontana* (HEDW.) BRID.: 15 (S).
- ? *Plagiobryum demissum* (HOOK.) LINDB.: ŠMARDA 1940b. The occurrence of this arctic species in Muránska planina is extremely unprobable. Though we did not find any specimen in Šmarda's herbarium, we attribute this record to misidentified *Plagiobryum zieri*. Šmarda confused the two species (HERBEN et al. 1982).
- Plagiobryum zieri* (HEDW.) LINDB.: 10 (S), 30 (H).
- Plagiomnium affine* (BLAND.) T. KOP.: 9 (H), 11 (H), 21 (H), 24 (H), 30 (H).
- Plagiomnium cuspidatum* (HEDW.) T. KOP.: 21 (H); ORBÁN 1975.
- Plagiomnium elatum* (B.S.G.) T. KOP.: 17 (N); ORBÁN 1975.
- Plagiomnium ellipticum* (BRID.) T. KOP.: 14 (H), 29 (S).
- Plagiomnium medium* (B.S.G.) T. KOP.: 7 (H), 9 (H), 10 (H), 21 (S), 29 (H); ORBÁN 1975.
- Plagiomnium rostratum* (SCHRAD.) T. KOP.: 5 (H), 9 (S), 19 (A), 21 (H), 28 (S); ORBÁN 1975.
- Plagiomnium undulatum* (HEDW.) T. KOP.: 1 (A), 11 (A), 19 (A), 29 (A); ŠMARDA 1948.
- Plagiopus oederi* (BRID.) LIMPR.: 1 (A), 7 (H), 9 (A), 10 (N), 14 (A), 19 (A), 22 (P), 23 (N), 25 (HN), 28 (A), 30 (A); SUZA 1930, ŠMARDA 1940b, ŠMARDA 1948, PECIAR 1974a.
- Plagiothecium curvifolium* LIMPR.: 8 (S), 9 (S), 19 (A), 24 (N); ŠOLTÉS 1976.
- Plagiothecium denticulatum* (HEDW.) B.S.G.: 5 (H), 16 (N), 27 (H); BOROS et al. 1961, PECIAR 1974a.
- Plagiothecium laetum* B.S.G.: 24 (NS), 25 (H), 28 (H), 29 (S).
- Plagiothecium nemorale* (MITT.) JAEG.: 1 (H), 10 (H), 21 (HS), 28 (N).
- Plagiothecium succulentum* (WILS.) LINDB.: 1 (H).
- Plagiothecium undulatum* (HEDW.) B.S.G.: 9 (S); ŠMARDA 1948, PECIAR 1974a, POSPIŠIL 1976.
- Plasturhynchium striatulum* (SPRUCE) FLEISCH.: 22 (P).
- Platydictya confervoides* (BRID.) CRUM: 22 (P); SUZA 1930, ŠMARDA 1940b, BOROS et al. 1961.
- Platydictya jungermannoides* (BRID.) CRUM: 25 (H). It grows on limestone rocks around the holes out of which the cold and humid air leaks in summer.
- Platydictya subtilis* (HEDW.) CRUM: 24 (S); SUZA 1930, ŠMARDA 1940b.
- Platyhypnidium riparioides* (HEDW.) DIX.: 11 (A), 23 (H), 28 (N).
- Pleurozium schreberi* (BRID.) MITT.: 4 (A), 8 (A), 9 (A), 10 (A), 22 (S), 24 (N), 30 (A); SUZA 1950.

- Pogonatum aloides* (HEDW.) P. BEAUV.: 10 (A), 12 (A), 27 (H); ŠMARDÁ 1948.
- Pogonatum urnigerum* (HEDW.) P. BEAUV.: 4 (A), 6 (A), 27 (H).
- Pohlia cruda* (HEDW.) LIND.: 9 (A), 10 (S), 26 (HNS). See the note at *Platydictya jungermannoides*.
- Pohlia elongata* HEDW.: 24 (H). See the note at *Platydictya jungermannoides*.
- Pohlia nutans* (HEDW.) LINDB.: 23 (N).
- Pohlia wahlenbergii* (WEB. et MOHR) ANDR.: 10 (A), 19 (A), 23 (H); ŠMARDÁ 1940b.
- Polytrichum alpinum* HEDW.: 3 (H), 9 (A), 24 (H); PECIAR 1974a.
- Polytrichum commune* HEDW.: 14 (H).
- Polytrichum formosum* HEDW.: 1 (H), 7 (A), 8 (S), 9 (H); ŠMARDÁ 1948, ŠOLTÉS 1976.
- Polytrichum juniperinum* HEDW.: 7 (A), 9 (A), 10 (A); SUZA 1950, PECIAR 1974a.
- Polytrichum strictum* BRID.: 9 (H), 24 (HN).
- Pseudoleskeella catenulata* (SCHRAD.) KINDB.: 1 (H), 5 (H), 7 (A), 9 (H), 19 (A), 21 (P), 25 (A), 28 (A), 29 (A), 30 (A); SUZA 1930, BOROS et al. 1961.
- Pseudoleskeella nervosa* (BRID.) NYH.: 20 (H), 21 (NS), 22 (S), 23 (HN), 28 (N), 29 (HS); ŠMARDÁ 1948, BOROS et al. 1961, PECIAR 1965.
- Pterigynandrum filiforme* HEDW.: 1 (H), 7 (S), 10 (HNS), 11 (A), 16 (N), 19 (H), 21 (HP), 22 (P), 23 (N), 28 (A), 30 (A); BOROS et al. 1961, ŠMARDÁ 1961b.
- Ptilium crista-castrensis* (HEDW.) DE NOT.: 9 (A), 10 (A), 24 (H); ŠMARDÁ 1948.
- Rhizomnium pseudopunctatum* (BRUCH et SCHIMP.) T. KOP.: ORBÁN 1975.
- Rhizomnium punctatum* (HEDW.) T. KOP.: 1 (A), 9 (A), 10 (A), 19 (A), 21 (H), 24 (H), 28 (A), 29 (A), 30 (A); SUZA 1930, BOROS et al. 1961, ORBÁN 1975, ŠOLTÉS 1976.
- Rhodobryum roseum* (HEDW.) LIMPR.: 1 (A), 8 (S).
- Rhynchostegium murale* (HEDW.) B.S.G.: 1 (A), 3 (H), 9 (A), 10 (N), 19 (A), 23 (H), 27 (H), 28 (N), 29 (H); BOROS et al. 1961, ŠMARDÁ 1961b.
- Rhytidiadelphus loreus* (HEDW.) WARNST.: ŠMARDÁ 1948.
- Rhytidiadelphus squarrosus* (HEDW.) WARNST.: 4 (A), 10 (A), 16 (N), 21 (S), 29 (A); POSPIŠIL 1968, PECIAR 1974a.
- Rhytidiadelphus subpinnatus* (LINDB.) T. KOP.: 9 (H).
- Rhytidiadelphus triquetrus* (HEDW.) WARNST.: 1 (S), 5 (A), 6 (A), 8 (A), 9 (A), 10 (A), 19 (A), 24 (A), 29 (A), 30 (A); SUZA 1930.
- Rhytidium rugosum* (HEDW.) KINDB.: 5 (H), 7 (A), 9 (A), 19 (A); SUZA 1930, ŠMARDÁ 1948, PECIAR 1973.
- Schistidium apocarpum* (HEDW.) B.S.G.: 1 (H), 5 (A), 7 (A), 9 (HS), 10 (S), 19 (A), 21 (H); 29 (H), 30 (A); SUZA 1930, BOROS et al. 1961, PECIAR 1974a.
- Seligeria donniana* (SM.) C. MÜLL.: 9 (H), 25 (H), 21 (S); PECIAR 1974a.
- Seligeria pusilla* (HEDW.) B.S.G.: 10 (NS); ŠMARDÁ 1940b, ŠMARDÁ 1948, ORBÁN 1974.
- Seligeria trifaria* (BRID.) LINDB.: 10 (S), 28 (HNS); BOROS et al. 1961, ŠMARDÁ 1961b.
- Sphagnum capillifolium* (EHRH.) HEDW.: 5 (H), 9 (HS), 24 (HNS); KÁMEN 1957, PILOUS 1971, MIADOK 1976.
- Sphagnum fallax* (KLINGGR.) KLINGGR.: 24 (H); PILOUS 1971.



- Sphagnum flexuosum* DOZY et MOLK.: PILOUS 1971.
Sphagnum girgensohnii RUSSOW: ŠMARDÁ 1940b, ŠMARDÁ 1948, MIADOK 1976.
Sphagnum magellanicum BRID.: 24 (HNS); PILOUS 1971, MIADOK 1976.
Sphagnum palustre L.: ŠMARDÁ 1948, PILOUS 1971.
Sphagnum quinquefarium (BRAITHW.) WARNST.: 9 (H); PILOUS 1971, PECIAR 1974a.
Taxiphyllum wissgrillii (GAROW.) WIJK et MARG.: 19 (H), 21 (P), 22 (P), 23 (HN), 28 (HNS), 29 (HS).
Tetraphis pellucida HEDW.: 1 (A), 7 (A), 9 (A), 10 (NS), 24 (A), 25 (A); BOROS et al. 1961.
Thamnobryum alopecurum (HEDW.) NIEUWL.: 21 (H), 22 (P), 23 (N), 28 (A), 29 (H); ŠMARDÁ 1948.
Thuidium abietinum (HEDW.) B.S.G.: 5 (A), 22 (S), 29 (A), 30 (H); POSPÍŠIL 1967.
Thuidium erectum DUBY: 16 (N), 21 (HP), 28 (N).
Thuidium philibertii LIMPR.: 28 (H).
Thuidium recognitum (HEDW.) LIND.: 29 (S).
Timmia austriaca HEDW.: 1 (H), 7 (H), 9 (HS), 10 (HS), 30 (H); ŠMARDÁ 1940b, ŠMARDÁ 1948.
Timmia bavarica HESSL.: 5 (HS), 10 (NS), 19 (HS), 22 (PS), 28 (HN), 29 (H); SUZA 1930, ŠMARDÁ 1940b, BOROS 1959, BOROS et al. 1961, ŠMARDÁ 1961b.
? *Timmia megapolitana* HEDW.: HAZSLINSZKY 1885. Hazslinszky quotes a collection of Marczell, but there is no specimen in BP (Váňa 1985). We consider this record doubtful, because *T. megapolitana* and *T. bavarica* were not recognized as separate species at the time of its publication.
Tortella inclinata (HEDW. f.) LIMPR.: 17 (N), 22 (S).
Tortella tortuosa (HEDW.) LIMPR.: 1 (H), 5 (A), 7 (H), 9 (H), 10 (HN), 19 (A), 21 (H), 25 (A), 28 (A), 29 (A), 30 (A); SUZA 1930, ŠMARDÁ 1940b.
Tortula muralis HEDW.: 19 (A).
Tortula ruralis (HEDW.) GAERTN. et al.: 1 (S), 5 (H), 9 (S), 19 (H), 28 (A), 30 (H); SUZA 1930.
Tortula subulata HEDW.: 21 (H), 27 (H), 29 (A).
Tortula virescens (DE NOT.) DE NOT.: 22 (S).
Trichostomum brachydontium BRUCH: 25 (H).
Trichostomum crispulum BRUCH: 1 (A), 9 (HS), 10 (S), 19 (H), 22 (P), 30 (A); SUZA 1930, ŠMARDÁ 1948, BOROS et al. 1961, ŠMARDÁ 1961b.
Ulota crispa (HEDW.) BRID.: 10 (N), 23 (HNS); ŠMARDÁ 1948.
Weissia condensata (VOIT) LINDB.: SUZA 1930.
Weissia controversa HEDW.: 22 (S).

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Vápencová oblast Muránské planiny je přes svou geologickou uniformitu území s velmi rozmanitou geomorfologií a klimatickými poměry, které podmiňují výskyt stanovišť s bohatou bryofiórrou. Mezi bryologicky nejvýraznější stanoviště patří

1. Chladné a stinné skály se severní expozicí. Tato stanoviště jsou charakteristická vysokým podílem subarkticko-alpických druhů. Roste na nich např. *Plagiobryum zieri*, *Platydictya jungermannoides*, *Orthothecium rufescens*, *Campylium halleri*, *Scapania* sp. div., *Mnium ambiguum*, *Hypnum recurvatum* aj.

2. Světlé vápencové skály s charakteristickou vegetací bohatou na submediteránní prvky. Ve srovnání s cévnatými rostlinami je však tento typ stanovišť bryologicky výrazně chudší než předcházející.

3. Hnijící kmeny, především na místech s trvale vysokou vzdušnou vlhkostí. Tato stanoviště mají charakteristickou bohatou jätrovkovou flóru, např. *Sphenolobus hellerianus*, *Mylia taylorii*, *Anastrophyllum michauxii*, *Riccardia* sp. div., *Scapania apiculata*, *Cephalozia leucantha*, *Harpanthus scutatus* aj.

4. Dekalcifikovaná místa se severní expozicí. Z nich je nejvýraznější rašeliníště „V machoch“ v Hrdzavé dolině. I přes vápencový podklad a velký sklon zde roste mnoho druhů oligotrofních stanovišť (*Polytrichum strictum*, *Sphagnum magellanicum*, *Mylia anomala*, *Cephalozia connivens*), které rostou pohromadě s druhy minerotrofních míst (*Drepanocladus sendtneri*, *D. revolvens*, *Sphagnum palustre*, *S. fallax*, *S. flexuosum*). Velmi výrazná, i když odlišná vegetace roste také na odvápněných vrcholech skal na Velké Stožce (*Meesia uliginosa*, *Dicranum elongatum*, *Kurzia trichocladus*, *Bazzania tricenata* aj.).

Seznam druhů v práci obsahuje všechny naše nálezy, nepublikované nálezy Ivana Novotného, Lenky Pujmanové a Jiřího Váni a publikované údaje z literatury. U některých sporných literárních údajů jsme revidovali původní materiál, pokud nebyla revize publikována již dříve; na základě těchto revizí se ukázalo, že druhy *Cephalozia macounii*, *Cladopodiella francisci*, *Porella cordaeana* jsou uváděny z Muránské planiny na základě nesprávně určených položek (v seznamu jsou tyto druhy označeny +). Dále pochybujeme o výskytu druhů *Calyptogeia neesiana*, *Dicranum majus*, *Drepanocladus aduncus*, *Eurhynchium striatum*, *Mnium spinulosum*, *Peltolepis quadrata*, *Plagiobryum demissum* a *Timmia megalopolitana*, ale nepodařilo se nám nalézt příslušný doklad (tato jména jsou v seznamu druhů označena?).

Celkem seznam obsahuje 281 mechorostů (202 mechů a 79 jätrovek). Nepotvrdili jsme (kromě pochybných údajů) 22 mechů a 13 jätrovek; naopak 69 mechů a 23 jätrovek uvádíme jako nové pro oblast. Nejzajímavější nové nálezy jsou *Cephalozia connivens*, *Dicranum elongatum*, *Kurzia richocladus*, *Cololejeunea rossettiana* a *Mnium ambiguum*.

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K. Horst:

Pflanzen im Aquarium Ihre Funktion und Pflege

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Milovníci vodních rostlin dostávají do rukou knihu, která vzešla ze čtyřicetileté praxe autora nejen této publikace, ale celé řady příspěvků týkajících se akvarijních rostlin a jejich života. Její název „Rostliny v akváriu“ rozhodně neodpovídá obsahu knihy a je více než skromným vyjádřením formy i faktů v ní uvedených. Autor jen poměrně malou část textu věnoval vlastnímu popisu akvarijních rostlin, které zvolil především jako představitele, příklady a dále takové, které lze, podle jeho vyjádření, sehnat po celý rok v obchodě. Valná část knihy je pak věnována výsledkům a zkušenostem získaným z ekologického studia vodních rostlin v tropech. Tomu odpovídá i členění textu, kde kromě úvodních kapitol (např. kyslík, eliminace jedovatých látek, odbourávání organických látek, ničení zárodků nemocí, rostliny dodávající antibiotika apod.) je 37 stran věnováno akvarijním rostlinám na jejich přirozených stanovištích v přírodě. Autor sledoval celkem 26 biotopů ve Srí Lance, Thajsku, západním Malajsku a na Borneu. Velmi podrobně se zabývá analýzami vody a v přehledných tabulkách informuje o elektrické vodivosti vody, pH, stupních celkové a karbonátové tvrdosti a obsahu jednotlivých komponent (CO_2 , O_2 , Ca^{2+} , Mg^{2+} , K^+ , Na^+ , HCO_3^- , SO_4^{2-} , S , Cl^- , PO_4^{3-} , P , NO_3^- , NH_4^+), včetně dvanácti stopových prvků. Mimo to uvádí v tabulkách vždy stupeň čistoty vody, složení dna, množství dopadajícího světla, vzdušnou vlhkost, teplotu vzduchu a vody. U každého biotopu je připojena krátká charakteristika s údaji o lokalitě, druhovém složení rostlin apod.

Hodnoty chemických rozborů uvedené v tabulkách patří k velmi cenným zjištěním, která informují o domácím prostředí i takových rostlin, o jejichž životním prostředí máme jen málo skutečných podkladů a pěstování je založeno spíše na tradicích a zkušenostech pěstitelů. Často však končí veškeré naše znalosti u doporučení užít při pěstování měkkou a mírně kyselou vodu. Z textu knihy máme možnost se přesvědčit o plasticitě podmínek v malých tropických tocích. Např. acidita vod Srí Lanky, s druhy *Aponogeton crispus*, *A. rigidifolius*, *A. ulvaceus*, *Barclaya longifolia*, *Cryptocoryne beckettii*, *C. parva*, *C. walkeri*, *C. wendtii*, *Eichhornia crassipes*, *Lagenandra*