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Bryoflora in block fields in south-western Moravian river valleys

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KUBEŠOVÁ S. 2003: Bryoflora in block fields in south-western Moravian river valleys. *Acta Musei Moraviae, Scientiae biologicae* (Brno) **88:** 81–94. – 93 bryophyte species (20 liverworts, 73 mosses) were recorded at 26 study sites. The most frequent species in block fields are *Barbilophozia barbata*, *Dicranum scoparium*, *Grimmia ovalis*, *Hedwigia ciliata*, *Hypnum cupressiforme*, *Pleurozium schreberi*, *Pohlia nutans*, and *Polytrichum formosum*. Interesting occurrences of the species *Antitrichia curtipendula*, *Bazzania trilobata*, *Buxbaumia aphylla*, *Dicranum fulvum*, *Jamesoniella autumnalis*, *Lophozia excisa*, *L. longidens*, *Polytrichum commune*, *Pseudotaxiphyllum elegans*, and *Racomitrium lanuginosum* are discussed. Seven threatened bryophytes were recorded in the block fields. The most common life-form of the block field is the chamaephyte and the most common life-strategies are the colonial and perennial. The most frequented distribution range types are the temperate, boreal, and sub-boreal in the block fields. Life-forms, life-strategies, and distribution range type spectra differ significantly between the block fields and the wider surroundings.

Key words. Life-strategies, life-forms, distribution range types, liverworts, mosses, scree

Introduction

The oldest bryophyte records from south-western Moravian river valleys were published by ROEMER (1866), KALMUS (1867), KALMUS & NIESSL (1871). Next were works by PODPĚRA (1905, 1906, 1908, 1923), OBORNY (1923), SUZA (e.g. 1931, 1935, 1938, 1946), VĚZDA (1950, 1955), ŠMARDA (1955, 1961) and POSPÍŠIL (1979). Recently, the bryophytes have been studied by HRADÍLEK & NOVOTNÝ (1998) and HRADÍLEK (2000) in this region. KUBEŠOVÁ (1996) has concentrated on bryophytes in block fields in the Dyje river valley.

Block fields in the south-western Moravian river valleys are among the natural treeless patches in the landscape (CHYTRÝ 1993, CHYTRÝ & VICHEREK 1996), constituting an azonal island ecosystem in Central Europe (MOLENDA 1999). The environment of block fields is relatively heterogeneous, partly due to their broken relief (many joints and exposed tops of stones) and partly due to the distinction between the isolated, open central part of the block field and its marginal section under tree canopy, between the central part and the surrounding scree forest.

This unique, specific type of habitat may be reflected in the composition of the bryophyte species. The current paper summarises bryophyte records in block fields in south-western Moravia and compares their bryoflora with the bryoflora of the adjacent landscape, in terms of species composition and different classifications such as life-forms, life-strategies, and chorological type.

Material and Methods

Study area

Bryophytes were investigated in block fields in the Oslava, Jihlava, Jevišovka and Dyje river valleys of south-western Moravia (Fig. 1).

The most common rocks are biotite paragneiss, cleaved granite, granulite, and orthogneiss. Amphibolites, marbles, phyllites, serpentines, and Tertiary and Quaternary sediments occur less frequently in the area. The block fields are formed of cleaved granite, granulite, gneiss, and orthogneiss (MATĚJOVSKÁ 1991, BATÍK 1992). A gently undulating plateau is cut with deep valleys (CULEK 1996). The lowest altitude is 210 m (near the city of Znojmo) and the highest is 536 m (near Vranov nad Dyjí). The mean air temperature in January is between –2 and –4 °C, in July between 17 and 18 (19) °C. Precipitation in the growing season ranges between 350 and 400 (up to 450) mm (QUITT 1971, 1975). Being situated in the lee of the Bohemian-Moravian Uplands, the area is comparatively dry (CULEK 1996).

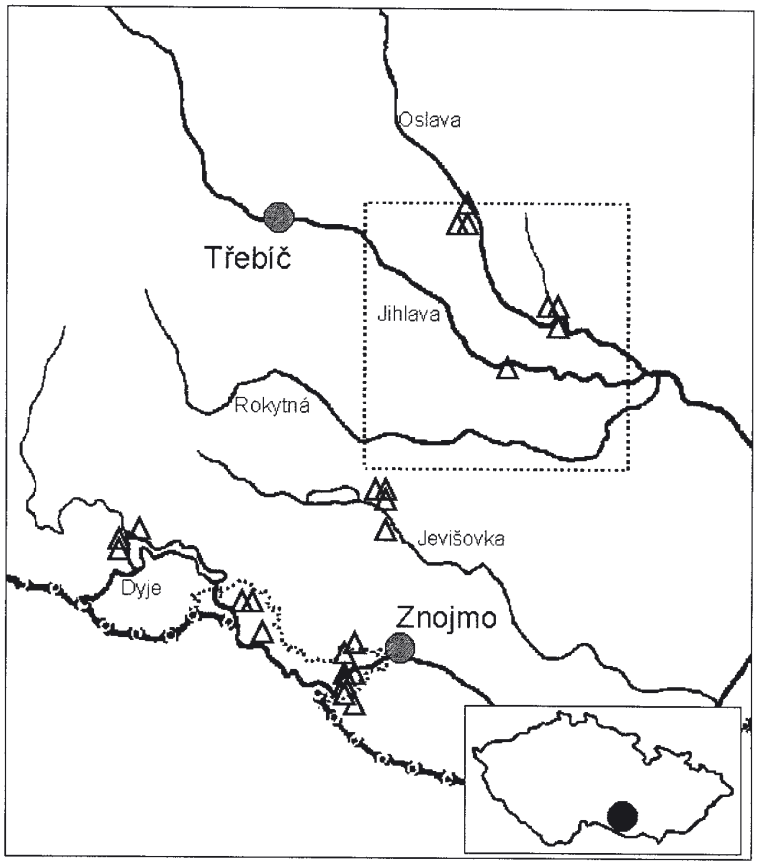


Fig. 1. Study block fields and areas studied by HRADÍLEK & NOVOTNÝ (1998) and HRADÍLEK (2000).

Bryophytes in block fields (26 sites; Appendix 1) in south-western Moravia were investigated from 1994 to 1998 (see Fig. 1). In this paper, a comparison is made between species recorded by Hradílek and Novotný and the bryophytes collected by the author in block fields. The eighteen block fields analysed in this paper (nos. 1–7, 16–26) were situated in areas studied by HRADÍLEK & NOVOTNÝ (1998) and HRADÍLEK (2000). The bryophytes of the Oslava, Jihlava and Rokytná river valleys and their surroundings were documented by Hradílek and Novotný in 1993–1997 (HRADÍLEK & NOVOTNÝ 1998). This area is delineated to the north by the villages of Třebenice, Kozlany, Sutice and Zakřany, to the east by the village of Oslavany and the town of Moravský Krumlov, and to the west by the village of Radkovice u Hrotovic. The southern border follows the Rokytná river valley. The bryophyte flora in the area of the Podyjí National Park was studied by HRADÍLEK (2000) in 1992–1996.

Bryophytes

The bryophytes were classified into life-strategy categories after DIERßEN (2001), themselves based on DURING (1992), and into life-forms (DŰLL 1992). The life-strategy classification is based on three major trade-offs: (1) few and large spores versus many and small spores; (2) survival through the difficult season as spores only versus survival of the gametophyte; (3) potential life-span of the gametophyte, which is negatively correlated with reproductive effort. The classification into distribution range types is according to DUELL (1983, 1984, 1985). Nomenclature of species follows FREY et al. (1995).

Results and discussion

Bryoflora of block fields of south-western Moravia

93 bryophyte species (20 liverworts, 73 mosses) were recorded in the block fields studied. The most common species in the block fields are *Barbilophozia barbata*, *Dicranum scoparium*, *Grimmia ovalis*, *Hedwigia ciliata*, *Hypnum cupressiforme*, *Pleurozium schreberi*, *Pohlia nutans*, and *Polytrichum formosum*. The mosses *Hypnum cupressiforme*, *Pleurozium schreberi*, *Pohlia nutans*, and *Polytrichum formosum* are also common in the wider surroundings (HRADÍLEK & NOVOTNÝ 1998, HRADÍLEK 2000). The abundant species *Dicranum scoparium* occurs on forest floors, heathlands, on rock outcrops, and in the block fields, where it is among the dominant species. The liverwort *Barbilophozia barbata* and the mosses *Grimmia ovalis* and *Hedwigia ciliata* were recorded both in block fields and on rocks (HRADÍLEK & NOVOTNÝ 1998, HRADÍLEK 2000).

Threatened bryophytes

Seven threatened bryophytes were recorded in the block fields. The moss *Hylocomium brevirostre* is an endangered taxon. It was collected in 1994 and 1996 on a boulder near the margin of a block field near locality no. 15 (HRADÍLEK & KUBEŠOVÁ 1997). The liverwort *Jamesoniella autumnalis*, and the mosses *Antitrichia curtipendula*, *Buxbaumia aphylla*, *Dicranum fulvum*, *Platygyrium repens*, and *Rhynchostegium confertum* are also considered vulnerable taxa (VÁŇA 1993, 1995).

In the following, some noteworthy bryofloristic records are commented upon:

Antitrichia curtipendula

In the Czech Republic, this moss is currently known to occur only in south-western Moravia and southern Bohemia (VONDRÁK 2000). The species was recorded in eleven block field localities. HRADÍLEK (2000) did not mention any other recent record of it on rock or talus slope in the study area.

Barbilophozia hatcheri

This liverwort, mostly occurring in mountains, was recorded in one block field (no. 16). HRADÍLEK (1996, 2000) reported the same locality or a nearby site (no. 16, Ledové sluje).

Bazzania trilobata

This liverwort is recently known from four block fields (two are the same as those mentioned by HRADÍLEK 2000). It occurs in uplands and mountains in the Czech Republic. In south-western Moravia, it is recently known only from these four localities (DUDA & VÁŇA 1990, HRADÍLEK & NOVOTNÝ 1998, HRADÍLEK 2000).

Buxbaumia aphylla

This moss occurs in one block field in the Oslava river valley (no. 3) and in one in the Dyje river valley (no. 13). It was recently recorded on forest floor and heathland in another four localities (HRADÍLEK 1996, 2000).

Dicranum fulvum

The moss *Dicranum fulvum* occurs in five block fields in the Oslava, Jevišovka and Dyje river valleys; HRADÍLEK & NOVOTNÝ (1998) mentioned another two localities on rocks in these valleys. In the Czech Republic it is generally confined to shaded non-calcareous rocks, often to sandstones (FRANKLOVÁ 2000).

Jamesoniella autumnalis

The liverwort *Jamesoniella autumnalis* was recorded in a single block field in the valley of the Chvojnice brook (no. 4). Its distributional centre is at higher altitudes, and it is patchily distributed (DUDA & VÁŇA 1970). Similarly remarkable for a low-altitude location is its occurrence in the area of Ledové sluje (HRADÍLEK 1996, 2000).

Lophozia excisa

This liverwort has been recorded in four localities (HRADÍLEK & NOVOTNÝ 1998, HRADÍLEK 2000) on soil and rocks and one in a block field (no. 19). It is usually confined to bare soil. It has a scattered distribution in the Czech Republic with its distributional centre at lower-altitudes (DUDA & VÁŇA 1992b).

Lophozia longidens

This liverwort occurs in six block fields. HRADÍLEK (2000) mentioned two records on talus slopes and shaded rocks; his records correspond with localities nos. 17 and 24. This rare species is most often found on siliceous rocks, stones, and talus slopes. Its distributional centre is in uplands and mountains (DUDA & VÁŇA 1992a).

Polytrichum commune

This species occurs in one block field in the Chvojnice valley (no. 4). A similar low-altitude occurrence of *Polytrichum alpinum* on block fields in the České středohoří Mts. and adjacent areas was documented by NĚMCOVÁ (2000). *Polytrichum commune* was not recorded by HRADÍLEK & NOVOTNÝ (1998), HRADÍLEK (2000) in the river valleys under study.

Pseudotaxiphyllum elegans

This species was recorded only in one block field (no. 25) near the Dyje valley. Six recent localities, mostly on rock, are mentioned by HRADÍLEK & NOVOTNÝ (1998) and HRADÍLEK (2000).

Racomitrium lanuginosum

Racomitrium lanuginosum occurs in one block field (no. 24), its only locality in the Dyje river valley (HRADÍLEK 2000). Block fields are a typical habitat of this moss in the České středohoří Mts. and adjacent areas in northern Bohemia (NĚMCOVÁ 2000). It is also a dominant species in the moss communities of the lower open borders of block fields in the Black Forest in Germany (LÜTH 1999). The *Racomitrietum lanuginosi* (Gams, 1927) Preis, 1937 community is characterised by dominance of this species; it shows a preference for block field habitats at higher altitudes (MARSTALLER 1982).

Comparison of bryoflora in block fields and over a wider area

In the Podyjí National Park, a total of 296 bryophytes has been recorded (HRADÍLEK 2000), and in the block fields in this region (nos. 16–26) the figure was 63 species. HRADÍLEK & NOVOTNÝ (1998) found 371 species in the Oslava, Jihlava and Rokytná river valleys and their surroundings, while in the block fields (nos. 16–26), 55 species were recorded.

Distribution range types

Distribution range type spectra in the block fields versus the wider surroundings differ significantly ($\div^2$=23.22, df=9, P<0.01). The most frequent are temperate, boreal and sub-boreal types, both in the wider surroundings and in the block fields. Suboceanic, submediterranean-suboceanic range types are less common in the block fields, and subcontinental species are more frequent in the block fields than in the wider

surroundings (Fig. 2). Higher continentality of the environment is typical of the open central parts of block fields (KUBEŠOVÁ 2000). Rare submediterranean, suboceanic-submediterranean, subcontinental-submediterranean-montane types are absent in block fields. Species of submediterranean type often grow on south-facing rock headlands (HRADÍLEK & NOVOTNÝ 1998) in the wider surroundings.

Life-forms

Life-form spectra in the block fields versus the wider surroundings (HRADÍLEK & NOVOTNÝ 1998, HRADÍLEK 2000) differ significantly ($\div^2$=9.77, df=4, P<0.05). The most frequent category is chamaephyte, while epiphytes and hemicryptophytes are less common (Fig. 2). Chamaephytes, epiphytes and hemicryptophytes are present in similar proportions in the block fields and in the wider surroundings. Hemicryptophytes are generally confined to the margins of block fields, between open areas and scree forest. The presence of woody debris (in the margins) gives ground to the occurrence of epiphytes in block fields. In addition, some species belong both among the chamaephytes (or hemicryptophytes) and the epiphytes. This artificial grouping explains the relatively high number of epiphytes. Therophytes in block fields are represented by a single species – *Buxbaumia aphylla*, which was recorded only in one block field. Hydrophytes were recorded only in the wider area. Generally suitable habitats for therophytes and hydrophytes are not present in the block fields.

Life-strategies

Life-strategy spectra in the block fields versus the wider surroundings differ significantly ($\div^2$=12.95, df=6, P<0.05). The most common categories are the colonists and perennials, both in the wider surroundings and in the block fields. However, the perennials are more abundant in the block fields (Fig. 2). The perennials are adapted to seasonal stresses in the environment (DURING 1981); the environment of the open block fields is typically subject to wide fluctuations of temperature and humidity. The fugitives and short-lived shuttles are infrequent and show similar abundance in both the wider surroundings and in the block fields. The fugitive strategy is very rare among bryophytes (DURING 1992). Annuals and short-lived shuttles are almost entirely confined to soil (DURING 1981), which seldom occurs in the block fields. The annual shuttle strategy was not recorded, and short-lived shuttles are uncommon in this habitat. Long-lived shuttles are found nearly exclusively on stony substrates (DURING 1981). This substrate dominates in the block field habitat and the long-lived shuttle is the third most frequent category. More than 50 % of species in the block fields are perennials and long-lived shuttles, which may indicate high stability for this habitat.

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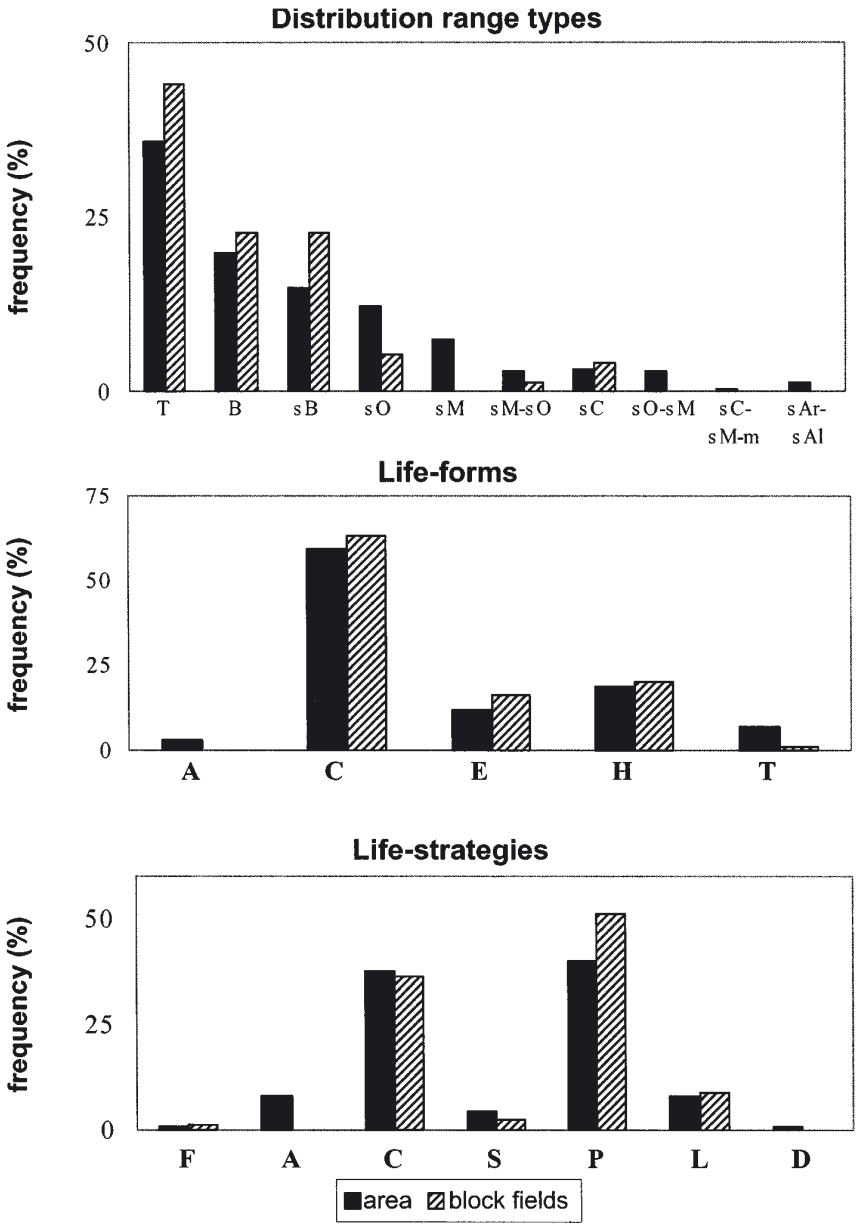


Fig. 2. Distribution range types: T – temperate, B – boreal, sB – sub-boreal, sO – suboceanic, sM – submediterranean, sM-sO – submediterranean-suboceanic, sO-sM – suboceanic-submediterranean, sC – subcontinental, sC-sM-m – subcontinental-submediterranean-montane, sAr-sAl – subarctic-subalpine. **Life-forms:** A – hydrophytes, C – chamaephytes, E – epiphytes, H – hemicryptophytes, T – therophytes. **Life-strategies:** F – fugitives, A – annuals, C – colonists, S – short-lived shuttles, P – perennials, L – long-lived shuttles, D – dominants.

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Appendices 1 and 2

APPENDIX 1

Localities

1. NáměšŹ nad Oslavou, ca 3.5 km WSW of the village Kralice nad Oslavou, ca 390 m a.s.l., 1997
2. NáměšŹ nad Oslavou, right slope of the Oslava valley, 4.25 km SW of the village Kralice nad Oslavou, ca. 370 m a.s.l., 1997
3. NáměšŹ nad Oslavou, right slope of the Oslava river valley, 4.25 km SW of the village Kralice nad Oslavou, 370–380 m a.s.l., 1997
4. NáměšŹ nad Oslavou, west-facing slope of the Chvojnice valley, 1.75 km NNW of the village Senorady, 290–330 m a.s.l., 1997
5. NáměšŹ nad Oslavou, on east-facing slope of the Chvojnice valley, ca 2 km NNW of the village Senorady, 300–320 m a.s.l., 1997
6. NáměšŹ nad Oslavou, on the right slope of the Oslava valley, near the ruin Ketkovický hrad, 1.5 km N of the village Senorady, 290–320 m a.s.l., 1997
7. Třebíč, on the right slope of the Jihlava valley, near dam, 1.5 km SSW of the village Mohelno, 310–340 m a.s.l., 1998
8. Jevišovice, on the left slope of the Jevišovka valley, 0.5 km N of the church in the village Jevišovice, ca 330 m a.s.l., 1998
9. Jevišovice, on the left slope of the Jevišovka valley, 0.5 km N of the church in the village Jevišovice, 310–330 m a.s.l., 1998
10. Jevišovice, on the left slope of the Jevišovka valley, 0.5 km N of the church in the village Jevišovice, ca 310 m a.s.l., 1998
11. Jevišovice, on the left slope of the Jevišovka valley, 0.5 km N of the church in the village Jevišovice, 320–330 m a.s.l., 1998
12. Jevišovice, on the right slope of the Hluboký potok valley, 5.25 km SE of the church in the village Jevišovice, 290–300 m a.s.l., 1998
13. Bítov, west-facing slope of the Dyje valley, 0.5 km W of the village Bítov, ca 380 m a.s.l., 1998
14. Bítov, the left slope of the Dyje valley, opposite to meander with the ruin of Cornštejn, 1.75 km WSW of the village Bítov, ca 400 m a.s.l., 1998
15. Bítov, the left slope of the Dyje valley, near bridge, 2 km W of the

Appendix 1

village Bítov, 420–430 m a.s.l., 1998

16. Vranov nad Dyjí, Ledové sluje, the south one of block field set, 2.5 km SE of the village of Vranov nad Dyjí, 350–390 m a.s.l., 1998
17. Vranov nad Dyjí, Ledové sluje, the midle one of block field set, 2.5 km SE of the village of Vranov nad Dyjí, 330–380 m a.s.l., 1994
18. Vranov nad Dyjí, on the left slope of the Dyje valley, opposite the castle Hardegg, 5.5 km SE of the village Vranov nad Dyjí, 300–350 m a.s.l., 1994
19. Znojmo, on the right slope of the Dyje valley, 2.5 km NW of the village of Popice, ca 300 m a.s.l., 1998
20. Znojmo, on the slope opposite to meander Šóbes, 2.5 km W of the village of Popice, 250–260 m a.s.l., 1998
21. Znojmo, between sites Nad Papírnou and Nad Novou cestou, 2.5 km WNW of the village of Popice, 250–300 m a.s.l., 1998
22. Znojmo, middle one of three block fields in line Nad Novou cestou, 2.75 km NW of the village of Popice, 250–330 m a.s.l., 1998
23. Znojmo, north one of three block fields in line Nad Novou cestou, 2.75 km NW of the village of Popice, 250–330 m a.s.l., 1994
24. Znojmo, block field below the cliff of Sealsfieldův kámen, 2.25 km NW of the village of Popice, 240–310 m a.s.l., 1998
25. Znojmo, on the left slope of the valley of Mločí údolí, 2.25 km SE of the village of Mašovice, 300–310 m a.s.l., 1998
26. Znojmo, on the left slope of the valley of Mločí údolí, 2.25 km SE of the village of Mašovice, 290–310 m a.s.l., 1998

APPENDIX 2

List of bryophytes recorded in block fields with numbers of localities

Amblystegium serpens	14, 23.
Anomodon attenuatus	5, 17, 21.
Antitrichia curtipendula	4, 7, 15, 16, 17, 18, 21, 22, 23, 24, 26.
Atrichum undulatum	3, 18.
Aulacomnium androgynum	1, 5, 13, 16, 17, 18, 19, 25, 26.
Barbilophozia barbata	2, 3, 6, 7, 10, 13, 14, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26.
Barbilophozia hatcheri	16.
Bartramia pomiformis	3, 4, 6, 7, 8, 9, 14, 16, 17, 24, 25.
Bazzania trilobata	4, 16, 17, 24.
Brachythecium glareosum	14.
Brachythecium populeum	12, 18.
Brachythecium reflexum	15.
Brachythecium rutabulum	7, 12, 13, 14, 17, 21.
Brachythecium salebrosum	10, 23, 26.
Brachythecium velutinum	4, 5, 7, 10, 12, 14, 15, 17, 18, 21, 23, 26.
Bryum capillare	2, 13, 14, 15, 17, 18, 20, 23, 26.
Bryum subelegans	4, 5, 7, 14, 15, 21, 26.
Buxbaumia aphylla	3, 13.
Cephaloziella divaricata	3, 9, 10, 11, 16, 17, 19, 21, 22, 25.
Ceratodon purpureus	3, 4, 5, 7, 10, 11, 13, 14, 16, 17, 18, 20, 21, 22.
Cynodontium polycarpon	4, 5, 6, 9, 13, 18, 21, 24, 25.
Dicranella heteromalla	3, 4, 5, 8, 9, 11, 13, 17, 18, 19, 22, 24, 25.
Dicranodontium denudatum	12.
Dicranum fulvum	6, 12, 15, 16, 26.
Orthodicranum montanum	2, 3, 7, 9, 12, 16, 17, 18.
Dicranum polysetum	2, 5, 16, 17, 18, 19.
Dicranum scoparium	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26.
Eurhynchium angustirete	14, 26.
Eurhynchium hians	14.
Eurhynchium pulchellum	23.
Eurhynchium schleicheri	7.
Frullania dilatata	18, 20.
Grimmia ovalis	1, 3, 4, 5, 7, 8, 9, 10, 11, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26.
Grimmia pulvinata	18, 23.
Grimmia trichophylla	24.

Hedwigia ciliata	2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26.
Homalia trichomanoides	12.
Homalothecium sericeum	5, 17, 20, 21, 23, 24.
Hylocomium splendens	4, 6, 7, 8, 9, 13, 14, 16, 17, 19, 24, 25, 26.
Hypnum cupressiforme	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26.
Pseudotaxiphyllum elegans	25.
Isothecium alopecuroides	12, 15, 17, 18, 24, 26.
Jamesoniella autumnalis	4.
Lejeunea cavifolia	12, 17.
Leskea polycarpa	21.
Leskeella nervosa	18.
Leucodon sciuroides	5, 20, 23.
Lophocolea bidentata	13, 14.
Lophocolea heterophylla	3, 10, 17.
Lophocolea minor	21.
Lophozia excisa	19.
Lophozia longidens	4, 6, 17, 24, 25, 26.
Lophozia ventricosa	4, 6, 13.
Metzgeria furcata	4, 5, 8, 12, 17, 18, 21, 23, 24, 26.
Mnium spinulosum	8.
Mnium stellare	18.
Orthotrichum affine	20.
Orthotrichum anomalum	20, 23.
Paraleucobryum longifolium	2, 3, 4, 6, 7, 12, 17, 18, 22, 26.
Plagiochila asplenioides	14.
Plagiochila porelloides	6, 7, 12, 13, 15, 16, 17, 18, 26.
Plagiomnium affine	4, 6, 7, 8, 9, 13, 14, 16, 17, 18, 21, 25, 26.
Plagiomnium cuspidatum	4, 10, 12, 15, 17, 18, 20, 21, 23, 24, 26.
Plagiomnium undulatum	14, 21, 26.
Plagiothecium cavifolium	3, 4, 6, 7, 14, 17, 18, 21.
Plagiothecium denticulatum	3, 4, 5, 6, 8, 9, 10, 12, 15, 17, 18, 21, 23, 25.
Plagiothecium laetum (*P. laetum* s.str. was not recorded, all records are *P. curvifolium*)	2, 3, 4, 6, 7, 8, 9, 10,13, 16, 17, 18, 19, 20, 22, 24, 25.
Plagiothecium succulentum	3, 7, 14, 15, 17, 18, 21, 22, 25, 26.

Platygyrium repens	2, 5, 20, 21.
Pleurozium schreberi	1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 14, 16, 17, 18, 19, 24, 25, 26.
Pohlia cruda	3, 6, 14, 17.
Pohlia nutans	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26.
Polytrichum cf. *longisetum*	4.
Polytrichum commune	4.
Polytrichum formosum	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26.
Polytrichum juniperinum	4, 6, 7, 8, 9, 10, 16, 17, 18, 19, 21, 24, 25, 26.
Polytrichum piliferum	10, 17, 21, 24.
Porella platyphylla	18, 20, 23.
Pterigynandrum filiforme	12, 18, 24.
Ptilidium ciliare	4, 5, 6, 8, 9, 10, 11, 13, 16, 17, 19, 22, 24, 25.
Ptilidium pulcherrimum	3.
Racomitrium lanuginosum	24.
Racomitrium microcarpon	7, 24.
Radula complanta	18, 21.
Rhabdoweisia fugax	4.
Rhynchostegium confertum	26.
Rhytidiadelphus triquetrus	4, 6, 9, 13, 14, 16, 17.
Rhytidium rugosum	18.
Schistidium apocarpum	5, 6, 14, 16, 20, 22, 24, 26.
Tetraphis pellucida	25.
Thuidium recognitum	2, 4.
Thuidium tamariscinum	14.
Tortula ruralis	4, 5, 18, 23.