

Contribution to the bryoflora of the Wiśnickie Foothills (Western Carpathians, Poland)

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Abstract: The paper presents distributional data for 24 liverwort and 94 moss species collected at the Wiśnickie Foothills, including 26 protected and 5 threatened bryophytes.

Key words: liverworts, mosses, distributional data, threatened species, protected species, Wiśnickie Foothills, Western Carpathians, Poland

Introduction

Wiśnickie Foothills (Pogórze Wiśnickie in Polish) is a part of the Western Carpathians Foothills (Fig 1) belt and covers an area of 700 km² (Kondracki 1994). It is one of the poorest bryologically known region in the Polish part of the Carpathians. Although first information about bryophytes origin from 19th century, till this time only sites of several species are known from this area (Krupa 1882; Bednarek-Ochyra 1995; Stebel 1999, 2004, 2007, 2013; Ochyra *et al.* 2011; Stebel & Vončina 2011).

The paper contains information about new localities of 24 liverwort and 94 moss species, including 26 protected and 5 threatened in Poland, found in this area. Overwhelming majority of these species are new for the Wiśnickie Foothills.

Materials and methods

Field investigations were carried out in the years 2010 and 2012. List of taxa are arranged alphabetically. The species names follow mainly Klama (2006a) and Ochyra *et al.* (2003). Species protected by law in Poland were taken after 'Regulation of the Minister of Environment' (2014) whereas threatened after Klama (2006b) and Żarnowiec *et al.* (2004).

For each species the following information is provided: ATMOS (Atlas of distribution of mosses in Poland) grid square, locality, habitat and altitude.



Fig 1: Location of the investigated area.

List of species and localities

Key: ! - species partly protected in Poland, in the square brackets - species threatened in Poland with the threat category.

Liverworts - *Marchantiophyta*

- ! *Bazzania trilobata* (L.) S. Gray – On ground and slopes in coniferous forest. [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, N slope, 410-420 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- Calypogeia azurea* Stotler & Crotz – Rotten wood and soil in forest. [Fe 73] Las Kopaliński, NE part, 300-305 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Rajbrot, Piekarski stream valley, 360-370 m.
- Calypogeia integristipula* Steph. – [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, N slope, wayside in *Pinus sylvestris* forest, 410-420 m.
- Calypogeia muelleriana* (Schiffn.) Müll.Frib. – [Fe 83] Chronów, slope near the Borowianka stream below ‘Skałki Chronowskie’ nature monument, 257-260 m.
- Cephalozia bicuspidata* (L.) Dumort. – Wet soil, sandstone and rotten wood in forest. [Fe 73] Las Kopaliński, NE part, 330-340 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 84] ‘Skałki Chronowskie’ nature monument, 325-330 m.
- Chiloscyphus polyanthos* (L.) Corda – [Fe 83] Lipnica Górna-Granice, boulders in stream, 370-400 m.
- Conocephalum conicum* (L.) Dumort. – [Fe 73] Las Kopaliński, NE part, bank of stream, 300-305 m.
- Diplophyllum albicans* – [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, wayside in coniferous forest, 395-410 m; [Fe 83] Lipnica Górna-Granice, sandstone near stream, 370-400 m.
- [E] *Fossombronina wondraczekii* (Corda) Lindb. – [Fe 83] Borówna-Skręć, wet soil near ditch, *c. spor.*, 325 m.
- ! *Frullania dilatata* (L.) Dumort. – [Fe 93] Mt Domeniczna Góra, S slope, bark of *Salix alba* near stream, 390-400 m; [Fe 93] Rajbrot, bark of *Fraxinus excelsior* near church, 229 m.
- Jungermannia gracillima* Sm. – [Fe 73] Las Kopaliński, NE part, wayside slope, 330-340 m; [Fe 83] Borówna, between Nadole and Skręć settlements, wayside, 280-290 m.
- Lepidozia reptans* (L.) Dumort. – Rotten wood and humus soil. [Fe 73] Las Kopaliński, NE part, 300-305 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- Lophocolea bidentata* (L.) Dumort. – [Fe 93] Mt Domeniczna Góra, S slope, thicket, 390-400 m.
- Lophocolea heterophylla* (Schräd.) Dumort. – Rotten wood, bark of trees. [Fe 73] Las Kopaliński, NE part, 300-305 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- Lophozia ventricosa* (Dicks.) Dumort. emend. H. Buch – [Fe 83] Chronów, sandstones near Borowianka stream below ‘Skałki Chronowskie’ nature monument, *c. gem.*, 257-260 m.
- Marchantia polymorpha* L. subsp. *ruderalis* Bischl. & Boisselier – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, wayside, *c. gem.*, 310-315 m; [Fe 93] Rajbrot-Górki, wayside, *c. gem.*, 340-350 m.
- Pellia epiphylla* (L.) Corda – Wet mineral soil. [Fe 83] Lipnica Górna-Granice, wayside, 370-400 m; [Fe 83] Nowy Wiśnicz, W of the Ziółowa Street, 290-300 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- ! *Plagiochila asplenioides* (L.) Dumort. – [Fe 83] Lipnica Górna-Granice, bank of stream, 370-400 m; [Fe 93] Rajbrot-Pasionków, wayside in thicket, 410-415 m.
- Plagiochila porelloides* (Nees) Lindenb. – [Fe 83] Chronów, slope near Borowianka stream below ‘Skałki Chronowskie’ nature monument, 257-260 m.
- Ptilidium pulcherrimum* (Weber) Vain. – [Fe 73] Las Kopaliński, NE part, bark of *Quercus robur*, 330-340 m; [Fe 83] Lipnica Górna-Granice, bark of *Quercus robur*, 370-400 m.
- Riccia glauca* L. – [Fe 83] Borówna-Skręć, wet soil near ditch, 325 m.
- Riccardia palmata* (Hedw.) Carruth. – [Fe 83] Połom Duży, near road to Królówka, stump in wet *Abies alba* forest, 320-330 m.
- Scapania nemorea* (L.) Grolle – [Fe 83] Chronów, sandstone near the Borowianka stream below ‘Skałki Chronowskie’ nature monument, 257-260 m; [Fe 83] Lipnica Górna-Granice, logs near stream, 370-400 m.
- ! *Trichocolea tomentella* (Ehrh.) Dumort. – [Fe 83] Połom Duży, near road to Królówka, bank of spring in wet *Abies alba* forest, 320-330 m.

Mosses - *Bryophyta*

- ! *Abietinella abietina* (Hedw.) M.Fleisch. – [Fe 93] Mt Domeniczna Góra, S slope, grassy wayside, 400-410 m.
- Amblystegium juratzkanum* Schimp. – [Fe 73] Las Kopaliński, NE part, log in stream, 300-305 m; [Fe 83] Chronów, boulders near the Borowianka stream below ‘Skałki Chronowskie’ nature monument, 257 m.

- Amblystegium serpens* (Hedw.) Schimp. – Bark of trees, walls, soil. [Fe 73] Kopaliny, near manor-house, 342 m; [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, *c. spor.*, 310-315 m; [Fe 93] Mt Rogożowa Góra, NE slope, *c. spor.*, 410-415 m.
- Atrichum undulatum* (Hedw.) P.Beauv. – Soil in forest. [Fe 73] Las Kopaliński, NE part, 300-340 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Barbula convoluta* Hedw. – [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Barbula unguiculata* Hedw. – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, wall, soil, 310-315 m.
- ! [R] *Brachydontium trichodes* (F.Weber) Milde – [Fe 84] ‘Skałki Chronowskie’ nature monumet’, sandstone, *c. spor.*, 325-330 m.
- Brachytheciastrum velutinum* (Hedw.) Ignatov & Huttunen – Bark of trees, wood, concrete walls. [Fe 73] Kopaliny, near manor-house, 342 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Brachythecium albicans* (Hedw.) Schimp. – Grassy places, waysides. [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, 310-315 m; [Fe 83] Nowy Wiśnicz, W of the Ziółowa Street, 290-300 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Mt Domeniczna Góra, S slope, 400-410 m.
- Brachythecium rivulare* Schimp. – [Fe 73] Las Kopaliński, NE part, bank of stream, 300-305 m.
- Brachythecium rutabulum* (Hedw.) Schimp. – Rotten wood, walls, soil. [Fe 73] Kopaliny, near manor-house, 342 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monumet, W slope, 395-410 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- Brachythecium salebrosum* (Hoffm. ex F.Weber & D.Mohr) Schimp. – Rotten wood, concrete walls. [Fe 83] Połom Duży, near road to Królówka, wet *Abies alba* forest, 320-330 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Bryoerythrophyllum recurvirostrum* (Hedw.) P.C.Chen – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, wall, 310-315 m.
- Bryum argenteum* Hedw. – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, wall, 310-315 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Calliergon cordifolium* (Hedw.) Kindb. – [Fe 73] Las Kopaliński, NE part, small pond in deciduous forest, 335 m.
- ! *Calliergonella cuspidata* (Hedw.) Loeske – Wet grassy places, drainage ditches, thicket. [Fe 73] Kopaliny, near manor-house, 342 m; [Fe 83] Leksandrowa, near Leksandrowa-Połom Duży road, 355-360 m; [Fe 93] Rajbrot-Pasionków, 410-415 m.
- ! [I] *Campylopus flexuosus* (Hedw.) Brid. – On ground and waysides in coniferous forest. [Fe 83] ‘Kamienie Brodzińskiego’ nature monumet, N slope, 410-420 m; [Fe 83] Mt Kobyła Góra, NW slope, 300-310 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 84] ‘Skałki Chronowskie’ nature monumet, 325 m.
- Ceratodon purpureus* (Hedw.) Brid. – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, wall, soil, 310-315 m; [Fe 93] Mt Domeniczna Góra, near summit, 460-465 m; [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, 395 m.
- Cirriphyllum piliferum* (Hedw.) Grout – [Fe 83] Chronów, slope near the Borowianka stream below ‘Skałki Chronowskie’ nature monumet, 257-260 m.
- ! *Climacium dendroides* (Hedw.) F.Weber & D.Mohr – [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Cratoneuron filicinum* (Hedw.) Spruce – [Fe 93] Rajbrot, Piekarski stream valley, 360-370 m;
- ! *Ctenidium molluscum* (Hedw.) Mitt. – [Fe 83] Chronów, slope near the Borowianka stream below ‘Skałki Chronowskie’ nature monumet, 257-260 m; [Fe 83] Lipnica Górna-Granice, bank of stream, 370-400 m.
- Dichodontium pellucidum* (Hedw.) Schimp. – [Fe 83] Chronów, boulders in the the Borowianka stream below ‘Skałki Chronowskie’ nature monumet, 257 m; [Fe 83] Lipnica Górna-Granice, stream, 370-400 m.
- Dicranella heteromalla* (Hedw.) Schimp. – Slopes in forest. [Fe 73] Las Kopaliński, NE part, 330-340 m; [Fe 83] Nowy Wiśnicz, W of the Ziółowa Street, 290-300 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Dicranella rufescens* (Dicks.) Schimp. – [Fe 73] Las Kopaliński, NE part, wayside, 330-340 m; [Fe 83] Borówna-Skręć, wet soil near ditch, *c. spor.*, 325 m.
- Dicranodontium denudatum* (Brid.) E.Britton – [Fe 83] Lipnica Górna-Granice, log in wet *Abies alba* forest, 370-400 m.
- ! *Dicranum polysetum* Sw. ex anon. – [Fe 73] Las Kopaliński, NE part, on ground in coniferous forest, 300-305 m.
- ! *Dicranum scoparium* Hedw. – Bark of trees, wood, soil. [Fe 73] Las Kopaliński, NE part, 300-305 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monumet, N slope, 410-420 m; [Fe 83] Lipnica Górna-Granice, 370-400

- m; [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, 310-315 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- Didymodon rigidulus* Hedw. – Concrete walls. [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, 310-315 m; [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, 395 m.
- Dryptodon pulvinatus* (Hedw.) Brid. – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, concrete wall, 310-315 m.
- ! *Eurhynchium angustirete* (Broth.) T.J.Kop. – On ground in forest. [Fe 73] Las Kopaliński, NE part, 300-305 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, N slope, 405 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Nowy Wiśnicz, W of the Ziółowa Street, 290-300 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Rajbrot, Piekarski stream valley, 360-370 m.
- Fissidens bryoides* Hedw. – Waysides. [Fe 83] Borówna, between Nadole and Skręć settlements, *c. spor.*, 280 m; [Fe 83] Lipnica Górna-Granice, 370-400 m.
- Fissidens taxifolius* Hedw. – Soil in forest. [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Nowy Wiśnicz, W of the Ziółowa Street, 290-300 m.
- Funaria hygrometrica* Hedw. – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, wall, *c. spor.*, 310-315 m.
- Herzogiella seligeri* (Brid.) Z.Iwats. – Rotten wood. [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Hygrohypnum luridum* (Hedw.) Jenn. – [Fe 83] Lipnica Górna-Granice, boulders in stream, 370-400 m.
- ! *Hylocomium splendens* (Hedw.) Schimp. – [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, coniferous forest, 395-410 m.
- Hypnum cupressiforme* Hedw. – Bark of trees, logs, sandstone, soil. [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, N slope, 410-420 m; [Fe 83] Leksandrowa, near Leksandrowa-Połom Duży road, 355-360 m; [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, 310-315 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- Hypnum lindbergii* Mitt. – Waysides. [Fe 83] Leksandrowa, near Leksandrowa-Połom Duży road, 355-360 m; [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, 310-315 m.
- Hypnum pallescens* (Hedw.) P.Beauv. – Bark of trees, logs, sandstone. [Fe 73] Las Kopaliński, NE part, 330-340 m; [Fe 83] Borówna, between Nadole and Skręć settlements, 300 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Leksandrowa, near Leksandrowa-Połom Duży road, 355-360 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 93] Mt Domeniczna Góra, near summit, 460-465 m.
- Isoetecium alopecuroides* (Dub.) Isov. – [Fe 83] Lipnica Górna-Granice, boulder, 370-400 m.
- Kindbergia praelonga* (Hedw.) Ochyra – [Fe 73] Las Kopaliński, NE part, path in deciduous forest 330-340 m.
- Leptodictyum riparium* (Hedw.) Warnst. – [Fe 73] Las Kopaliński, NE part, small pond in deciduous forest, 335 m; [Fe 83] Chronów, boulders in the Borowianka stream below ‘Skałki Chronowskie’ nature monument, 257 m.
- Leskea polycarpa* Hedw. – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, wall, *c. spor.*, 310-315 m.
- ! *Leucobryum glaucum* (Hedw.) Ångstr. – On ground and waysides in coniferous forest. [Fe 83] Borówna, between Nadole and Skręć settlements, 280 m; [Fe 83] Chronów, slope near the Borowianka stream below ‘Skałki Chronowskie’ nature monument, 257-260 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, N slope, 410-420 m; [Fe 83] Mt Kobyla Góra, NW slope, 300-310 m; [Fe 83] Leksandrowa, near Leksandrowa-Połom Duży road, 355-360 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, *c. spor.*, 320-330 m; [Fe 84] ‘Skałki Chronowskie’ nature monument, 325-330 m; [Fe 93] Mt Domeniczna Góra, near summit, 460-465 m; [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, 395 m; [Fe 93] Rajbrot, Piekarski stream valley, 360-370 m.
- Leucodon sciuroides* (Hedw.) Schwägr. – [Fe 93] Mt Domeniczna Góra, S slope, bark of *Salix alba*, 390-400 m.
- Mnium hornum* Hedw. – Slopes near streams. [Fe 73] Las Kopaliński, NE part, 300-305 m; [Fe 83] Chronów, the Borowianka stream below ‘Skałki Chronowskie’ nature monument, 257-260 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 93] Rajbrot, Piekarski stream valley, 360-370 m.
- Niphotrichum canescens* (Hedw.) Ochyra & Bednarek-Ochyra – [Fe 93] Mt Domeniczna Góra, S slope, grassy wayside, 400-410 m.
- Orthodicranum montanum* (Hedw.) Loeske – Bark of trees, humus soil in forest, rotten wood. [Fe 73] Las Kopaliński, NE part, 330-340 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Orthotrichum affine* Brid. – [Fe 93] Mt Domeniczna Góra, near summit, bark of *Salix caprea* in mixed forest, *c. spor.*, 460-465 m; [Fe 93] Rajbrot, bark of *Populus* sp. near church, *c. spor.*, 229 m.

- Orthotrichum anomalum*** Hedw. – Concrete walls, roofs. Always with sporophytes. [Fe 73] Kopaliny, near manor-house, 342 m; [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, 310-315 m; [Fe 93] Rajbrot-Górki, 340-350 m; [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, 395 m.
- Orthotrichum diaphanum*** Brid. – Bark of deciduous trees, walls. Always with sporophytes. [Fe 73] Kopaliny, near manor-house, 342 m; [Fe 73] Las Kopaliniński, NE part, 330-340 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, 310-315 m; [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, 395 m; [Fe 93] Rajbrot-Pasionków, 430 m.
- Orthotrichum obtusifolium*** Brid. – [Fe 83] Leksandrowa, near Leksandrowa-Połom Duży road, bark of *Malus domestica*, 355-360 m.
- Orthotrichum pumilum*** Sw. ex anon. – [Fe 83] Leksandrowa, near Leksandrowa-Połom Duży road, bark of *Malus domestica*, c. spor., 355-360 m; [Fe 93] Rajbrot-Pasionków, bark of *Fraxinus excelsior*, c. spor., 430 m.
- Orthotrichum speciosum*** Nees – [Fe 73] Kopaliny, near manor-house, wall, c. spor., 342 m; [Fe 93] Rajbrot, bark of *Populus* sp. near church, c. spor., 229 m.
- Oxyrrhynchium hians*** (Hedw.) Loeske – On ground in forest, thicket, waysides, boulders in stream. [Fe 73] Las Kopaliniński, NE part, 300-305 m; [Fe 83] Leksandrowa, near Leksandrowa-Połom Duży road, 355-360 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Nowy Wiśnicz, W of the Ziołowa Street, 290-300 m; [Fe 93] Rajbrot-Pasionków, 410-415 m.
- Plagiomnium affine*** (Funck) T.J.Kop. – On ground in forest, waysides. [Fe 73] Las Kopaliniński, NE part, 330-340 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, 395 m.
- Plagiomnium cuspidatum*** (Funck) T.J.Kop. – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, dry wayside, 310-315 m.
- Plagiomnium undulatum*** (Hedw.) T.J.Kop. – Wet places in forest and thicket. [Fe 73] Las Kopaliniński, NE part, 300-305 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Nowy Wiśnicz, W of the Ziołowa Street, 290-300 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- Plagiothecium cavifolium*** (Brid.) Z.Iwats. – Slopes and waysides in forest and thicket. [Fe 83] Borówna, between Nadole and Skręć settlements, 280 m; [Fe 83] Nowy Wiśnicz, W of the Ziołowa Street, 290-300 m; [Fe 93] Mt Domeniczna Góra, S slope, 390-400 m.
- Plagiothecium curvifolium*** Limpr. – On ground and rotten wood in forest. [Fe 73] Las Kopaliniński, NE part, 330-340 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Plagiothecium laetum*** Schimp. – Bark of trees, soil. [Fe 73] Las Kopaliniński, NE part, 330-340 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Nowy Wiśnicz, W of the Ziołowa Street, 290-300 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- Plagiothecium nemorale*** (Mitt.) A.Jaeger – [Fe 73] Las Kopaliniński, NE part, bank of stream, 300-305 m; [Fe 83] Lipnica Górna-Granice, slope, 370-400 m.
- Platygyrium repens*** (Brid.) Loeske – Bark of deciduous trees and logs. [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, 310-315 m; [Fe 93] Rajbrot, near church, 229 m.
- Pleurozium schreberi*** (Brid.) Mitt. – On ground in coniferous forest, grassy slopes. [Fe 73] Las Kopaliniński, NE part, 300-305 m; [Fe 83] Chronów, slope near the Borowianka stream below ‘Skałki Chronowskie’ nature monument, 257-260 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Mt Kobyla Góra, NW slope, 300-310 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 84] ‘Skałki Chronowskie’ nature monument, 325-330 m; [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, 395 m.
- Pohlia melanodon*** (Brid.) A.J.Shaw – [Fe 73] Las Kopaliniński, NE part, wayside slope, 330-340 m; [Fe 83] Chronów, slope near the Borowianka stream below ‘Skałki Chronowskie’ nature monument, 257-260 m.
- Pohlia nutans*** (Hedw.) Lindb. – On ground in forest. [Fe 83] Nowy Wiśnicz, W of the Ziołowa Street, 290-300 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Pohlia wahlenbergii*** (F. Weber & D. Mohr) A. L. Andrew – [Fe 93] Rajbrot, Piekarski stream valley, wayside ditch, 360-370 m; [Fe 93] Rajbrot-Pasionków, wayside slope, 430 m.
- Polytrichastrum formosum*** (Hedw.) G.L.Sm. – On ground in forest. [Fe 73] Las Kopaliniński, NE part, 330-340 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- ! *Polytrichum commune*** Hedw. – Wet places in coniferous forest. [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Lipnica Górna-Granice, 370-400 m.
- Polytrichum juniperinum*** Hedw. – [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, insolated place, 395 m.
- ! *Pseudoscleropodium purum*** (Hedw.) Broth. – Grassy places, on ground in coniferous forest. [Fe 73] Kopaliny, near manor-house, 342 m; [Fe 73] Las Kopaliniński, NE part, 300-305 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży,

- near road to Królówka, 320-330 m; [Fe 93] Mt Domeniczna Góra, S slope, 400-410 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Pseudotaxiphyllum elegans*** (Brid.) Z.Iwats. – Mineral soil in forest. Always with gemmae. [Fe 73] Las Kopalński, NE part, 300-305 m; [Fe 83] Chronów, slope near the Borowianka stream below ‘Skalki Chronowskie’ nature monument, 257-260 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Nowy Wiśnicz, W of the Ziołowa Street, 290-300 m; [Fe 83] ‘Kamień Grzyb’ nature reserve, 380 m; [Fe 93] Rajbrot, Piekarski stream valley, 360-370 m; [Fe 93] Mt Rogożowa Góra, NE slope, 460 m.
- Pylaisia polyantha*** (Hedw.) Schimp. – [Fe 73] Kopaliny, near manor-house, wall, 342 m; [Fe 93] Rajbrot, bark of *Populus* sp. near church, 229 m.
- Rhynchostegium murale*** (Hedw.) Schimp. – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, wall, 310-315 m.
- Rhyidiadelphus loreus*** (Hedw.) Warnst. – [Fe 73] Las Kopalński, NE part, on ground in coniferous forest, 300-305 m.
- Rhyidiadelphus squarrosus*** (Hedw.) Warnst. – Grassy places, thicket. [Fe 73] Kopaliny, near manor-house, 342 m; [Fe 83] Borówna, between Nadole and Skręć settlements, 290-300 m; [Fe 83] Chronów, slope near the Borowianka stream below ‘Skalki Chronowskie’ nature monument, 257-260 m; [Fe 83] Nowy Wiśnicz, W of the Ziołowa Street, 290-300 m; [Fe 93] Mt Domeniczna Góra, S slope, 390-400 m; [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, 395 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- Rosulabryum moravicum*** (Podp.) Ochyra & Stebel – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, bark of *Robinia pseudoacacia*, 310-315 m.
- Sanionia uncinata*** (Hedw.) Loeske – [Fe 83] Lipnica Górna-Granice, log in wet *Abies alba* forest, 370-400 m.
- Schistidium crassipilum*** H.H.Blom – Concrete walls. [Fe 73] Kopaliny, near manor-house, 342 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, 310-315 m; [Fe 93] Rajbrot, ‘Rakowiec’ cemetery, 395 m.
- Sciuro-hypnum oedipodium*** (Mitt.) Ignatov & Huttunen – [Fe 73] Las Kopalński, NE part, wayside slope, 330-340 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, N slope, wayside in *Pinus sylvestris* forest, 410-420 m.
- Sciuro-hypnum plumosum*** (Hedw.) Ignatov & Huttunen – [Fe 83] Lipnica Górna-Granice, boulders in stream, 370-400 m.
- Sciuro-hypnum populeum*** (Hedw.) Ignatov & Huttunen – [Fe 83] Nowy Wiśnicz, cemetery near the Bocheńska Street, wall, *c. spor.*, 310-315 m.
- ! ***Sphagnum capillifolium*** (Ehrh.) Hedw. – Wet coniferous forest. [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m.
- ! ***Sphagnum compactum*** Lam. & DC. – [Fe 93] Rajbrot, Piekarski stream valley, slope above wayside ditch, 360-370 m.
- ! ***Sphagnum girgensohnii*** Russow – Wet places in coniferous forest, ditches. [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Rajbrot, Piekarski stream valley, 360-370 m.
- ! ***Sphagnum russowii*** Warnst. – [Fe 83] Lipnica Górna-Granice, wet *Abies alba* forest, 370-400 m.
- ! [R] ***Syntrichia papillosa*** (Wilson) Jur. – Bark of wayside deciduous trees. [Fe 93] Rajbrot, near church, 229 m; [Fe 93] Rajbrot-Rogożówka, 356 m.
- Syntrichia ruralis*** (Hedw.) Web. & Mohr – [Fe 73] Kopaliny, near manor-house, wayside, 342 m; [Fe 93] Rajbrot-Górki, roof, 340-350 m.
- ! [R] ***Syntrichia virescens*** (De Not.) Ochyra – [Fe 93] Rajbrot, bark of *Fraxinus excelsior* near church, 229 m.
- Tetraphis pellucida*** Hedw. – Rotten wood in forest. [Fe 83] Lipnica Górna-Granice, 370-400 m; [Fe 83] Połom Duży, near road to Królówka, 320-330 m; [Fe 93] Mt Rogożowa Góra, NE slope, wayside, 410-415 m.
- ! ***Thuidium assimile*** (Mitt.) A.Jaeger – [Fe 93] Mt Domeniczna Góra, S slope, grassy wayside, 400-410 m.
- ! ***Thuidium delicatulum*** (Hedw.) Schimp. – [Fe 83] Chronów, sandstone near the Borowianka stream below ‘Skalki Chronowskie’ nature monument 257-260 m.
- ! ***Thuidium tamariscinum*** (Hedw.) Schimp. – Wet places in forest. [Fe 73] Las Kopalński, NE part, 300-305 m; [Fe 83] ‘Kamienie Brodzińskiego’ nature monument, W slope, 395-410 m; [Fe 83] Mt Kobyla Góra, NW slope, 300-310 m; [Fe 83] Lipnica Górna-Granice, 370-400 m.

Discussion on most important records

The Wiśnickie Foothills is densely populated and urbanized, thus its bryoflora is on the large areas poor and consists of several ubiquitous species. The interesting components of the



Fig 2: 'Kamienie Brodzińskiego' nature monument – bryologically interesting place at the Wiśnickie Foothills (Photo by A. Stebel, 25 August 2012).



Fig 3: *Trichocolea tomentella* – very rare liverwort at the Wiśnickie Foothills (Photo by A. Stebel).

flora survived only on dispersed sites, such as inaccessible parts of steep ravines, sandstone outcrops (Fig 2) and larger forest complexes. The most interesting records are:

Brachydontium trichodes – epilithic moss occurring mainly in the forest belts of the higher ranges of the Carpathians (Stebel 2008), recently one time found in the Carpathian Foothills at the Wielickie Foothills (Stebel 2004). The population observed on the investigated area was extremely small and consists of only several individuals.

Campylopus flexuosus – species considered as rare in Poland, but for several years more and more of its sites have been discovered, mainly in western part of the country. In the Carpathians Foothills is known from several localities (Armata 2006, Stebel 2007). The species occurs here mainly on humus soil in managed, wet pine or fir forest and seems to be spreading in this area.

Diplophyllum albicans – liverwort known in the Carpathians mainly from its higher ranges, in the Carpathians Foothills very rare, till this time known here from only four sites (Cykowska 2006). The populations at the Wiśnickie Foothills were fairly abundant (several square decimetres) and this species seems not to be threatened in this area

Rhytidiadelphus loreus – moss occurring in the Carpathians mainly in the upper forest belt (Bednarek-Ochyra *et al.* 1994), in the Carpathians Foothills very rare, till this time known here from only one site reported in 19th century (Krupa 1882). The only population found at the Wiśnickie Foothills is small and covers about 2 square decimetres. At present it is difficult to say if this species is threatened in this area because during the last years *R. loreus* seems to be spreading, at least in the western part of the Carpathians (Stebel 2006).

Trichocolea tomentella (Fig 3) – liverwort fairly frequent in the Carpathians, but from the Carpathians Foothills reported for one time only from the Dynowskie Foothills (Armata 2005). The population at the investigated area is fairly abundant and covers several square metres.

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