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A contribution to the bryoflora of the Pogórze Dynowskie
Foothills (Western Carpathians)

Materiały do flory mszaków Pogórza Dynowskiego (Karpaty Zachodnie)

SUMMARY

This paper provides distributional data for 87 rare bryophyte species recorded for the first time from the Pogórze Dynowskie Foothills (Western Carpathians). All of the presented taxa are habitually characterized and ordered in a list. Ecological groups, including epilithic, epiphytic, epixylic, terrestrial and torrenticolous species, are characterized in detail. The most remarkable species are, among others, *Diplophyllum albicans*, *Jamesoniella autumnalis*, *Preissia quadrata*, *Campylostelium saxicola*, *Diphyscium foliosum*, *Orthotrichum patens*, *Schistostega pennata*, *Sphagnum russowii* and *Trichostomum crispulum*.

STRESZCZENIE

W niniejszej pracy zamieszczono wykaz stanowisk 87 rzadszych gatunków mszaków, stwierdzonych po raz pierwszy na obszarze Pogórza Dynowskiego (Karpaty Zachodnie). Listę florystyczną sporządzono w porządku alfabetycznym, podając dla każdego taksonu: kwadrat ATMOS, typ siedliska oraz informację o występowaniu sporogonów i rozmnożeń. Scharakteryzowano dokładniej główne grupy ekologiczne mszaków, tj. gatunki naskalne, nadrzewne, naziemne, murszejącego drewna oraz potokowe. Do najbardziej interesujących gatunków, stwierdzonych w trakcie niniejszych badań, należą *Diplophyllum albicans*, *Jamesoniella autumnalis*, *Preissia quadrata*, *Campylostelium saxicola*, *Diphyscium foliosum*, *Orthotrichum patens*, *Schistostega pennata*, *Sphagnum russowii* i *Trichostomum crispulum*.

Key words: Pogórze Dynowskie Foothills, rare bryophytes, distribution, ecology, Poland, Western Carpathians.

INTRODUCTION

Although the Carpathians chain has always been of special interest to muscologists and hepaticologists, its bryofloristic data remain incomplete. Apart from some well-studied ranges, for example the Bieszczady Zachodnie (7, 17), Beskid Niski (5, 13, 20) and Beskidy Zachodnie Mts (14, and literature cited), there are still extensive areas, especially at lower elevations, from which there are almost no bryological data. The paucity of information concerning the bryoflora of these regions forced the autor to undertake studies in the Pogórze Dynowskie, the most eastern part of the Carpathian Foothills. Its bryophyte flora was not hitherto a subject of botanical studies and only fragmentary information on the occurrence of single moss species can be found in Szafran (15, 16).

STUDY AREA

The investigated region forms a western part of the Pogórze Dynowskie Foothills and extends between two rivers Wisłok and Stobnica (Fig. 1). The southern border is delimited by the northern part of the Jasło–Krosno Basin (6). The whole area lies below 600 m a.s.l., reaching the highest altitude at 591 m (Sucha Góra Mt). Particular ridges run almost parallel to one another from north-west to south-east. The slopes are almost exclusively overgrown by the Carpathian beech forest *Dentario glandulosae-Fagetum*, whereas there is a large level of *Abies alba* forest in deeply incised valleys of streams. Only exceptionally a mixed upland forest with considerable admixture of *Acer pseudoplatanus* is present at the lower elevation.

MOST IMPORTANT FLORA COMPONENTS

Epilithic species — Epilithic liverworts and mosses constitute the most valuable and diversified group of species in the present flora. As they differ markedly in their habitat preferences, two ecologically distinct groups can be distinguished.

The first group of species grows on acidic Istebnian sandstone (Odrzykoń, "Prządki" nature reserve). Here belong such interesting mosses as *Hedwigia ciliata*, *Pseudotaxiphyllum elegans* and *Schistostega pennata*. In the Carpathians *Schistostega pennata* is an exceedingly rare plant, known so far only from scattered localities in the Beskid Śląski, Babia Góra and Tatra Mts (10). The rarity of this species can be explained by the gradual decrease of an oceanic climate influence and the considerable admixture of lime in the Magurian sandstone.

The second group of species is restricted in their occurrence to the sandstone markedly enriched with lime. These bryophytes grow on sandstone outcrops in beech forest (*Porella platyphylla*, *Fissidens gracilifolius*, *Taxiphyllum wissgrillii*) and on the walls of the castle "Kamieniec" (*Preissia quadrata*, *Anomodon longifolius*, *Neckera complanata*). Only rarely they were found on another substrate, such as wet rock detritus at the base of the shist wall by the stream (*Didymodon spadiceus*, *Trichostomum crispulum*).

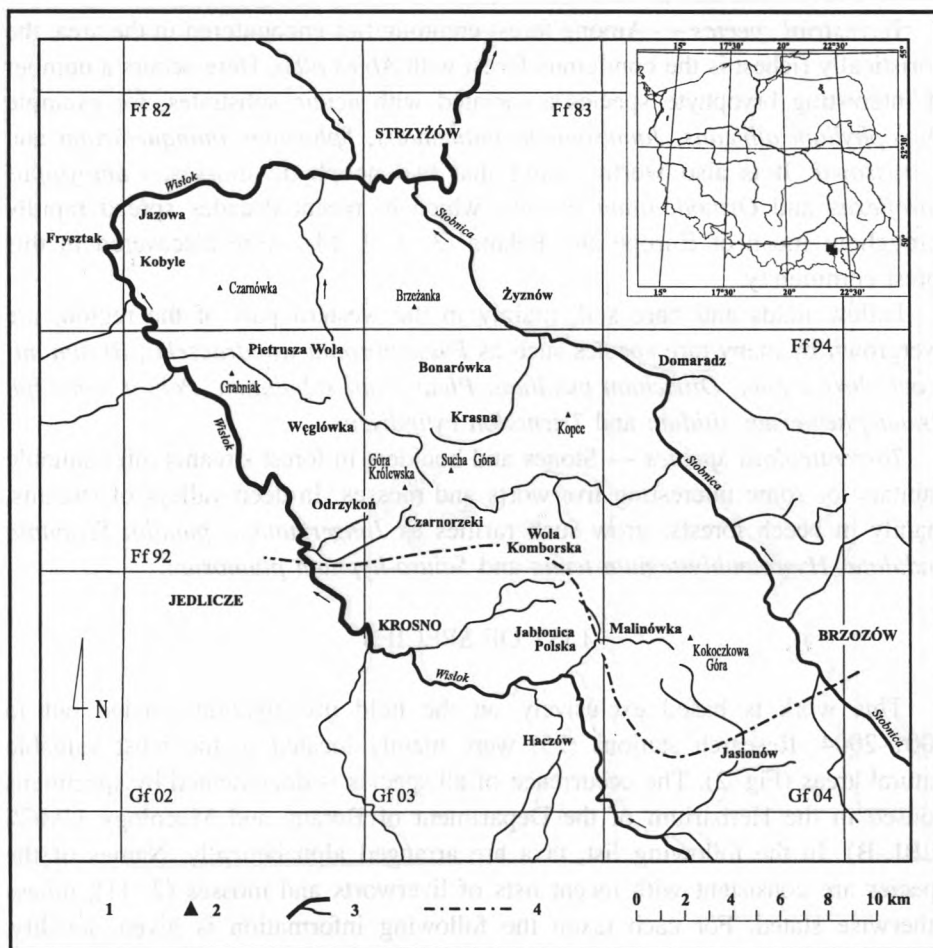


Fig. 1. Topographic map of the study area; 1 — town or village, 2 — mountain peak, 3 — rivers and streams, 4 — southern border of area investigated

Epiphytic species — The epiphytic flora of the study area is certainly well-developed and consists of many rare and threatened bryophytes such as *Lejeunea cavifolia*, *Porella platyphylla*, *Orthotrichum patens*, *Serpoleskea subtilis* and *Ulota bruchii*. However, due to reduction in the humidity of sites, these species are only small components of present flora and grow usually in small populations on the bark of old deciduous trees.

Epixylic species — Four obligatory liverwort species were observed in epixylic habitats, namely *Calypogeia suecica*, *Cephalozia catenulata*, *C. lunulifolia* and *Nowellia curvifolia*. These plants were found only on single localities and belong with some epiphytic liverworts and mosses to the most threatened elements of the investigated flora.

Terrestrial species — Among forest communities encountered in the area, the floristically richest is the coniferous forest with *Abies alba*. Here occurs a number of interesting bryophyte species associated with acidic substrates, for example *Diplophyllum albicans*, *Jamesoniella autumnalis*, *Sphagnum quinquefarium* and *S. russowii*. It is also worth noting that two neophytic mosses, *Campylopus introflexus* and *Orthodontium lineare*, which in recent decades spread rapidly throughout much of Europe and Poland (3, 4, 9, 14), were discovered in this forest community.

Fallow fields and bare soil, mainly in the western part of the region, are overgrown by many rare species such as *Fossombronina wondraczekii*, *Bryum microerythrocarpum*, *Ditrichum pusillum*, *Pleuridium subulatum*, *Pohlia annotina*, *Pseudephemerum nitidum* and *Trichodon cylindricus*.

Torrenticolous species — Stones and boulders in forest streams offer suitable habitats for some interesting liverworts and mosses. In deep valleys of streams, mainly in beech forests, grow such rarities as *Jungermannia pumila*, *Scapania undulata*, *Hygroamblystegium tenax* and *Sciuro-hypnum plumosum*.

LIST OF SPECIES

This work is based exclusively on the field investigation carried out in 2001–2004. Research stations (25) were mainly located in the most valuable natural areas (Fig. 2). The occurrence of all species is documented by specimens housed in the Herbarium of the Department of Botany and Mycology UMCS (LBL-B). In the following list, taxa are arranged alphabetically. Names of the species are consistent with recent lists of liverworts and mosses (2, 11), unless otherwise stated. For each taxon the following information is given: locality, ATMOS square grid, habitat, information concerning the type of propagation observed.

List of collecting sites

- 1 — Jaz. — Jazowa, village E of Frysztak, 300 m (Ff 82)
- 2 — Kob. — Kobyle, village E of Frysztak, 300 m (Ff 82)
- 3 — Bon. [I] — Bonarówka, forest N of the village, 325–350 m (Ff 93)
- 4 — Żyz. — Żyznów, village N of Krasna, 250 m (Ff 83)
- 5 — Bon. [II] — Bonarówka, village NW of Krasna, 300–325 m (Ff 93)
- 6 — P. W. — Pietrusza Wola, village E of Łęki Strzyżowskie, 350–375 m (Ff 92)
- 7 — Węgl. [I] — Węglówka, NE part of the village, 325–350 m (Ff 93)
- 8 — Cz. Dz. — Czarny Dział, ridge N of Węglówka, SW slope, 425–450 m (Ff 93)
- 9 — Węgl. [II] — Węglówka, forest S of the village, 375–400 m (Ff 93)
- 10 — Kra. [I] — Krasna, forest W of the village, 375 m (Ff 93)
- 11 — Kra. [II] — Krasna, S part of the village, 350–375 m (Ff 93)
- 12 — Cz. [I] — Czarnorzeki, valley of the Czarny Potok stream, 425–450 m (Ff 93)

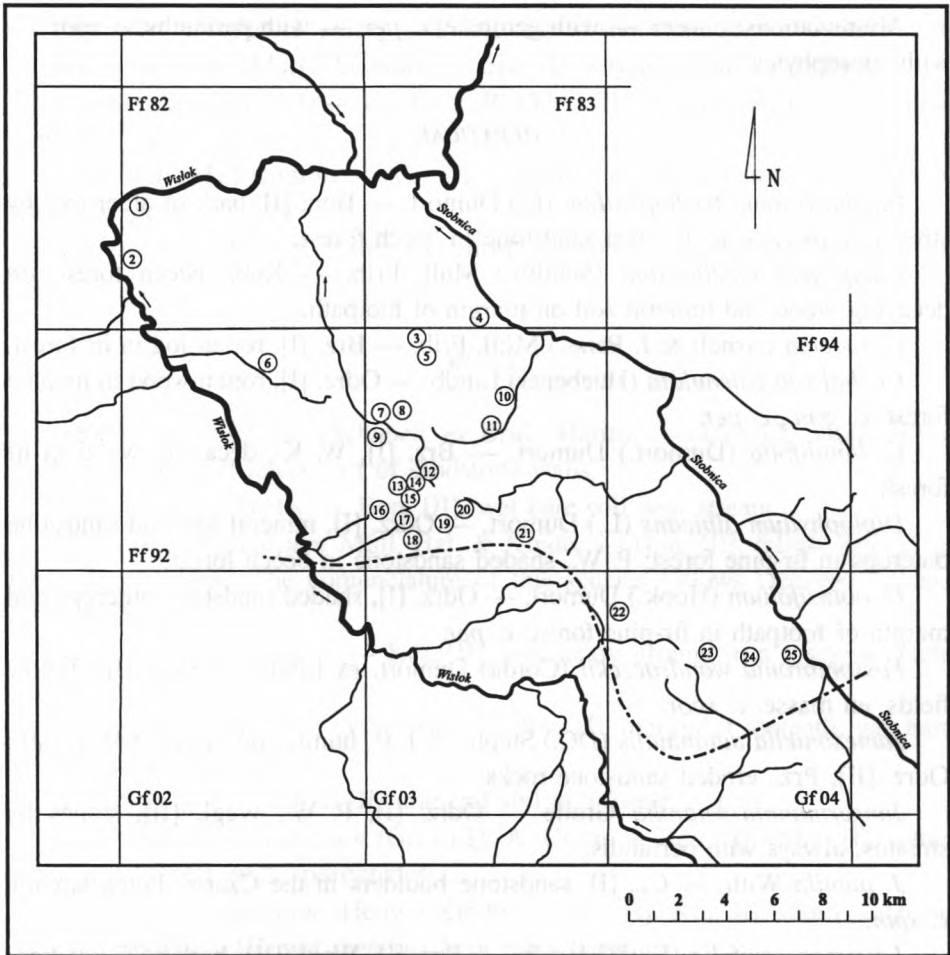


Fig. 2. Collecting sites of bryophytes

- 13 — G. K. [I] — Góra Królewska, mount NW of Czarnorzeki, W slope, 475–500 m (Ff 93)
- 14 — G. K. [II] — Góra Królewska, summit of the mount, 550 m (Ff 93)
- 15 — G. K. [III] — Góra Królewska, S slope of the mount, 475 m (Ff 93)
- 16 — Odrz. [I] — Odrzykoń, forest W of the castle hill, 400–425 m (Ff 93)
- 17 — Odrz. [II] — Odrzykoń, the castle hill, 450 m (Ff 93)
- 18 — Cz. [II] — Czarnorzeki, valley of the Marcinek stream, 400–425 m (Ff 93)
- 19 — Prz. — the "Prządki" nature reserve in Czarnorzeki, 475 m (Ff 93)
- 20 — Cz. [III] — Czarnorzeki, SE part of the village, 375–400 m (Ff 93)
- 21 — W. K. — Wola Komborska, forest S of the village, 425–450 m (Ff 93)
- 22 — J. P. — forest between Jabłonica Polska and Malinówka, 375 m (Gf 04)
- 23 — Brz. [I] — Brzozów, forest W of the town, 350–375 m (Gf 04)
- 24 — Brz. [II] — Brzozów, W part of the town, near the road to Zmiennica, 350 m (Gf 04)
- 25 — Brz. [III] — Brzozów, centre of the town, 300–325 m (Gf 04)

Abbreviations: *c. gem.* — with gemmae, *c. per.* — with perianths, *c. spor.* — with sporophytes

HEPATICAЕ

Blepharostoma trichophyllum (L.) Dumort. — Bon. [I], bark of alder tree by stream, *c. per.*; G. K. [I], wet sandstone in beech forest.

Calypogeia muelleriana (Schiffn.) Müll. Frib. — Kob., beech forest, on decaying wood and mineral soil on margin of footpath.

C. suecica (Arnell & J. Perss.) Müll. Frib. — Brz. [I], rotten log in fir forest.

Cephalozia catenulata (Huebener) Lindb. — Odrz. [I], rotten wood in fir-pine forest, *c. gem.*, *c. per.*

C. lunulifolia (Dumort.) Dumort. — Brz. [I], W. K., decaying wood in fir forest.

Diplophyllum albicans (L.) Dumort. — Odrz. [I], mineral soil and sandstone outcrops in fir-pine forest; P. W., shaded sandstone in beech forest.

D. obtusifolium (Hook.) Dumort. — Odrz. [I], shaded sandstone outcrops and margin of footpath in fir-pine forest, *c. per.*

Fossombronia wondraczekii (Corda) Dumort. *ex* Lindb. — Bon. [II], fallow fields, en masse, *c. spor.*

Jamesoniella autumnalis (DC.) Steph. — J. P., humic soil in fir forest, *c. per.*; Odrz. [II], Prz., eroded sandstone rocks.

Jungermannia leiantha Grolle — Odrz. [I], P. W., Węgl. [II], stones by streams, always with perianths.

J. pumila With. — Cz. [I], sandstone boulders in the Czarny Potok stream, *c. spor.*

Lejeunea cavifolia (Ehrh.) Lindb. — Brz. [I], Węgl. [II], bark of forest trees (beech, oak) in deep valleys of streams.

Lophozia incisa (Schrad.) Dumort. — J. P., eroded sandstone in fir forest, *c. gem.*

Metzgeria conjugata Lindb. — Bon. [II], bark of *Quercus* sp. in mixed forest; G. K. [I], wet sandstone in beech forest.

Nardia geoscyphus (De Not.) Lindb. — Kob., Odrz. [I], margin of footpath, sandstone outcrops, with archeogonia.

Nowellia curvifolia (Dicks.) Mitt. — Brz. [I], decaying wood in fir forest, *c. gem.*, *c. per.*

Porella platyphylla (L.) Pfeiff. — Cz. Dz., Odrz. [II], Węgl. [II], Żyz., shaded sandstone outcrops, bark of old deciduous trees (beech, elm).

Preissia quadrata (Scop.) Nees — Odrz. [II], ruins of the castle, at base of low stone fence.

Riccardia multifida (L.) Gray — P. W., base of sandstone rock in beech forest.

Scapania curta (Mart.) Dumort. — Brz. [I], wayside slope in fir forest.

S. nemorea (L.) Grolle — Cz. [I], J. P., Odrz. [I], shaded sandstone outcrops, *c. gem.*, *c. per.*

S. undulata (L.) Dumort. — Cz. [I], sandstone boulders in the Czarny Potok stream, *c. per.*

Trichocolea tomentella (Ehrh.) Dumort. — Bon. [I], wet place by stream in fir forest.

MUSCI

Anomodon longifolius (Schleich. ex Brid.) Hartm. — Odrz. [II], ruins of the castle, on humus at lower part of sandstone walls.

Bryum bicolor Dicks. — Bon. [II], wet bare soil near stream.

B. microerythrocarpum Müll. Hal. & Kindb. — Bon. [II], fallow field N of the village, *c. gem.* The nomenclature of this species follows Demaret (1) and Nyholm (8).

B. pallens Sw. ex anon. — Kra. [II], wet sandy ground in a roadside ditch, *c. spor.*

B. pallescens Schleich. ex Schwägr. — Brz. [I], margin of footpath, wet bare soil among forest, *c. spor.*

B. rubens Mitt. — Bon. [II], mineral soil in a forest, *c. gem.*

Callicladium haldanianum (Grev.) H. A. Crum — Bon. [I], Odrz. [I], rotten wood in fir forest, with sporophytes.

Calliargon cordifolium (Hedw.) Kindb. — Brz. [I], Kra. [I], small water-pit in fir forest; Węgl. [I], wet meadow N of the village.

Campylidium calcareum (Crundwell & Nyholm) Ochyra — Odrz. [II], on humus at the base of sandstone rock, *c. spor.*

Campylopus introflexus (Hedw.) Brid. — Bon. [I], on the ground in fir forest.

Campylostelium saxicola (F. Weber & D. Mohr) Bruch & Schimp. — Cz. [I], Odrz. [I], shaded sandstone near streams, with sporophytes.

Dicranella schreberiana (Hedw.) Dixon — Odrz. [I], wet bare soil among forest, *c. spor.*

Dicranum majus Sm. — W. K., on the ground and at the base of tree trunks in fir forest.

Didymodon ferrugineus (Schimp. ex Besch.) M. O. Hill — Brz. [III], wall-top covered with soil layer; Żyz., calcareous soil near the road.

D. spadiceus (Mitt.) Limpr. — Bon. [II], rock detritus at the lower part of the shist wall by the stream.

Diphyscium foliosum (Hedw.) D. Mohr — Bon. [I], Brz. [I], semi-shaded slopes in beech forest, *c. spor.*

Ditrichum pusillum (Hedw.) Hampe — Bon. [II], fallow field N of the village, *c. spor.*; Prz., bare soil out of the reserve, *c. spor.*

Drepanocladus aduncus (Hedw.) Warnst. — Brz. [I], wet bare soil among forest.

Dryptodon hartmanii (Schimp.) Limpr. — Odrz. [II], eroded sandstone rock below the castle ruins.

Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen — Kob., hornbeam forest by the road; Żyz., bare soil in a shady ravine.

Fissidens dubius P. Beauv. — Cz. [I], Cz. Dz., shaded sandstone in beech forest.

F. exilis Hedw. — Brz. [I], Cz. [III], mineral soil on the edge of the forest, *c. spor.*

F. gracilifolius Brugg.-Nann. & Nyholm — G. K. [II], beech forest, wayside sandstone near the peak, *c. spor.*

Hedwigia ciliata (Hedw.) P. Beauv. — Odrz. [II], insolated sandstone rocks, *c. spor.*; Prz., scarcely on shaded sandstone rock. From the second locality previously reported by Szafran (16).

Homalothecium lutescens (Hedw.) H. Rob. — Brz. [II], insolated grassy place near the roadside tree line.

Hygroamblystegium tenax (Hedw.) Jenn. — Bon. [I], Węgl. [II], sandstone boulders and wood in forest streams.

Kindbergia praelonga (Hedw.) Ochyra — Jaz., footpath in a forest.

Mnium spinulosum Bruch & Schimp. — G. K. [II], beech forest, wayside sandstone near the peak.

Neckera complanata (Hedw.) Huebener — Odrz. [II], ruins of the castle, at the base of the sandstone wall.

Orthodicranum tauricum (Sapjegin) Smirnova — Bon. [I], abundantly on the bark of a birch tree.

Orthodontium lineare Schwägr. — Odrz. [I], abandoned sandstone excavation in fir-pine forest, on pine roots, *c. spor.*

Orthotheciella varia (Hedw.) Ochyra — Brz. [I], wet bare soil among forest; Cz. [II], fir forest, on wet concrete by the Marcinek stream, *c. spor.*

Orthotrichum patens Bruch ex Brid. — Brz. [III], bark of a roadside lime tree, *c. spor.*

O. tenellum Bruch ex Brid. — Cz. Dz., sandstone outcrops in beech forest, *c. spor.*

Philonotis calcarea (Bruch & Schimp.) Schimp. — Cz. [III], wayside slope, a bank of a small spring.

Plagiomnium ellipticum (Brid.) T. J. Kop. — Kra. [II], wet ground in an alder streamside forest.

P. medium (Bruch & Schimp.) T. J. Kop. — J. P., wet place by the stream in an ash streamside forest, *c. spor.*

Pleuridium subulatum (Hedw.) Rabenh. — Bon. [I], Odrz. [I], bare soil among forest, with sporophytes.

Pogonatum nanum (Schreb. ex Hedw.) P. Beauv. — Kra. [II], abandoned sandstone excavation; Prz., sandy ground in the reserve.

Pohlia annotina (Hedw.) Lindb. — Bon. [II], fallow field N of the village, *c. gem.*

P. camptotrachela (Renauld & Cardot) Broth. — Kra. [I], mineral soil in beech forest; Odrz. [I], margin of footpath in fir-pine forest, *c. gem.*

P. melanodon (Brid.) A. J. Shaw — Odrz. [I], wet bare soil among forest, *c. spor.*

P. wahlenbergii (F. Weber & D. Mohr) A. L. Andrews — Bon. [I], wet mineral soil on the edge of fir forest; Brz. [I], concrete in a source of a stream.

Pseudephemerum nitidum (Hedw.) Loeske — Bon. [II], wet bare soil on the edge of the forest, *c. spor.*

Pseudotaxiphyllum elegans (Brid.) Z. Iwats. — Prz., eroded sandstone, humus in rock crevices, *c. gem.*

Schistostega pennata (Hedw.) F. Weber & D. Mohr — Odrz. [II], in deep gap at base of sandstone rock; Prz., deep and humid rock crevice, *c. spor.*

Sciuro-hypnum plumosum (Hedw.) Ignatov & Huttunen — Cz. [I], sandstone boulders in the Czarny Potok stream, *c. spor.*

S. starkei (Brid.) Ignatov & Huttunen — Cz. [I], shaded sandstone in beech forest, few stems scattered among *Fissidens dubius*.

Serpoleskea subtilis (Hedw.) Loeske — Węgl. [II], bark on the lower part of an old beech tree, *c. spor.*

Sphagnum compactum Lam. & DC. — Brz. [I], wayside slope in fir forest.

S. cuspidatum Ehrh. ex Hoffm. — Bon. [I], small water-pit in fir forest.

S. flexuosum Dozy & Molk. — Bon. [I], small water-pit in fir forest.

S. russowii Warnst. — Odrz. [I], lower part of slopes in fir-pine forest, *c. spor.*

S. quinquefarium (Braithw.) Warnst. — Odrz. [I], fir-pine forest, on a shaded slope below sandstone outcrops.

Syntrichia papillosa (Wilson) Jur. — Brz. [III], bark of roadside trees (ash, lime), *c. gem.*

Taxiphyllum wissgrillii (Garov.) Wijk & Margad. — Cz. Dz., shaded sandstone outcrops in beech forest; Odrz. [II], sandstone rock below the castle ruins.

Thuidium assimile (Mitt.) A. Jaeger — Kra. [I], wayside slope on the edge of the forest. The nomenclature of this species follows Touw (18, 19).

Trichodon cylindricus (Hedw.) Schimp. — Bon. [II], fallow field N of the village, *c. gem.*; Kra. [I], mineral soil in beech forest, *c. spor.*

Trichostomum crispulum Bruch — Bon. [I], shaded sandstone by the stream in fir forest; Bon. [II], rock detritus on shist wall by stream.

T. tenuirostre (Hook. & Taylor) Lindb. — G. K. [I], wet sandstone in beech forest.

Ulota bruchii Hornsch. ex Brid. — Brz. [I], bark of *Quercus* sp. in mixed forest, *c. spor.*

U. crispa (Hedw.) Brid. — Bon. [II], Brz. [I], J. P., bark of forest trees (ash, poplar, sycamore), *c. spor.*

Weissia brachycarpa (Nees & Hornsch.) Jur. — Kra. [I], sandy ground near footpath leading to the forest, *c. spor.*

W. controversa Hedw. — Bon. [I], margin of footpath in a forest, *c. spor.*

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