NEW DISTRIBUTIONAL DATA ON BRYOPHYTES
OF POLAND AND SLOVAKIA, 5PIOTR GÓRSKI, ANNA RUSIŃSKA, MICHAŁ SMOCZYK, IWONA DEMBICZ, SYLWIA WIERZCHOLSKA,
ŁUKASZ KOZUB, MACIEJ ROMAŃSKI, EWA FUDALI, MAGDA PODLASKA, ALBERT WIADERNY

Editors of the column: PIOTR GÓRSKI, ANNA RUSIŃSKA

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- I. Dembicz, Department of Plant Ecology and Environmental Conservation, Institute of Botany, Faculty of Biology, Biological and Chemical Research Centre, University of Warsaw, Żwirki i Wigury 101, 02-096 Warsaw, Poland, e-mail: i.dembicz@biol.uw.edu.pl
- E. Fudali, Department of Botany and Plant Ecology, Wrocław University of the Life and Environmental Sciences, pl. Grunwaldzki 24 A, 50-363 Wrocław, Poland, e-mail: ewa.fudali@gmail.com
- P. Górski, Department of Botany, Poznań University of Life Sciences, Wojska Polskiego 71 C, 60-625 Poznań, Poland, e-mail: peter@up.poznan.pl
- Ł. Kozub, Department of Plant Ecology and Environmental Conservation, Institute of Botany, Faculty of Biology, Biological and Chemical Research Centre, University of Warsaw, Żwirki i Wigury 101, 02-096 Warsaw, Poland, e-mail: lukasz.kozub@biol.uw.edu.pl
- M. Podlaska, Department of Botany and Plant Ecology, Wrocław University of the Life and Environmental Sciences, pl. Grunwaldzki 24 A, 50-363 Wrocław, Poland, e-mail: magda.podlaska@up.wroc.pl
- M. Romański, Wigry National Park, Krzywe 82, 16-402 Suwałki, Poland, e-mail: maciej.romanski@wigry.org.pl
- A. Rusińska, Natural History Collections, Adam Mickiewicz University, Umultowska 89, 61-614 Poznań, Poland, e-mail: annarus@amu.edu.pl
- M. Smoczyk, Wojska Polskiego 30/5, 69-110 Rzepin, Poland, e-mail: msmoczyk@wp.pl
- A. Wiaderny, pl. Ratuszowy 51/3, 58-500 Jelenia Góra, Poland, e-mail: albert_wiaderny@onet.eu
- S. Wierzcholska, Białowieża Geobotanical Station, Faculty of Biology, University of Warsaw, Sportowa 19, 17-230 Białowieża, Poland, e-mail: sylwia.wierzcholska@gmail.com

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1. *Anastrophyllum michauxii* (F. Weber) H. Buch

Author: P. GÓRSKI

SLOVAKIA: High Tatra Mountains, 34UDV3753 (1 km × 1 km square grid adopted from the UTM/MGRS cartographic system), Skupina Širokej (name of the micro region according to BALON et al. 2015), lower part of the Svišťovská dolina valley, decaying log in spruce forest, 49.22892°N, 20.14034°E, alt. 1350 m above sea level (a.s.l.), leg., det. P. Górski, 6.11.2015 (POZNB 1986).

Anastrophyllum michauxii is an epixylic species that is relatively rare in the Tatra Mts. In the Slovakian part of this massif, where the presented data were found, there are only 10 localities of this plant (SZYSZYŁOWICZ 1885, ŠMARDÁ 1961b, DUDA & VÁŇA 1971, 1984, GÓRSKI & VÁŇA 2014). In the entire area of the Tatra Mts, 40 localities of *A. michauxii* have been recorded within an altitude range of 900–1575 m a.s.l. (GÓRSKI & VÁŇA 2014). It is worth noting that the herbarium of Adam Mickiewicz University in Poznań contains many unpublished data concerning

this species. SZWEYKOWSKI (2006) has stated that in the Polish Tatra Mts, *A. michauxii* occurs at more than 30 localities, whereas only 16 localities are known from data in the literature (GÓRSKI & VÁŇA 2014).

2. *Campylopus introflexus* (Hedw.) Brid.

Authors: E. FUDALI, M. PODLASKA

ATMOS Ec-21: SW Poland, Sudety Mountains, Ize-ry Foothills (Pogórze Izerskie), forests near Lubań, 51.04964°N, 15.21969°E, alt. 307 m a.s.l., on ground in strongly managed coniferous forest (plantation of *Pinus sylvestris* and *Picea abies* on a habitat of beech forest) with stands 60–70 years old, leg. M. Podlaska, 3.06.2015, det. E. Fudali (KRAM).

This neophytic species in Europe, regarded as an aggressive invader in managed coniferous and mixed forests as well as in drained bogs, seems to be distributed widely in western Poland, especially in West Pomerania, in Lubuskie Lakeland, and in the Wielkopolska region (FUDALI et al. 2009, GÓRSKI 2014, SMOCZYK 2015). However, in the area of Lower Silesia (south-western Poland), it was recorded only in forests of Bory Dolnośląskie (STEFANŃSKA et al. 2006). The site reported here is the first record in the Polish part of the Sudety Mts. According to MIKULÁŠKOVÁ et al. (2012), further expansion of *C. introflexus* in central Europe is expected because habitats with favourable vegetation composition and ecological parameters commonly occur there.

2. *Campylopus introflexus* (Hedw.) Brid.

Authors: P. GÓRSKI, M. ROMAŃSKI

ATMOS Af-86: NE Poland, Litewskie Lakeland (Pojezierze Litewskie), Puszcza Romincka Forest, 54.3222°N, 22.66155°E, ca 2.5 km north-east of the village of Błakąły, sandy soil on the edge of a peat-bog, leg., det. P. Górski, M. Romański, 15.10.2015 (POZNB).

The presented locality of neophytic *Campylopus introflexus* is the north-easternmost one in Poland and is new for the Puszcza Romincka Forest.

2. *Campylopus introflexus* (Hedw.) Brid.

Author: M. SMOCZYK

ATMOS Ca-93: W Poland, Lubuskie Lakeland (Pojezierze Lubuskie), Łagów Lakeland (Pojezierze Łagowskie), 1.8 km west of the village of Sułów, forest section 126h of the Rzepin Forest Inspectorate, 52.3739°N, 14.7093°E, on mineral sandy soil in a young pine plantation, in an epigeic moss community from the *Ceratodonto-Polytrichion piliferi* alliance, leg., det. M. Smoczyk, 21.06.2015 (POZG); ATMOS Ca-95: W Poland, Lubuskie Lakeland, Łagów Lakeland, 3.2 km north-east of the village of Staroścín, forest section 321c of the Rzepin Forest Inspectorate,

52.3777°N, 14.8888°E, on mineral sandy soil at the edge of the forest road in a *Spergulo vernalis-Corynephorum canescentis* association, leg., det. M. Smoczyk, 11.11.2014 (POZG); ATMOS Da-03: W Poland, Lubuskie Lakeland, Torzym Plain (Równina Torzumska), 2.5 km south-west of the village of Gajec, Krzywy Ług peat-bog, forest section 122f of the Rzepin Forest Inspectorate, 52.3297°N, 14.7391°E, between tussocks of *Molinia caerulea* at the edge of a peat-bog, leg., det. M. Smoczyk, 17.10.2015 (POZG); ATMOS Da-04: W Poland, Lubuskie Lakeland, Torzym Plain, ca 1 km east of Staroścín, forest section 347j of the Rzepin Forest Inspectorate, 52.3598°N, 14.8668°E, sandy escarpment by the forest road, in a *Spergulo-Corynephorum* association, leg., det. M. Smoczyk, 11.11.2014 (POZG); 2.9 km south-east of the church in Rzepin, forest section 88c of the Rzepin Forest Inspectorate, 52.3233°N, 14.8670°E, edge of a young pine plantation, in an epigeic moss community from a *Ceratodonto-Polytrichion piliferi* alliance, leg., det. M. Smoczyk, 15.03.2015 (POZG); 0.2 km south-west of the Jerzmanice Lubuskie railway station, forest section 170g of the Rzepin Forest Inspectorate, 52.3047°N, 14.8653°E, humus layer on sandy soil, in an epigeic moss community from a *Ceratodonto-Polytrichion piliferi* alliance, leg., det. M. Smoczyk, 1.05.2015 (POZG); ATMOS Da-05: W Poland, Lubuskie Lakeland, Torzym Plain, 1.2 km north-east from the church in Lubin, forest section 190k of the Torzym Forest Inspectorate, 52.3064°N, 14.9169°E, sandy soil by the forest road, in a *Spergulo-Corynephorum* association, leg., det. M. Smoczyk, 7.03.2015 (POZG); 1.8 km south-east of the church in Boczków, forest sections 209f and 210f of the Torzym Forest Inspectorate, 52.3158°N, 14.9690°E, edge of forest road in a pine forest complex, leg., det. M. Smoczyk, 2.01.2015 (POZG); 1.8 km east of the church in Garbicz, forest section 29b of the Torzym Forest Inspectorate, 52.3102°N, 15.0167°E, by the forest road in a pine forest complex in a *Spergulo-Corynephorum* association, leg., det. M. Smoczyk, 2.01.2015 (POZG); ATMOS Da-15: W Poland, Lubuskie Lakeland, Torzym Plain, 0.9 km north-east of the railway station in the village of Gądków Wielki, forest section 96f of the Torzym Forest Inspectorate, 52.2531°N, 14.9571°E, sandy soil by the forest road in an epigeic moss community from a *Ceratodonto-Polytrichion piliferi* alliance, leg., det. M. Smoczyk, 6.01.2015 (POZG); 0.6 km south-west of the church in Gądków Mały, forest section 306j of the Cybinka Forest Inspectorate, 52.2503°N, 14.9386°E, sandy escarpment at the edge of a pine forest in a *Spergulo-Corynephorum* association, leg., det. M. Smoczyk, 18.01.2015 (POZG); 2.3 km north of the Pliszka railway station, near the railway bridge over the Pliszka River, forest section 231p of the Torzym Forest Inspectorate, 52.2226°N, 15.0038°E, humus layer on sandy mineral soil at the edge of forest road in pine forest complex, leg., det.

M. Smoczyk, 1.02.2015 (POZG); ATMOS Fb-34: SW Poland, Central Sudety Mts (Sudety Środkowe), Bystrzyckie Mountains (Góry Bystrzyckie), 'Torfowisko pod Zieleńcem' nature reserve, forest section 215a of the Zdroje Forest Inspectorate, 50.3513°N, 16.4161°E, alt. 755 m a.s.l., on dried peat in a peatland spruce forest, no sporophytes observed in the population, *leg.*, *det.* M. Smoczyk, 22.08.2015 (POZG); ATMOS Fb-35: SW Poland, Central Sudety Mts, Bystrzyckie Mts, southern slope of Mount Ubocze, forest section 134c of the Bystrzyca Kłodzka Forest Inspectorate, 50.2864°N, 16.5035°E, alt. 780 m a.s.l., on dried peat in a peatland spruce forest, *leg.*, *det.* M. Smoczyk, 9.07.2015, *c. spor.* (POZG).

Campylopus introflexus is a neophytic moss in the bryoflora of Poland (OCHYRA 1983) regarded as an aggressive invader in Europe (MIKULÁŠKOVÁ et al. 2012). Currently, it is known from numerous localities, mostly in western Poland (FUDALI et al. 2009). Still, there are new ones that have been found (WOLSKI 2011, PIWOWARSKI 2013, 2015, GÓRSKI 2014, 2015a, STANIASZEK-KIK 2014a, GÓRSKI & KAPUSTYŃSKI 2015a, SMOCZYK 2015). Given above are the new records from Lubuskie Lakeland in western Poland, where *C. introflexus* seems to be quite frequent now. The first localities in the Polish part of Sudety Mts in the south-western part of the country are also given here.

3. *Campylopus pyriformis* (Schultz) Brid.

Author: M. SMOCZYK

ATMOS Da-03: W Poland, Lubuskie Lakeland, Torzym Plain, 2.5 km south-west of the village of Gajec, Krzywy Ług peat-bog, forest section 122f of the Rzepin Forest Inspectorate, 52.3297°N, 14.7391°E, on bare peat at the edge of damaged peat-bog in tall sedge or *Molinia caerulea* dominated vegetation and on decaying stumps of *Pinus sylvestris*, *leg.*, *det.* M. Smoczyk, 17.10.2015 (POZG); ATMOS Da-04: W Poland, Lubuskie Lakeland, Torzym Plain, ca 5 km south-west of Rzepin, forest section 103d of the Rzepin Forest Inspectorate, 52.3337°N, 14.7680°E, on bare peat at the edge of a small peat-bog in tall sedge vegetation, *leg.*, *det.* M. Smoczyk, 12.04.2015, *teste* V. Plášek (POZG); 0.4 km east of Jezioro Popienko Lake, forest section 105i of the Rzepin Forest Inspectorate, 52.3313°N, 14.7558°E, abundant on dried peat at the edges of a small damaged peat-bog, *leg.*, *det.* M. Smoczyk, 15.03.2015 (POZG); ATMOS Fb-34: SW Poland, Central Sudety Mts, Bystrzyckie Mts, 'Torfowisko pod Zieleńcem' nature reserve, forest section 215a of the Zdroje Forest Inspectorate, 50.3513°N, 16.4161°E, alt. 755 m a.s.l., on peat in a root-plate pit in a peatland spruce forest, growing with *Dicranella cerviculata* and *Calypogeia sphagnicola*, no sporophytes observed in the population, *leg.*, *det.* M. Smoczyk, 22.08.2015 (POZG).

Campylopus pyriformis is a rare moss species endangered of extinction in Poland (ŻARNOWIEC et al. 2004). It occurs on bare peat on damaged peat-bogs. In the western part of Poland, it was recorded twice from Lubuskie Lakeland (KOPPE 1929, 1931a), Wolin Island (LISOWSKI 1961) and recently from Drawskie Lakeland (WILHELM 2015). The species is recorded for the first time from the Sudety Mts (both Polish and Czech parts).

4. *Crossocalyx hellerianus* (Nees ex Lindenb.) Meyl. (= *Anastrophyllum hellerianum* (Nees ex Lindenb.) R.M. Schust.)

Authors: P. GÓRSKI, M. ROMAŃSKI

ATMOS Af-86: NE Poland, Litewskie Lakeland, Puszcza Romincka Forest, Dolina Błędzianki valley, 54.33978°N, 22.58912°E, *Sphagno girgensohnii-Piceetum*, decaying log, growing with *Nowellia curvifolia*, *leg.*, *det.* P. Górski, M. Romański, 15.10.2015 (POZNB).

Crossocalyx hellerianus is a very rare epixylic liverwort related to well-preserved forests with a long ecological continuity (CIEŚLIŃSKI et al. 1996, KLAMA 2002b). In Poland, the species is known from the northern (mainly north-eastern) part of the country as well as from the mountains (both the Sudety and Carpathian Mountains; SZWEYKOWSKI 2006). In north-eastern Poland, where the presented locality was found, *C. hellerianus* has been recorded in the Puszcza Knyszyńska Forest (KARCZMARZ & SOKOŁOWSKI 1995), Białowieża National Park (SZWEYKOWSKI 1971, KLAMA 2002a, b), the vicinity of Pisz and Węgorzewo (DIETZOW 1938), Wigry National Park (WIŚNIEWSKI & REJMENT 1935), the Puszcza Borecka Forest, and the southern part of the Puszcza Augustowska Forest (PAWLIKOWSKI & GÓRSKI 2014). In recent years, it has been noted also in Świętokrzyski National Park (*leg.* P. Górski; STEBEL et al. 2013) and the Tatra Mts (KLAMA 2008, GÓRSKI & VÁŇA 2014). The presented locality is new in the Polish part of the Puszcza Romincka Forest. Previously, *C. hellerianus* was recorded in the Russian part of the Romincka Forest (KOPPE 1931b).

5. *Fossombronina foveolata* Lindb.

Authors: M. SMOCZYK, A. WIADERNY

ATMOS Da-03: W Poland, Lubuskie Lakeland, Torzym Plain, 2.5 km south-west of the village of Gajec, Krzywy Ług peat-bog, forest section 122f of the Rzepin Forest Inspectorate, 52.3300°N, 14.7395°E, on moist bare peat in the gaps in the vegetation and on decaying stumps of *Pinus sylvestris*, associated species: *Pellia epiphylla*, *Cephalozia bicuspidata*, *Atrichum tenellum*, and *Campylopus pyriformis*, *leg.* A. Wiaderny, 6.07.2013, *det.* M. Smoczyk, *c. spor.* (POZG), *leg.*, *det.* M. Smoczyk, 17.10.2015, *c. spor.* (POZG).

Fossombronia foveolata is a rare liverwort endangered of extinction in Poland (category E, KLAMA 2006). Most of the localities are known from the lowland regions in the western part of Poland (SZWEYKOWSKI 1967b, 2006), and the records come from the second half of the nineteenth century and the first half of the twentieth century. In the twenty-first century, the species has been recorded from Dolne Łużyce (western Poland; ROSADZIŃSKI & BRZEG 2010), West Pomerania (north-western Poland; GÓRSKI 2015b, GÓRSKI & KAPUSTYŃSKI 2015b), and central Poland (STANIASZEK-KIK 2014b).

6. *Fuscocephaloziopsis macrostachya* (Kaal.) Váňa et L. Söderstr. (= *Cephalozia macrostachya* Kaal.)

Authors: P. GÓRSKI, M. ROMAŃSKI

ATMOS Af-85: NE Poland, Litewskie Lakeland, Puszcza Romincka Forest, 'Mechacz Wielki' nature reserve, 54.33053°N, 22.43883°E, 54.32944°N, 22.44516°E, on peat, poor fen, growing with *Mylia anomala*, leg., det. P. Górski, M. Romański, 15.10.2015 (POZNB).

The distribution centre of *Fuscocephaloziopsis macrostachya* in Poland is situated in the northern part of the country (SZWEYKOWSKI & KOZŁICKA 1969, SZWEYKOWSKI 2006). Recent records of this plant originate from that area, mostly from West Pomerania (GÓRSKI 2013, GÓRSKI & GĄBKA 2015a, GÓRSKI & KAPUSTYŃSKI 2015c). A few localities have been found in north-eastern Poland (SZWEYKOWSKI 1958b and the references cited therein). Nearest historical localities of *F. macrostachya* are located in the vicinity of the town of Gołdap (KOPPE & KOPPE 1931, 1937).

7. *Kiaeria falcata* (Hedw.) I. Hagen

Authors: P. GÓRSKI, A. RUSIŃSKA

SLOVAKIA, HIGH TATRA MOUNTAINS: 34UDV2845, Skupina Kriváňa, Furkotská dolina valley, above N shore of Nižné Wahlenbergovo pleso lake, 49.16042°N, 20.02452°E, alt. 2065 m a.s.l., *Pohlietum commutatae gymnomitrietosum brevissimae*, leg. P. Górski, 12.08.2010, det. A. Rusińska (POZNB); 34UDV2846, Skupina Kriváňa, Nefcerka valley, upper glacial cirque, below Mt Hrubý vrch, 49.16983°N, 20.02197°E, alt. 2155 m a.s.l., *Polytrichetum sexangularis fuscocephaloziopsietosum albescentis*, leg. P. Górski, 3.08.2011, det. A. Rusińska (POZNB); 34UDV2946, Skupina Kriváňa, Furkotská dolina valley, blocks of rock near SE shore of Vyšné Wahlenbergovo pleso lake, alt. 2100 m a.s.l., leg. P. Górski, 8.08.2008, det. A. Rusińska (POZNB); 34UDV2946, Skupina Kriváňa, Mlynická dolina valley, blocks of rock below rocky walls descending from Mt Furkotský štít, above Okružle pleso lake, alt. 2135 m a.s.l., *Pohlietum commutatae*, leg. P. Górski, 10.08.2008, det. A. Rusińska (POZNB); 34UDV3047, Skupina Kriváňa, Hlinská dolina valley, bottom plateau below

Výšné Kôprovské sedlo pass, alt. 1950 m a.s.l., leg. P. Górski, 21.08.2006, det. A. Rusińska (POZNB); 34UDV3148, Skupina Kriváňa, Hincova dolina valley, rocky outcrops near N shore of Veľké Hincovo pleso lake, alt. 1940 m a.s.l., *Polytrichetum sexangularis fuscocephaloziopsietosum albescentis*, leg. P. Górski, 12.08.2008, det. A. Rusińska (POZNB); 34UDV3446, Mengusovský masív, Rumanova dolinka valley, near N shore of Vyšné Rumanovo pliesko lake, 49.17202°N, 20.1006°E, alt. 2125 m a.s.l., *Pohlietum commutatae*, leg. P. Górski, 4.08.2010, det. A. Rusińska (POZNB); 34UDV3447, Mengusovský masív, Ťažká dolina valley, upper glacial cirque, blocks of rock above S shore of Zmarzlé pleso lake, alt. 1715 m a.s.l., leg. P. Górski, 20.08.2009, det. A. Rusińska (POZNB); 34UDV3546, Bielowodsko-studenovské masívy, Kačacia dolina valley, above and E from Zelené pleso Kačacie lake, below sub-glacially eroded step of the upper glacial cirque, 49.17213°N, 20.11865°E, alt. 1725 m a.s.l., *Pohlietum ludwigii oligotrichetosum hercynici*, leg. P. Górski, 29.08.2012, det. A. Rusińska (POZNB); 34UDV3546, Massív Gerlachovského štítu a Končistej, Kačacia dolina valley, the upper glacial cirque under Mt Zadný Gerlachovský štít, 49.16943°N, 20.1192°E, alt. 1970 m a.s.l., leg. P. Górski, 29.08.2012, det. A. Rusińska (POZNB); 34UDV3546, Massív Gerlachovského štítu a Končistej, Kačacia dolina valley, the upper glacial cirque under Mt Zadný Gerlachovský štít, 49.16973°N, 20.11915°E, alt. 1965 m a.s.l., leg. P. Górski, 29.08.2012, det. A. Rusińska (POZNB); 34UDV3747, Bielowodsko-studenovské masívy, Svišťová (Bielovodská) dolina valley, Zmarznutý kotol basin, alt. 2005 m a.s.l., *Pohlietum commutatae gymnomitrietosum brevissimae*, leg. P. Górski, 1.08.2006, det. A. Rusińska (POZNB); 34UDV3948, Bielowodsko-studenovské masívy, Zadná Javorová dolina valley, near SE shore of Žabie Javorové pleso lake, 49.1908°N, 20.16975°E, alt. 1890 m a.s.l., *Pohlietum commutatae*, leg. P. Górski, 14.08.2013, det. A. Rusińska (POZNB); 34UDV3949, Bielowodsko-studenovské masívy, Zadná Javorová dolina valley, near SE shore of Žabie Javorové pleso lake, 49.19087°N, 20.16968°E, alt. 1915 m a.s.l., leg. P. Górski, 14.08.2013, det. A. Rusińska (POZNB); 34UDV4148, Massívy Ľadového a Lomnického štítu, Kotlina Piatich Spišských Plies valley, near N shore of Nižné Spišské pleso lake, 49.19055°N, 20.19678°E, alt. 2000 m a.s.l., community with *Nardia breidlerii*, leg. P. Górski, 11.08.2011, det. A. Rusińska (POZNB); 34UDV4149, Massívy Ľadového a Lomnického štítu, Kotlina Piatich Spišských Plies valley, above W shore of Prostredné Spišské pleso lake, alt. 2000 m, 2005 m, 2025 m a.s.l., *Nardietum scalaris kiaerietosum starkei*, community with *Nardia breidlerii*, leg. P. Górski, 27.08.2007, det. A. Rusińska (POZNB); SLOVAKIA, WESTERN TATRA MOUNTAINS: 34UDV0849, Roháče, upper part of the Žiarska dolina valley, Malé Závraty, below Žiarske sedlo pass, in the cirque below Mt Plačlivý Roháč, alt. 1785 m, 1835 m a.s.l.,

Polytrichetum sexangulare, *Pohlietum commutatae gymnomitriosum brevissimae*, leg. P. Górski, 20.07.2006, det. A. Rusińska (POZNB); 34UDV1250, Tomanovsko-jamnické vrchy, Račková dolina valley, Račkov Zadok, glacial cirque below Mt Jakubíná, alt. 1825 m, 1830 m a.s.l., *Pohlietum commutatae gymnomitriosum brevissimae*, *Polytrichetum sexangulare fuscocephaloziopsietosum albescentis*, leg. P. Górski, 10.08.2004, det. A. Rusińska (POZNB); 34UDV1549, Tomanovsko-jamnické vrchy, upper part of the Gáborova dolina valley, Gáborov Zadok, alt. 1825 m a.s.l., *Polytrichetum sexangulare*, leg. P. Górski, 24.07.2009, det. A. Rusińska (POZNB); 34UDV1649, Tomanovsko-jamnické vrchy, upper part of the Kamenistá dolina valley, glacial cirque below Mt Blyšť, close to Pyšné sedlo pass, alt. 1820 m, 1865 m, 1875 m a.s.l., *Polytrichetum sexangulare*, *Pohlietum commutatae gymnomitriosum brevissimae*, leg. P. Górski, 29.08.2008, det. A. Rusińska (POZNB).

POLAND, HIGH TATRA MOUNTAINS: 34UDV2752, ATMOS Ge-50, Grań Orlej Perci, Dolina Gąsienicowa valley, Świnicka Kotlinka basin, near route to Świnicka Przełęcz pass, 49.22315°N, 20.00522°E, alt. 1880 m a.s.l., *Marsupelletum condensatae*, leg. P. Górski, 30.08.2011, det. A. Rusińska (POZNB); 34UDV2851, ATMOS Ge-60, Wierchy Pięciostawiańsko-Białczańskie, Dolina Pięciu Stawów Polskich valley, bottom plateau below Gładka Przełęcz pass, 49.20905°N, 20.01522°E, alt. 1880 m a.s.l., *Pohlietum drummondii gymnomitriosum brevissimae*, leg. P. Górski, 23.08.2012, det. A. Rusińska (POZNB); 34UDV2952, ATMOS Ge-50, Grań Orlej Perci, Dolinka Kozia valley, rocky rubble filling the valley bottom, alt. 1920 m a.s.l., *Pohlietum commutatae gymnomitriosum brevissimae*, leg. P. Górski, 21.08.2005, det. A. Rusińska (POZNB); 34UDV3049, ATMOS Ge-60, Masyw Mięguszwiecki, Dolina za Mnichem valley, below Mt Cubryna, snowbed among blocks of rock, alt. 1900 m a.s.l., *Polytrichetum sexangulare fuscocephaloziopsietosum albescentis*, leg. P. Górski, 16.08.2004, det. A. Rusińska (POZNB); 34UDV3049, ATMOS Ge-60, Dolina za Mnichem valley, below Wrota Chałubińskiego pass, 49.19248°N, 20.04693°E, alt. 1960 m a.s.l., *Polytrichetum sexangulare fuscocephaloziopsietosum albescentis*, leg. P. Górski, 26.08.2012, det. A. Rusińska (POZNB); 34UDV3049, ATMOS Ge-60, Masyw Mięguszwiecki, Dolina za Mnichem valley, between Wyżni Staw Staszica and Wyżnie Mnichowe Stawki lakes, 49.19183°N, 20.04947°E, alt. 1970 m a.s.l., *Polytrichetum sexangulare fuscocephaloziopsietosum albescentis*, leg. P. Górski, 26.08.2012, det. A. Rusińska (POZNB); 34UDV3050, ATMOS Ge-60, Wierchy Pięciostawiańsko-Białczańskie, Dolina Pięciu Stawów Polskich valley, Czerwony Piarg, bottom plateau near route to Szpiglasowa Przełęcz pass, alt. 1955 m a.s.l., *Pohlietum commutatae gymnomitriosum brevissimae*, leg. P. Górski, 25.07.2005, det. A. Rusińska (POZNB); 34UDV3051, ATMOS Ge-60, Wierchy Pięciostawiańsko-Białczańskie, Dolina Pięciu Stawów Polskich val-

ley, near S shore of Przedni Staw Polski lake, alt. 1670 m a.s.l., snowbed with *Gymnomitrium brevissimum* and *Anthelia juratzkana*, leg. P. Górski, 25.07.2005, det. A. Rusińska (POZNB); 34UDV3151, ATMOS Ge-60, Wierchy Pięciostawiańsko-Białczańskie, Dolina Pięciu Stawów Polskich valley, below rocky walls descending from Marchwiczna Przełęcz pass, alt. 1900 m a.s.l., *Polytrichetum sexangulare*, leg. P. Górski, 26.07.2005, det. A. Rusińska (POZNB); POLAND, WESTERN TATRA MOUNTAINS: 34UDV1150, ATMOS Gd-68, Wierchy Tomanowo-Jamnickie, Dolina Jarząbcza valley, below rocky walls descending from Niska Przełęcz pass, alt. 1700 m a.s.l., *Nardietum scalaris kiaerietosum starkei*, leg. P. Górski, 9.08.2004, det. A. Rusińska (POZNB); 34UDV1251, ATMOS Gd-68, Wierchy Tomanowo-Jamnickie, Dolina Jarząbcza valley, NW slope of Mt Kończysty Wierch, alt. 1755 m a.s.l., leg. P. Górski, 22.07.2009, det. A. Rusińska (POZNB); 34UDV1351, ATMOS Gd-68, Wierchy Tomanowo-Jamnickie, Dolina Jarząbcza valley, in a gully descending from Mt Kończysty Wierch, alt. 1750 m a.s.l., leg. P. Górski, 10.08.2004, det. A. Rusińska (POZNB); 34UDV1450, ATMOS Gd-69, Wierchy Tomanowo-Jamnickie, Dolina Starorobociańska valley, Zadnie Zagony, Krzywy Żleb gully, alt. 1655 m a.s.l., *Pohlietum ludwigii*, leg. P. Górski, 23.07.2009, det. A. Rusińska (POZNB).

Kiaeria falcata is an arctic-alpine species occurring in late snow fields (DIERSSEN 2001). In Poland, the localities of this species have been found in the Tatra and Sudety Mts (SZAFRAN 1957). In the Tatra Mts, *K. falcata* has been noted within an altitude range of 1550–2200 m a.s.l. (WAHLENBERG 1814, REHMAN 1864, KRUPA 1882, 1888, CHAŁUBIŃSKI 1886, GYÖRFFY 1924, SZAFAER et al. 1927, KRAJINA 1933, HADAČ 1956, LISOWSKI 1956, 1958, 1959, ŠMARD 1961a, 1976, BALCERKIEWICZ 1984, ŠOLTÉS 1984, 1989, HÁBEROVÁ & ŠOLTÉSOVÁ 1989, KOSIŃSKI 1999, OCHYRA & CISLO 1999, 2001, ŠOLTÉS et al. 2006, GÓRSKI 2009, 2015d, 2016, ŠOLTÉS & CIRIAKOVÁ 2010). Among the members of the genus *Kiaeria* known in Poland, another snow-bed species is *Kiaeria starkei*. Both species grow in different types of habitats (GÓRSKI 2015d, 2016), which has been noticed previously by BALCERKIEWICZ (1984). Moreover, *K. falcata* is rarer in the Tatra Mts than *K. starkei*. Previous studies (GÓRSKI 2016) indicate that the occurrence optimum of *K. falcata* is in *Pohlietum commutatae* Krajina 1933 *gymnomitriosum brevissimae* Górski 2015 phytocoenoses. Patches of this subassociation develop on flat-bottomed surfaces of small, suspended valleys that are covered with fine gravel in places where water is not stagnant. The abundance of *Pohlia drummondii* in these phytocoenoses, compared to the floristic variability of the association, is significantly lower. The codominants are species that distinguish this form (i.e., *Gymnomitrium brevissimum* and *K. falcata*). The physiognomy of these patches is formed by a pillow of both species,

between which a fine-grain material is situated (GÓRSKI 2016). Well-developed phytocoenoses of *Pohlietum gymnomitrietosum brevissimae* can be observed mostly in the Western Tatra Mts. In that vegetation type, the snow vanishes in the first half of June or only at the end of July. *Kiaeria falcata* also occurs, in smaller proportions, in patches of *Polytrichetum sexangularis*, *Pohlietum ludwigii*, and communities with *Nardia breidleri*. *Kiaeria falcata* has been recorded rarely near tourist trails in the alpine belt of the Tatra Mts (GÓRSKI 2009).

8. *Odontoschisma fluitans* (Nees) L. Söderstr. et Váňa (= *Cladopodiella fluitans* (Nees) H. Buch)

Authors: P. GÓRSKI, M. ROMAŃSKI

ATMOS Af-85: NE Poland, Litewskie Lakeland, Puszcza Romincka Forest, 'Mechacz Wielki' nature reserve, 54.33053°N, 22.43883°E, on peat, poor fen, growing with *Mylia anomala*, leg., det. P. Górski, M. Romański, 15.10.2015 (POZNB).

On a whole-country scale, *Odontoschisma fluitans* is a species threatened with extinction (category V, KLAMA 2006). Distribution characteristics of this liverwort in Poland have been presented by KLAMA (1998). Recent records of this species are known from West Pomerania (north-western Poland), Lubuskie Lakeland (western Poland), and the Tatra Mts (GÓRSKI 2013, 2015c, GÓRSKI & GĄBKA 2015b, GÓRSKI et al. 2015). A few localities have been found in north-eastern Poland (SZWEYKOWSKI 1958b and the references cited therein). Nearest historical localities of *O. fluitans* are located in the vicinities of the town of Gołdap (KOPPE & KOPPE 1931, 1937) and Jezioro Wigry Lake (WIŚNIEWSKI & REJMENT 1935).

9. *Orthodicranum tauricum* (Sapjegin) Smirnova

Authors: E. FUDALI, M. PODLASKA

ATMOS Ea-47: SW Poland, Silesian Lowland (Nizina Śląska), Oleśnicka Plain (Równina Oleśnicka), forests near the village of Grabowno, 51.353°N, 17.36406°E, alt. 198 m a.s.l., rotting wood of stump in deciduous forest with a *Pinus sylvestris* admixture, leg. M. Podlaszka, 15.06.2015, det. E. Fudali (KRAM).

During the past few recent decades, this native European epiphytic species has expanded rapidly its range in most countries of central and eastern Europe (STEBEL et al. 2012b), probably due to environmental changes resulting from acid rain (SÖDERSTRÖM 1992). According to STEBEL et al. (2012a), at present, *Orthodicranum tauricum* is known in Poland from more than 200 localities, distributed throughout the whole country. In the area of the Silesian Lowland, the species has been recorded so far only from five sites: three located in Opolska Plain (Równina Opolska) and two from the Odra valley (parks of the city of

Wrocław; STEBEL et al. 2008, 2012a). The site reported here is the first record for Oleśnicka Plain.

10. *Paludella squarrosa* (Hedw.) Brid.

Authors: I. DEMBICZ, Ł. KOZUB

ATMOS Bc-15: N Poland, Tuchola Forest (Bory Tucholskie), Pomerania Province, Kościerzyna County, Lipusz commune, between Wyrówno and Schodno Lakes, 54.05728°N, 17.84001°E, sedge-moss spring fen within the Wda River valley, dominant species in moss layer within an area of 0.1 ha composed of mown fen meadow and a shrubby sprig fen, with *Carex appropinquata* at the edge of the valley, leg., det. I. Dembicz, Ł. Kozub, 7.06.2014 (POZG); ATMOS Bc-31: NW Poland, South Pomeranian Lakeland (Pojezierze Południowopomorskie), Charzykowska Plain (Równina Charzykowska), Pomerania Province, Człuchów County, Koczała commune, mires within the Lipczynka River valley below Olszewki Lake, 53.92098°N, 17.25030°E, abundant within rich fen, fen woodland, and tall sedge (*C. appropinquata*) vegetation along the shores of Olszewki Lake and the Lipczynka River on a stretch of about 800 m, leg., det. I. Dembicz, Ł. Kozub, 29.08.2015 (POZG).

Paludella squarrosa is a moss with circumpolar, subarctic-boreal distribution. In Poland, it is considered a glacial relict. It is much more common in the young, northern glacial landscapes but becomes increasingly rare in southern regions (OCHYRA et al. 1988a). This pattern can be explained also by availability of suitable habitats, as the occurrence of the species is restricted to well-preserved, treeless, low-productive, minerotrophic fens that are much better preserved in the northern regions (WOŁĘJKO et al. 2012). As its habitat is disappearing from the landscape, the species has become threatened and is now regarded as endangered in Poland (category E, ŻARNOWIEC et al. 2004). Recently, very few new localities of *P. squarrosa* have been published (FOJCIK & ROSTAŃSKI 1996, LISOWSKI et al. 2000); however, the species is still being recorded within fens in northern Poland (P. Pawlikowski, F. Jarzombkowski pers. comm.). The second of the listed localities is probably confirmation of the species' presence within that area after 95 years (OCHYRA et al. 1988a), which may indicate stable and favourable conditions with fen mires of the Lipczynka River valley.

11. *Preissia quadrata* (Scop.) Nees

Authors: M. SMOCZYK, S. WIERZCHOLSKA

ATMOS Fb-24: SW Poland, Central Sudety Mts, Bystrzyckie Mts, Bystrzyca Dusznicka River valley, Smocze Gardło, 50.3727°N, 16.3918°E, alt. 640 m a.s.l., slate outcrop, associated species: *Pellia endiviifolia*, *Plagiochila porelloides*, *Fissidens dubius*, and *Mnium stellare*, leg., det. M. Smoczyk, 27.09.2014, c.

spor. (POZG); ATMOS Fb-34: Central Sudety Mts, Bystrzyckie Mts, Bystrzyca Dusznicka River valley, forest section 277b of the Zdroje Forest Inspectorate, 50.3470°N, 16.4009°E, alt. 695 m a.s.l., slate outcrop, in a *Cystopteridetum fragilis* association, associated species: *P. endiviifolia*, *Pedinophyllum interruptum*, *Plagiochila porelloides*, *F. dubius*, and *Rhizomnium punctatum*, *leg.*, *det.* M. Smoczyk, 10.10.2004 (POZG); Orlickie Mountains (Góry Orlickie), 1.4 km south-east of the church in the village of Zieleniec, slope of the Młynówka stream valley, 50.3414°N, 16.3922°E, alt. 780 m a.s.l., on bare soil by the road escarpment, accompanying species were *Marchantia polymorpha*, *P. endiviifolia*, *Blasia pusilla*, *Fissidens taxifolius*, and *Pogonatum urnigerum*, *leg.*, *det.* M. Smoczyk, 28.07.2015, *c. spor.* (POZG); ATMOS Fb-36: SW Poland, Eastern Sudety Mts (Sudety Wschodnie), Śnieżnik Massif (Masyw Śnieżnika), Krowiarki, Mount Wapniarka, forest section 308 of the Bystrzyca Kłodzka Forest Inspectorate, 50.3605°N, 16.6690°E, alt. 440 m a.s.l., north-eastern slope of the limestone quarry, on rubble stones, accompanying species were *Ctenidium molluscum* and *Encalypta streptocarpa*, *leg.*, *det.* S. Wierzholska, 11.10.2013, *c. spor.* (BSG).

Preissia quadrata is a calciphilous species that is rare in the Sudety Mts because of their geological structure (composed of acidic rocks mainly). In the Polish part of the Sudety Mts, records are provided only from the Jelenia Góra valley and the Kaczawskie, Wałbrzyskie, and Stołowe mountain ranges (LIMPRICHT 1876, SZWEYKOWSKI 1953, 1958a, 1967a), where calcareous rocks occur. Given above are the first findings of this species in the Polish parts of the Śnieżnik massif and the Orlickie and Bystrzyckie Mts (KOŁA 1967). On the Czech side of those mountain ranges, only single localities of *P. quadrata* are known (DUDA & VÁŇA 1992, PLÁŠEK et al. 2004, ZMRHALOVÁ 2008).

12. *Tomentypnum nitens* (Hedw.) Loeske

Authors: I. DEMBICZ, Ł. KOZUB

ATMOS Gd-37: S Poland, Carpathian Mts (Karpaty), Orawa Basin (Kotlina Orawsko-Nowotarska), Małopolska Province, the valley of the Czarna Orawa River, near the village of Murowanica, 49.46024°N, 19.65054°E, sedge-brown moss fen vegetation dominated by *Carex diandra* developing at the edge of the valley, forming hummocks, *leg.*, *det.* I. Dembic, Ł. Kozub, 7.06.2015 (POZG); ATMOS Bc-15: N Poland, the Tuchola Forest, Pomerania Province, Kościerzyna County, Lipusz commune, between Wyrówno and Schodno Lakes, 54.05632°N, 17.83933°E, acidified sedge-moss spring fen with *Carex appropinquata* near the Wda River, few clumps among *Sphagnum teres* and *Aulacomnium palustre*, *leg.*, *det.* I. Dembic, Ł. Kozub, 7.06.2014 (POZG); ATMOS Bc-31: NW Poland, South Pomeranian Lakeland, Charzykowska Plain,

Pomerania Province, Człuchów County, Koczała commune, mire within the Lipczynka River valley below Olszewki Lake, 53.920978°N, 17.250304°E, forming hummocks within well-preserved rich fen vegetation, *leg.*, *det.* I. Dembic, Ł. Kozub, 29.08.2015 (POZG).

Tomentypnum nitens is one of the most widespread mosses from a group of glacial relicts. It is distributed all over Poland, with concentrations in the northern belts of lakelands as well as in the uplands and mountains (OCHYRA et al. 1988b). It is often found within patches of well-preserved rich fen vegetation; however, it can survive also within patches with disturbed hydrology (OCHYRA et al. 1988b, WOŁEJKO et al. 2012). As the habitat it occupies nowadays is disappearing from the landscape, *T. nitens* becomes less frequent, and the species was considered vulnerable in Poland (category V) by ŻARNOWIEC et al. (2004). Sill, new localities of the species have been reported recently both from the mountainous areas (STEBEL & ŻARNOWIEC 2010, STEBEL & VONČINA 2011) and from the lowlands (LISOWSKI et al. 2000, PAWLIKOWSKI 2014, 2015, PAWLIKOWSKI & WOŁKOWYCKI 2015, RUSIŃSKA & ROSADZIŃSKI 2015). Two of the localities presented above have not been known before, while the third is probably confirmation of the presence of *T. nitens* within that area after 95 years (OCHYRA et al. 1988b).

12. *Tomentypnum nitens* (Hedw.) Loeske

Author: P. GÓRSKI

ATMOS Cb-23: NW Poland, West Pomerania (Pomorzanie Zachodnie), Drawska Plain (Równina Drawska), West Pomerania Province, Wałcz County, Człopa commune, 53.08467°N, 16.0906°E, 53.08482°N, 16.09055°E, Człopa Forest Inspectorate, ca 1.9 km south-east of the village of Załom, rich fen near the south-western shore of Jezioro Kamień Lake, *leg.*, *det.* P. Górski, 1.08.2008 (POZNB).

12. *Tomentypnum nitens* (Hedw.) Loeske

Authors: M. SMOCZYK, S. WIERZCHOLSKA

ATMOS Fb-24: SW Poland, Central Sudety Mts, Orlickie Foothills (Pogórze Orlickie), Polskie Wrota Pass near Duszniki-Zdrój, forest section 372h of the Zdroje Forest Inspectorate, 50.3971°N, 16.3541°E, alt. 645 m a.s.l., calcareous fen developed in a spring area of the Jastrzębnik stream, overgrown with black alder, small patches in a *Valeriano dioicae-Caricetum davallianae* association (pH 7.6), *leg.* M. Smoczyk, 17.06.2005, *det.* S. Wierzholska (POZG); SW Poland, Central Sudety Mts, Orlickie Foothills, Natura 2000 Special Area of Conservation (SAC) 'Grodzoczyn i Homole koło Dusznik', west of the village of Słoszów, 50.4100°N, 16.3460°E, alt. 630–670 m a.s.l., a few localities in calcareous fens (*Valeriano dioicae-Caricetum davallianae*) and *Molinia* meadows (*Selino car-*

vifoliae-*Molinietum caeruleae cirsietosum rivularis*) developing on the northern slopes of Mount Grzywacz (pH 6.8–7.4), leg., det. M. Smoczyk, 23.06.2011 (POZG); SW Poland, Central Sudety Mts, Orlickie Foothills, Natura 2000 SAC ‘Grodzyczyn i Homole koło Dusznik’, east of the Ludowe settlement, 50.4001°N, 16.3646°E, alt. 635 m a.s.l., scattered patches in a calcareous fen of a *Sphagno warnstorffii-Tomentypnion nitentis* alliance (pH 7.2), leg., det. M. Smoczyk, 30.06.2013 (POZG); SW Poland, Central Sudety Mts, Orlickie Mts, Zimne Wody settlement, 50.3825°N, 16.3507°E, alt. 765 m a.s.l., calcareous fen of a *Sphagno warnstorffii-Tomentypnion nitentis* alliance (pH 7.1–7.4), scattered patches, leg., det. M. Smoczyk, 27.07.2012 (POZG); ATMOS Fb-25: SW Poland, Central Sudety Mts, Stołowe Mountains (Góry Stołowe), west of the village of Chocieszów, valley of the Toczek stream, 50.4466°N, 16.4864°E, alt. 395 m a.s.l., scattered shoots in calcareous fen (*Valeriano dioicae-Caricetum davallianae* association) and *Molinia* meadow (*Selino carvifoliae-Molinietum caeruleae cirsietosum rivularis*) (pH 6.8–7.1), leg., det. M. Smoczyk, 12.07.2012 (POZG); ATMOS Fb-25: SW Poland, Central Sudety Mts, Stołowe Mts, Piekłna Góra massif, Bukowa settlement near Polanica-Zdrój, 50.4120°N, 16.4813°E, alt. 495 m a.s.l., scattered shoots in a *Valeriano dioicae-Caricetum davallianae* calcareous fen (pH 8.0), leg., det. M. Smoczyk, 17.07.2012 (POZG); ATMOS Fb-34: SW Poland, Central Sudety Mts, Orlickie Mts, Zieleniec settlement, 50.3406°N, 16.3782°E, alt. 990 m a.s.l., calcareous fen of a *Sphagno warnstorffii-Tomentypnion nitentis* alliance (pH 7.2), leg., det. M. Smoczyk, S. Wierzchołska, 9.07.2012 (POZG).

Tomentypnum nitens is a robust and distinctive moss with a characteristic golden lifted stem. In Poland, it is considered a protected and vulnerable moss species (ŻARNOWIEC et al. 2004). Currently, it is provided from many localities (OCHYRA et al. 1988b, PAWLIKOWSKI & WOŁKOWYCKI 2015, RUSIŃSKA & ROSADZIŃSKI 2015). It is known as a common glacial relict of the Holarctic range (SZAFRAN 1948). Due to its wide ecological range the species grows both in rich fens and transitional bogs (OCHYRA et al. 1988b), and it could be a component of different phytocoenoses of the class *Scheuchzerio palustris-Caricetea nigrae* with a priority in *Valeriano dioicae-Caricetum davallianae* associations (NEBEL 2001). In the Central Sudety Mts, it is associated with calcareous fens occurring around sloping springs and areas of seepage in stream valleys with vegetation of *Caricion davallianae* and *Sphagno warnstorffii-T. nitentis* alliances. It occurs mostly accompanied by *Limprichtia cossonii*, *Bryum pseudotriquetrum*, *Campylium stellatum*, *Hypnum pratense*, *Aneura pinguis*, and *Plagiomnium elatum* as well as calcitolerant peat mosses *Sphagnum warnstorffii* and *S. teres*. It is worth emphasising that occurrence in the Polish part of the Sudety Mts is quite unique given the mountains’ geological structure, which is composed main-

ly of acidic rocks. Small and scattered intrusions of richer rocks are restricted to the Central Sudety Mts, where many floristic peculiarities have been noted (MILDE 1857, LIMPRICHT 1876, SZMAJDA 1979). Moreover, we observed a high abundance of *T. nitens* on sites with a decreased water table and small patches in typically well-hydrated fens. This correlation is typical and was pointed out by OCHYRA et al. (1988b), and we find it useful in conservation management.

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