CONTRIBUTION TO THE BRYOFLORA OF THE ROZTOCZE NATIONAL PARK (SE POLAND)– BRYOPHYES OF THE ŚWIERSZCZ RIVER VALLEY

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ABSTRACT. New distribution data for 171 bryophyte taxa in the Roztocze National Park are provided. Among them there are 43 species protected by law in Poland, including 20 strictly protected species, as well as 13 species threatened by loss of old-growth forests what confirms the specificity of nature of the Roztocze region. The most valuable and interesting finds are: mosses Campylophyllopsis sommerfeltii (Myrion) Ochyra, Dicranum viride (Sull. & Lesq.) Lindb., Buxbaumia viridis (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl. as well as liverworts Calypogea suecica (Arnell et J. Perss.) Müll. Frib. and Cephalozia catenulata (Huebener) Lindb. A brief characterisation of these species is presented.

KEY WORDS: bryophytes distribution data, mountain species, old-forests relicts, threatened bryophytes, Roztocze National Park, Świerszcz river valley
INTRODUCTION

Situated on the south–eastern border of Poland, an upland region called “Roztocze” is best known for the occurrence of old-growth natural fir-dominated mixed forests, at their north-eastern limit of dense natural geographical range, and for breeding of Polish horses. The vegetation of Roztocze is more peculiar and reflects its geographical specificity – geomorphology, geology, hydrology and climate (Buraczynski 2002). From the floristic point of view the most interesting is rich representation of mountain species in spite of rather low elevations (290-400 m a.s.l.).

The first bryological notes from the Roztocze area were reported from the end of the 19th century (Błonski 1890). The next bryological reports were published almost 70 years later (Szweykowski 1957, Lisowski 1958b). Field research refer to the bryophytes of Roztocze were carried out quite intensively by some authors in the years 1963-1977 (Kuc 1963, 1964; Karczmarsz 1964, 1965, 1967, Grabarz 1969, Bloch & Karczmarsz 1973, Mendelak 1977). Their results were summarized by Karczmarsz (1994) who estimated that bryoflora of the Roztocze National Park includes 195 species (1 hornwort, 39 liverworts and 155 mosses). The most recent studies (Maciejewski & Zubel 2009a, b, Zubel 2009, Zubel & Maciejewski 2009, 2011) have revealed some new species and at the same time authors have confirmed the occurrence of only 60% of the earlier reported species. Thus knowledge on present distribution of bryophytes in the Roztocze region and of the Roztocze National Park required to be updated. Therefore the tree-days bryological exploration in some sites of the Roztocze National Park was organised in September 2011 by the Section of Bryology of the Polish Botanical Society. This paper presents bryological data collected in the Świerszcz river valley, especially poorly bryologically known hitherto.

STUDY AREA, MATERIAL AND METHODS

According to the physico-geographical division of Poland, the Roztocze region is situated in two macroregions of south-eastern Poland: Wyżyna Lubelsko-Lwowska (Lublin-Lwów Upland) and Kotlina Sanomierska Dale (Kondracki 2002). In respect to the geobotanical division it belongs to the South-Poland Uplands district, Roztocze land (Matuszkiewicz 1993).

The Roztocze National Park (Fig. 1) was established in 1974 but the first efforts to protect vegetation of the Roztocze region are much older and begun in 1936 when the nature reserve “Bukowa Góra”, protecting old-growth beech forests with silver fir, was set up (Matlaw ska 1994). At present, the total area of national park amounts 8483 ha and it comprises five areas of strict protection. Regarding territorial division, 94% of its area is situated in the Zwierzyniec commune, Lublin voivodeship. The 95% of the Park area is covered with forests. Waters from the area of the Roztocze National Park fall into the Wieprz river. Świerszcz river, which is a tributary of Wieprz, gathers water from the Zwierzyniec valley, situated southwards from the Zwierzyniec village. Two retention ponds, Czarny Staw and Staw Flora, are situated southwards from the Zwierzyniec village.

The main nature values of the Park are old-growth well-preserved forest phytocoenoses, regarded to be remnants of primeval forests represented mainly by the Carpathian beech forest Dentario glandulosae-Fagetum and upland fir-dominated mixed forest Abietetum albae (= Abietetum polonicum) developed in two forms: typical A.p. typicum and moderately wet A.p. circarceo-sum (Lorens 1998). The forest vegetation is more differentiated; altogether 21 forest communities were recognised (Izdebski et al. 1992).

The results of the field studies presented in this paper were carried out between 15th and 17th of September 2011, within the valley of the Świerszcz river (ATMOS squares: Eg-91 and Fg-01). Świerszcz river valley extends from 260 m a.s.l. around its springs to 230 m a.s.l. at its mouth to the Wieprz river. The studied area was divided into 21 sites consistent with forest section division, including municipal public park in the Zwierzyniec village (site nr 1 – Table 1; Fig. 2). Within each site every liverwort and moss species were recorded from every substratum type.

Bryophyte nomenclature follows mainly Ochyra et al. (2003) and Klama (2006b). Status of their legal protection in Poland is given after the “Regulation of the Minister of the Environment” from 5th January 2012, degree of threat in Poland according to Klama (2006a) and Żarnowiec et al. (2004). Mountain species were recognized according to Stebel (2006) and the relicts of primeval forests according to Cieslinski et al. (1996), Stebel (2012) and Stebel & Żarnowiec (2014).

RESULTS

GENERAL CHARACTERISATION OF THE BRYOFLORA IN THE ŚWIERSZCZ RIVER VALLEY

As result of three day field studies the localities of 171 bryophyte taxa (40 taxa of liverworts including two subspecies of Marchantia polymorpha and 131 taxa of mosses, with two varieties of Hypnum cupressiforme) were stated. They occurred with various frequency; 55 of them (32%) were recorded on 1–2 sites, while others were more widespread (Table 2). Thirteen taxa occurred exclusively in the municipal public park in Zwierzyniec village.

In the list there are 36 taxa new for the region: five liverworts and 31 mosses. Noteworthy is the occurrence of 43 protected (among them 20 strictly pro-
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...tected) and 13 threatened in Poland bryophyte species (Table 2). Regarding the vertical distribution of all the recorded species and their affinities to higher elevations, most of them represent lowland element whereas 19 can be classified as typical mountain bryophytes. Ten species of bryophytes are considered to be relics of primeval forests and most of them occurred in no more than three sites (Table 2).

The bryophytes were collected from all available substrata (Table 2) and 69 species (40%) showed visible affiliation to only one substratum type, while 50 species (29%) colonized three different substrata or more (Fig. 3).

...THE MOST INTERESTING SPECIES

To the most valuable findings of the workshops belongs a site of the moss species *Campylophyllopsis sommerfeltii* (Myrin) Ochyra which is new for Poland. It has been known earlier under some synonyms: *Campylium hispidulum* auct. eur., *Campylium sommerfeltii* (Myrin) Lange, *Campylium hispidulum var. sommerfeltii* (Myrin) Lindb., *Campylophyllum sommerfeltii* (Myrin) Hedenäs, *Campylidium sommerfeltii* (Myrin) Ochyra. In 1962 CRUNDWELL and NYHOLM (1962) revised herbarium specimens identified as *Campylium*...
Fig. 2. Arrangement and enumeration of investigated sites on the background of forest communities diversity along the Świerszcz river valley: 1 – rivers, streams, ponds; 2 – enumeration of site; 3 – forest section number; 4 – forest communities type: Ap – Abietetum polonicum, FA – Fraxino-Alnetum, LP – Leucobryo-Pinetum, QP – Querco-Piccetum, QrP – Querco roboris-Pinetum, RnA – Ribo nigri-Alnetum; Eg 91, Fg 01 – number of ATMOS grid.
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hispidulum (Brid.) Mitt. collected from Europe and North America and found that they represented three different taxa: *Campylium sommerfeltii* (Myrin) Lange [ = *Camphyllopsis sommerfeltii* (Myrin) Ochyra], *C. calcarea* Crundw. & Nyh. [ = *Campylophyllopsis calcarea* (Crundwell & Nyholm) Ochyra] and *C. hispidulum* (Brid.) Mitt [ = *Campylophyllum hispidula* (Brid.) Ochyra]. They also claimed that the latter has not occurred in Europe. *Campylium hispidulum* (Brid.) Mitt was reported from Poland by S. Lisowski from the Równina Augustowska Upland (LISOWSKI 1958a) and Bieszczady Mountains (LISOWSKI 1956). To find out the real distribution of *Campylium sommerfeltii* in Poland there have been revised all herbarium materials gathered in following herbaria: KRAM-B, LUBL, POZG-B and WA. These studies revealed altogether five historical sites of this species in the country (Fig. 4), all noted 30–40 years ago. There is a high probability of misidentification of this species and confusion with more frequent *Campylophyllum calcarea* (Crundwell & Nyholm) Ochyra, which has different leaf shape and angular cells.

*Campylophyllum sommerfeltii* occurs in North America (HEDENÅS 1997, 2000), Greenland, northern and central Europe, North and East Asia (Syberia) as well as in Mexico (PODPĚRA 1954, NYHOLM 1965). In Europe it has been reported from Scandinavia, Baltic countries and Russia (PODPĚRA 1954); it has also been recorded in some sites in the mountains of Czech Republic (KUCERA & VAŇA 2005). *Campylophyllum sommerfeltii* is one of the most rarely noted in Poland representative of the Amblystegiaceae family. The species occurs mainly on decaying wood but sometimes colonizes also soil or rocks. In the Świerszcz river valley the species was found in three places (Table 2).

The next valuable finding is *Dicranum viride* (Sull. & Lesq.) Lindb., an epiphytic moss species regarded to be a relic of primeval forests (STREBEL 2012). The species was protected by the Bern Convention since 1978, mentioned in the Annex II of the Habitat Directive in 1992 and strictly protected by law in Poland (REGULATION... 2012). It is also classified as threatened in Europe (V category; SCHUMACKER & MARTINY 1995)

**Table 1. Enumeration and description of sites**

<table>
<thead>
<tr>
<th>ATMOS square</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>187 B</td>
<td>FA, LP</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>186 B</td>
<td></td>
<td></td>
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<td>4</td>
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<td>5</td>
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<td>194 B</td>
<td>FA, LP</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>194 A</td>
<td>FA, RnA, LP</td>
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<tr>
<td>8</td>
<td>204 B</td>
<td>FA, QR LP</td>
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</tr>
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<td>204 A</td>
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</tr>
<tr>
<td>19</td>
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<td>QR, RnA, LP</td>
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<td>20</td>
<td>274 A</td>
<td>RnA, FA, QR, QR P, LP</td>
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</tr>
<tr>
<td>21</td>
<td>290</td>
<td>QR, QR P, RnA, LP</td>
<td></td>
</tr>
</tbody>
</table>


Fig. 3. Bryophyte occurrence on different substratum types (number of species): conc. – species occurring on concrete elements, EG – species occurring on ground, EPH – species occurring on tree trunks, EX – species occurring on logs, polysubstrata – species occurring on three or more substrata.
Table 2. Bryophytes of the Świerszcz river valley and details of their occurrence.

<table>
<thead>
<tr>
<th>Species name</th>
<th>Distinguishing feature</th>
<th>Collecting sites</th>
<th>Habitats and substrata</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIVERWORTS (MARCHANTIOPHYTA)</td>
<td></td>
<td></td>
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<td></td>
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<td>Aneura pinguis (L.) Dumort.</td>
<td></td>
<td>1, 5, 9, 10, 14, 20</td>
<td>A2, A3, B1, B2</td>
<td>AS, BC, EF, GJW, GV, MSK, MW, RZ, SW</td>
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<tr>
<td>Bazzania trilobata (L.) Gray</td>
<td>Pp; R</td>
<td>2, 10–12, 15, 16, 20, 21</td>
<td>A2, A3, B1</td>
<td>AS, BC, BP, GF, GJW, MSK, PG, RZ, TP</td>
</tr>
<tr>
<td>Blepharostoma trichophyllum (L.) Dumort.</td>
<td></td>
<td>15, 16, 18–21</td>
<td>A2, B1, B2, C1</td>
<td>BC, BP, EF, GJW, MSK, PG, RZ, TP</td>
</tr>
<tr>
<td>Calypogeia azurea Stoller &amp; Crotz</td>
<td>M</td>
<td>9, 17, 19–21</td>
<td>A2, B1, C1</td>
<td>BC, GJW, MSK, RZ</td>
</tr>
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<td>Calypogeia integrifolia Steph.</td>
<td></td>
<td>6, 7, 9, 10, 12, 14, 19–21</td>
<td>A2, A3, B1, C1</td>
<td>AS, GJW, MSK, PG, RZ</td>
</tr>
<tr>
<td>Calypogeia muelleriana (Schiffn.) Müll. Frib.</td>
<td></td>
<td>1, 6, 16, 21</td>
<td>A3, B1</td>
<td>AS, BP, GJW, PG, TP</td>
</tr>
<tr>
<td>Calypogeia suecica (Arnell &amp; J. Perss.) Müll. Frib.</td>
<td>Th; M</td>
<td>17</td>
<td>B1</td>
<td>PG</td>
</tr>
<tr>
<td>Cephalozia bicuspida (L.) Dumort.</td>
<td></td>
<td>8, 9, 6, 15–17, 19–21</td>
<td>B1, C1</td>
<td>AS, BC, BP, EF, GJW, GV, MSK, MW, PG, RZ, SW, TP</td>
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<tr>
<td>Cephalozia catenulata (Huebener) Lindb.</td>
<td>Ps; Th; R</td>
<td>16, 17</td>
<td>B1</td>
<td>BC, PG</td>
</tr>
<tr>
<td>Cephalozia connivens (Dicks.) Lindb.</td>
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<td>17, 21</td>
<td>A3, B1</td>
<td>BC, PG</td>
</tr>
<tr>
<td>Cephalozia lunulifolia (Dumort.) Dumort.</td>
<td></td>
<td>16, 17, 21</td>
<td>B1</td>
<td>BC, BP, PG, TP</td>
</tr>
<tr>
<td>Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dumort.</td>
<td></td>
<td>2, 3, 10, 14, 21</td>
<td>A2, A3, B1, C1</td>
<td>BC, MSK, PG</td>
</tr>
<tr>
<td>Chiloscyphus polyanthos (L.) Corda</td>
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<td>1, 4, 20</td>
<td>A2, C1, C2</td>
<td>AS, BC, BP, EF, GJW, GV, MSK, MW, SW, TP</td>
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<tr>
<td>Conocephalum concinum (L.) Dumort.</td>
<td></td>
<td>3, 4, 8, 18, 19, 21</td>
<td>A2, A3</td>
<td>AS, BC, BP, GJW, RZ, TP</td>
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<tr>
<td>Conocephalum salsigrum</td>
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<td>14, 19, 21</td>
<td>A2, B2</td>
<td>BC, MSK, RZ</td>
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<td>Cystolejeunea autumnalis (DC.) Steph.</td>
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<td>Frullania dittata (L.) Dumort.</td>
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<td>1, 9</td>
<td>B1, C2</td>
<td>AS, BP, RZ, TP</td>
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<td>Geocalyx gramineus (Schrad.) Nees</td>
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<td>GJW, PG, RZ</td>
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<td>Jungmannia leiophylla (Dumort.) Dumort.</td>
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<td>AS, BC, BP, EF, GJW, GV, MSK, MW, PG, RZ, SW, TP</td>
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<td>Lepidozia reptans (L.) Dumort.</td>
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<td>AS, BC, BP, EF, GJW, GV, MSK, MW, PG, RZ, SW, TP</td>
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<td>Lophocolea bidentata (L.) Dumort.</td>
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<tr>
<td>Lophocolea heterophylla (Schrad.) Dumort.</td>
<td></td>
<td>2–6, 8–10, 12–14, 16–21</td>
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<td>AS, BC, BP, EF, GJW, GV, MSK, MW, PG, RZ, SW, TP</td>
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<td>A2, B1, B2, C1</td>
<td>AS, BC, BP, EF, GJW, GV, MSK, MW, RZ, SW, TP</td>
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<td>C1, C2</td>
<td>AS, BC, BP, GJW, MSK, SW, TP</td>
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<tr>
<td>Metzgeria farata (L.) Dumort.</td>
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<td>AS, BC, BP, GJW, MSK, PG, RZ, TP</td>
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<tr>
<td>Nowellia curvifolia (Dicks.) Mitt.</td>
<td>Ps; Th</td>
<td>2, 3, 6, 8–10, 14, 16, 17, 20, 21</td>
<td>B1, B2</td>
<td>AS, BC, BP, EF, GJW, GV, MSK, MW, PG, RZ, SW, TP</td>
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<tr>
<td>Odontoschisma denuatatum (Mart.) Dumort.</td>
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<td>11, 12</td>
<td>A3, B1</td>
<td>PG, RZ, SW</td>
</tr>
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<tr>
<td>Pellia epiphylla (L.) Corda</td>
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<td>A2, A3, B2</td>
<td>AS, BC, BP, EF, GJW, GV, MSK, MW, PG, RZ, SW, TP</td>
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<td>Species name</td>
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<td>A2, A3, B1, C1, C2, D2</td>
<td>AR, AS, BC, GJW, MSK, MWt, RZ, SR, SW</td>
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<tr>
<td>Plagiomnium elatum (Bruch &amp; Schimp.) T.J. Kop.</td>
<td></td>
<td>3, 20, 21</td>
<td>W1, A2, A3</td>
<td>AR, BP, MWt, SR, SW, TP</td>
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<td>Plagiomnium ellipticum (Brid.) T.J. Kop.</td>
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<td>W1, A2, B1</td>
<td>AR, BC, MWt, SR</td>
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<tr>
<td>Plagiomnium rostratum (Schrad.) T.J. Kop.</td>
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<td>21</td>
<td>A3</td>
<td>BC, MW</td>
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<tr>
<td>Plagiomnium undulatum (Hedw.) T.J. Kop.</td>
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<td>1, 3-6, 8-10, 14-21</td>
<td>A2, A3, B1, C1, C2</td>
<td>AR, AS, BC, BP, EF, GJW, GV, MSK, MW, MWt, SR, SW, TP</td>
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<td>Plagiothecium cavifolium (Brid.) Z. Iwats.</td>
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<td>21</td>
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<td>GJW</td>
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<tr>
<td>Species name</td>
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<td>Collecting sites</td>
<td>Habitats and substrata</td>
<td>Authors</td>
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<td>Plagiothecium curvifolium</td>
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<td>A2, A3, B1, C1, C2</td>
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<td>AR, AS, BC, BP, GJW, MSK, MW, MWt, SR, SW, TP</td>
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<td>2, 5-9, 15, 16, 18-21</td>
<td>A2, A3, B1, C1, C2</td>
<td>AR, GJW, MSK, MWt, SR, SW</td>
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<td>Plagiothecium nemorale (Mitt.) A. Jaeger</td>
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<td>1, 3, 4, 6, 9, 16-21</td>
<td>A2, A3, B1, C1, C2</td>
<td>AR, AS, BC, BP, EF, GJW, MSK, MW, MWt, SR, TP</td>
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<td>Plagiothecium rutheli Limpr.</td>
<td></td>
<td>4, 5, 6, 9, 10, 20</td>
<td>A1, A2, A3, B1</td>
<td>BC, BP, EF, MSK, MW, SW, TP</td>
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<tr>
<td>Plagiothecium succulentum (Wilson) Lindb.</td>
<td>M</td>
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<td>C1</td>
<td>BC</td>
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<td>Pleurozium schreberi (Willd. ex Brid.) Mitt.</td>
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<td>2–6, 8–10, 12, 15, 17–21</td>
<td>B1, B2, C1, C2</td>
<td>AR, AS, BC, EF, GJW, GV, MSK, MW, MWt, RZ, SR, SW, TP</td>
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<tr>
<td>Pohlia nutans (Hedw.)</td>
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<td>A2, A3, B1, C1</td>
<td>AS, BC, EF, GJW, GV, MSK, MW, RZ, SW</td>
</tr>
<tr>
<td>Pohlia wahlenbergii (F. Weber &amp; D. Mohr) A.L. Andrews</td>
<td></td>
<td>15</td>
<td>A2</td>
<td>SW</td>
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<tr>
<td>Polytrichastrum formosum (Hedw.) G.L. Sm.</td>
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<td>2–21</td>
<td>A2, A3, B1, C1</td>
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<td>Polytrichum commune Hedw.</td>
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<td>1, 2, 9, 10, 12, 13, 15, 16, 20, 21</td>
<td>A1, A2, A3</td>
<td>AR, AS, EF, GJW, MSK, MWt, RZ, SR, SW</td>
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<tr>
<td>Polytrichum juniperinum Hedw.</td>
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<td>19, 20, 21</td>
<td>A2, B1</td>
<td>GJW, SW</td>
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<td>Pseudoscleropodium purum (Hedw.) M. Fleisch. ex Broth.</td>
<td>Pp</td>
<td>5, 6</td>
<td>A2, A3</td>
<td>AS, BC, BP, EF, GJW, GV, MSK, MW, SW, TP</td>
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<tr>
<td>Pterigynandrum filiforme Hedw.</td>
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<td>1, 20</td>
<td>B1, C2</td>
<td>AS, RZ, SW</td>
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<td>Ptilium crista–castrensis (Hedw.) De Not.</td>
<td>M</td>
<td></td>
<td>2, 3, 6, 7, 10, 12, 17, 19, 20, 21</td>
<td>A2, A3, B1, B2</td>
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<td>Pylaisia polyantha (Hedw.) Schimp.</td>
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<td>1, 12, 10</td>
<td>C2, D2</td>
<td>AS, EF, RZ</td>
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<td>Rhizomnium punctatum (Hedw.) T.J. Kop.</td>
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<td>2–10, 12–21</td>
<td>A1, A2, A3, B1, B2, C1, D2</td>
<td>AR, AS, BC, BP, EF, GJW, GV, MSK, MW, MWt, RZ, SR, SW, TP</td>
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<td>Rhodobryum roseum (Hedw.) Limpr.</td>
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<td>2, 6, 8, 20, 21</td>
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<td>AR, AS, BC, EF, GJW, GV, MSK, MWt, RZ, SR, SW, TP</td>
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<tr>
<td>Rhynchothecium murale (Hedw.) Schimp.</td>
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<td>10, 20</td>
<td>D2</td>
<td>BC, EF, SW</td>
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<tr>
<td>Rhytidiadelphus squarrosus (Hedw.) Warnst.</td>
<td>Pp</td>
<td>2, 3, 5, 7, 8, 20, 21</td>
<td>A2, A3, B1</td>
<td>AS, BC, EF, GJW, GV, MSK, MW, SW</td>
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<tr>
<td>Rhytidiadelphus subpinnatus (Lindb.) T.J. Kop.</td>
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<td>21</td>
<td>A2, A3</td>
<td>AR, AS, BC, BP, MWt, SR, TP</td>
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<tr>
<td>Rosulabryum capillare (Hedw.) J.R. Spence</td>
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<td>2, 17, 18, 21</td>
<td>B1, C2</td>
<td>AR, BC, MWt, SR</td>
</tr>
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<td>Rosulabryum monoxicum (Podp.) Ochyra &amp; Stebel</td>
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<td>1, 3–5, 12, 14–17, 19, 20</td>
<td>B1, C1, C2, D2</td>
<td>AR, AS, BC, MSK, MWt, RZ, SR</td>
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<tr>
<td>Sanionia uncinata (Hedw.) Loeske</td>
<td>M</td>
<td>2, 4, 5, 17–19, 21</td>
<td>A2, A3, B1</td>
<td>AR, AS, BC, EF, GJW, GV, MSK, MW, MWt, RZ, SR, SW</td>
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<td>Schistidium crassipilum H.H. Blom</td>
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<td>Sciuro–hypnum oedipodium (Mitt.) Ignatov &amp; Huttunen</td>
<td></td>
<td>2, 3, 5, 7, 16, 21</td>
<td>A2, A3</td>
<td>AR, AS, BC, BP, MWt, SR, SW, TP</td>
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<td>Sciuro–hypnum reflexum (Starke) Ignatov &amp; Huttunen</td>
<td>M</td>
<td>21</td>
<td>A2, B1</td>
<td>EF, SW</td>
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<td>Authors</td>
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<tr>
<td>Sphagnum capillifolium (Ehrh.) Hedw.</td>
<td>Ps</td>
<td>1, 2, 7, 16, 20, 21</td>
<td>A1, A2, A3</td>
<td>AR, AS, BC, BP, EF, GJW, MSK, MW, MWt, SR, SW, TP</td>
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<tr>
<td>Sphagnum fimbriatum Wilson</td>
<td>Ps; M</td>
<td>10, 13, 16, 21</td>
<td>A1, A2, A3</td>
<td>AR, AS, BP, MW, SR, SW, TP xxx</td>
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<td>Sphagnum girgensohni Russow</td>
<td>Ps</td>
<td>6, 10, 12, 15, 20, 21</td>
<td>A2, A3</td>
<td>AR, BC, BP, MSK, MW, MWt, SR, SW, TP</td>
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<td>Sphagnum palustre L.</td>
<td>Ps</td>
<td>5, 6, 8–10, 12, 14–17, 21</td>
<td>A1, A2, A3, B1</td>
<td>AR, AS, BC, BP, EF, GJW, GV, MSK, MW, MWt, SR, SW, TP</td>
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<tr>
<td>Sphagnum russowii Warnst.</td>
<td>Ps; M</td>
<td>2, 12, 15, 20, 21</td>
<td>A2, A3</td>
<td>AR, GJW, MW, MWt, SR, SW</td>
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<td>Sphagnum squarrosum Creme</td>
<td>Pp</td>
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<td>A1, A2, A3</td>
<td>AR, AS, BC, EF, GJW, GV, MSK, MW, MWt, RZ, SR, SW, TP</td>
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<td>Straminergon stramineum (Dicks. ex Brid.) Hedenäs</td>
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<td>A1</td>
<td>SW</td>
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<td>Syntrichia papillosa (Wilson) Jur.</td>
<td>Ps; Th</td>
<td>1</td>
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<td>AS</td>
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<tr>
<td>Syntrichia ruralis (Hedw.) F. Weber &amp; D. Mohr</td>
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<td>D2</td>
<td>AS</td>
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<tr>
<td>Syntrichia virescens (De Not.) Ochyra</td>
<td>Ps; Th</td>
<td>1</td>
<td>C1, C2, D2</td>
<td>AS, RZ</td>
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<td>A3, B1, C1, C2</td>
<td>AR, AS, BC, BP, EF, GJW, GV, MSK, MW, MWt, RZ, SR, SW, TP</td>
<td></td>
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<tr>
<td>Thuidium delicatulum (Hedw.) Schimp.</td>
<td>Pp</td>
<td>21</td>
<td>C1</td>
<td>MSK</td>
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<tr>
<td>Thuidium philiberti (Limpr.)</td>
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<td>14</td>
<td>D2</td>
<td>AS</td>
</tr>
<tr>
<td>Thuidium recognitum (Hedw.) Lindb.</td>
<td>Pp</td>
<td>20</td>
<td>B1</td>
<td>GJW</td>
</tr>
<tr>
<td>Tortula muralis (Hedw.) Mitt.</td>
<td>Ps; Th; R</td>
<td>1, 10, 12, 19</td>
<td>A1, D2</td>
<td>AS, BP, EF, SW, TP</td>
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<tr>
<td>Tortula truncata (Hedw.) Mitt.</td>
<td>2, 4</td>
<td>A2</td>
<td>BC, BP, TP</td>
<td></td>
</tr>
<tr>
<td>Ulota crispa (Hedw.) Brid.</td>
<td>Ps; Th; R</td>
<td>18, 20</td>
<td>C2</td>
<td>AR, AS, MWt, SR, SW</td>
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</tbody>
</table>

and in Poland (R category; Żarnowiec et al. 2004). It is scattered within the whole area of our country but most of sites were known from the Carpathians (Stebel et al. 2011). Recently numerous new sites have been also reported from other regions of Poland: Chelmińsko-Dobrzyńskie Lakeland, Lower Silesia, Woźnicko-Wieluńska Upland, Krakowski-Częstochowska Upland (Stebel et al. 2008), Opawskie Mountains (Stebel 2008), Wysoczyna Polanowska in Western Pomerania (Rusińska et al. 2010), Mazury Lakeland (Sawicki 2010), Lublin region (Armas-Ta 2012), Suwałki Lakeland (Wigry National Park – Wierczolska et al. 2010) and from Świętokrzyskie Mountains (Stebel et al. 2013).

These reports arise a question whether the species is actually spreading, what is suggested by Armata (2012), or nowadays researchers are searching more carefully in the field. The first suggestion seems to be very probable, since in the majority of new sites it occurs in the form of small and young cushions, almost always sterile (Stebel et al. 2011). Dicranum viride was reported from the Roztocze region, from

Fig. 4. Distribution of Campylophyllopsis sommerfeltii (Myrin) Ochyra in Poland: 1 – historical sites, 2 – new site in the Świerszcz river valley

two sites: Hrebenne village and Kamienna Góra near Zwierzyniec village (Lisowski 1958b).

Noteworthy is also a new site of Buxbaumia viridis (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl., the epiphytic moss species classified as threatened in Europe (V category; Schumacker & Marty NY 1995) and Poland (E category; Żarnowiec et al. 2004). Since many historical European sites of Buxbaumia viridis have disappeared in the last decades of the 20th century the species became protected by international law (Annex I of the Bern Convention in 1978 and Annex II of the Habitat Directive in 1992). It is also strictly protected in Poland (Regulation... 2012).

Buxbaumia viridis was reported from singular localities from the whole area of the country but the majority of them were situated in the southern part of Poland, in the mountains (SzaMja et al. 1991). In the last decade a visible increase of reports on Buxbaumia viridis, both concerning new sites and confirming historical ones, was observed in various regions of Poland (Philippe & Ochrya 2004, Cykowski 2008, Hajek 2008, Smoczyk & Wierczolska 2008, Voncina 2008, Chachula & Voncina 2010, Haje k 2010, Cykowska & Voncina 2011, Voncina et al. 2011, Kozik & Voncina 2012, Voncina & Chachula 2012, Zarzecki 2012). The species colonizes mainly decayed logs of spruce and silver fir and sporadical ly humus. Buxbaumia viridis has been reported from Rostoczce region from four sites (Kuc 1963, 1964, Karczmarsz 1965, Bloch & Karczmarsz 1973) in mixed forests with silver fir, colonizing logs or humus. New site is localized in an oak-spruce forest Quercus-Picee tum at 252 m a.s.l. on decayed spruce log, lying in the waters of Świerszcz river. Similarly to the case of previous species, it seems that the recent increase of the number of Buxbaumia viridis sites may be an effect of the increase of researchers’ interest.

Among liverworts the most valuable is a finding of mountain species Calypogeia suecica (Arnell et J. Perss.) Müll. Frib. never reported earlier from the Rostoczce region. In Poland the distribution centre of that species is situated in the Carpathians, especially in the Tatra Mountains where there are known about 100 sites at elevations between 800 and 1750 m a.s.l. (Schiffner 1911, Szweykowski 1960, Śmarda 1961, GórsK – unpubl.). It occupies logs in spruce forests. The species occurs quite frequently also in the Bieszczady Mountains, where it was found in sites situated at lower altitudes (560–1000 m a.s.l.) (Szweykowski & Buczowska 1996). In the Świerszcz river valley Calypogeia suecica was observed at the altitude of 252 m a.s.l.

Noteworthy is also the finding of liverwort Cephalo­zia catenulata (Huebener) Lindb. regarded to be a rare relict species of primeval forests (CiesiNSk et al. 1996), which colonizes decayed wood and sometimes peat. Similarly to the previous species it is classified as threatened in Poland (Klama 2006b). The species has been known both from the northern Poland and all the mountain ranges situated in southern part of the country (Szweykowski 1953, 1958, 1961, 2006; Klama 2002, 2004). Recently it has been reported from the Puszcza Borecka forests (Górski & Pawlikowski 2014), Puszcza Augustowska forests (Górski & Pawlikowski, unpubl.), Western Pomerania (Górski 2013) and Tatra Mountains (Klama 2008). In the latter area Cephalozia catenulata was recorded on 17 localities situated at elevations between 860-1300 m a.s.l., according to the literature and unpublished data collected by P. Górski. The site in the Świerszcz river valley is the second one known from the Roztocze National Park (Zubel & Maciejewski 2011).

REFERENCES


Contribution to the bryoflora of the Roztocze National Park – Bryophytes of the Świerszcz river valley


Regulation of the Minister of the Environment (Poland) of 5 January 2012 on wild species of plants under protection. Journal of Laws No 14 (2012), item 81.


