

FURTHER SPREADING OF *ORTHODICRANUM TAURICUM*
(BRYOPHYTA, DICRANACEAE) IN POLANDADAM STEBEL, STANISŁAW ROSADZIŃSKI, GRZEGORZ J. WOLSKI, MONIKA STANIASZEK-KIK,
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ABSTRACT. New distributional data for expanding moss *Orthodicranum tauricum* as well as map of its current distribution in Poland are provided. Nowadays this species is known from over 200 stations. Majority of them is located in western and central parts of the country.

KEY WORDS: *Orthodicranum tauricum*, mosses, expanding species, distributional data, Poland

INTRODUCTION

The moss *Orthodicranum tauricum* (Sapjegin) Smirnova, a Euro-North American species, is known to spread throughout the territory of Poland. Until 2008 the estimated number of its localities in Poland had reached 150 (STEBEL et AL. 2008 and papers cited). Since that time even more new data on the occurrence of this moss have been revealed (STEBEL 2010, 2011, STEBEL et AL. 2011, URBAŃSKI and GÓRSKI 2010, WOLSKI and JAKUBOWSKA-GABARA 2010, ARMATA 2011, FOJCIK 2011, FUDALI 2011). In this paper 48 new localities of *O. tauricum* are provided and updated map of the distribution of species in Poland is presented.

NEW LOCALITIES

For each locality the following information is given: ATMOS grid square, geographical region(s), GPS coordinates (if available), habitat, estimated size of population, altitude (only for stations from mountain areas), name of the collector(s), date of observation and herbarium in which the specimens are stored.

Ad 85 – Baltic Coast, Mierzeja Wiślana (the Vistula Spit): **Nowy Świat**, 54°21'21.4"N, 19°18'42.7"E, bark of

Betula pubescens near peat-bog, 4 dm², leg. A. Stebel, 11 Aug 2011, SOSN.

Bd 78 – Pojezierze Chełmińsko-Dobrzyńskie: **Zajęczi** near Glaznoty in Dylewo Landscape Park, birch bark in full light exposition by the road in beech wood, 1 cm², leg. M. Szczepański, 20 Sept 2009, hb. M. Szczepański.

Bd 79 – Pojezierze Chełmińsko-Dobrzyńskie: **Francuska Hill** near Miejska Wola in Dylewo Landscape Park, on a stone in beech wood, also on bark of hornbeam, a few cm², leg. M. Szczepański, 26 Sept 2009, hb. M. Szczepański; **Jeziro Francuskie Nature Reserve**, rotten log in beech wood, 20 cm², leg. M. Szczepański, 26 Sept 2009, hb. M. Szczepański; **Wysoka Wieś**, (a) a small clump on bark of oak on the edge of broad-leaved forest, leg. M. Szczepański, 26 Sept 2009, hb. M. Szczepański; (b) Wysoka Wieś, bark of birch by the forest road, several cm², leg. M. Szczepański, 26 Sept 2009, hb. M. Szczepański.

Cc 90 – Pojezierze Poznańskie: **Katarzynki** village, 52°26'57"N, 17°6'47.5"E, Cybina river valley, bark of *Betula pendula* in forest secondary community, 5 cm², leg. S. Rosadziński, 14 Jun 2010, POZG.

Cd 08 – Pojezierze Chełmińsko-Dobrzyńskie: **Ostrów Tarczyński Nature Reserve** near Koszelewiki, decaying wood in mixed coniferous forest, 10 cm², leg. M. Szczepański, 10 Mar 2008, hb. M. Szczepański.

Cg 00 – Nizina Północnopodlaska: **Puszczka Knyszynska**, near Katryńka village, 53°14'26.1"N, 23°08'48.78"E, bark of wayside *Alnus glutinosa* near alder carr, 4 cm², leg. M. Staniaszek-Kik, 27 Apr 2011, LOD.

Da 43 – Wzniesienia Gubińskie: **forest of Gubin commune**, 51°57'45.19"N, 14°45'5.39"E, bark of *Betula pendula* in wet-ground forest *Galio sylvatici-Carpinetum*, 80 cm², leg. S. Rosadziński, 21 Oct 2011, POZG.

Da 63 – Wzniesienia Gubińskie: Forest Inspectorate Lubsko, forest district Jezioro Dolne, 0.9 km SW of **Jezioro Dolne** village, 51°47'18.05"N, 14°45'2.13"E, forest section No. 25a, bark of *Fagus sylvatica* trunk in acidophilous beech forest *Deschampsio flexuosae-Fagetum*, 2 m², leg. S. Rosadziński, 19 Aug 2008, POZG; forest section No. 25b, 0.83 km SW of **Jezioro Dolne** village, 51°47'24.73"N, 14°44'49.77"E, bark of *Pseudotsuga menziesii* in wet-ground forest *Galio sylvatici-Carpinetum*, 20 cm², leg. S. Rosadziński, 20 Jul 2008, POZG; forest section No. 24a, 1.29 km SW of **Jezioro Dolne** village, 51°47'8.77"N, 14°45'21.36"E, decaying log of beech in acidophilous beech forest *Deschampsio flexuosae-Fagetum*, leg. S. Rosadziński, 20 Oct 2011, POZG; SW of Jezioro Dolne village, **forest of Brody commune**: (a) 51°47'27.54"N, 14°44'51.02"E, bark of *Quercus robur* in oak-elm forest *Querco-Ulmetum*, 1 m², leg. S. Rosadziński, 25 Jul 2011, POZG; (b) 51°47'45.49"N, 14°44'46.01"E, stumps of *Carpinus betulus* in wet-ground forest *Galio sylvatici-Carpinetum*, 3 m², leg. S. Rosadziński, 25 Jul 2011, POZG; (c) 51°47'17.15"N, 14°45'9.41"E, bark of *Betula pendula* in forest secondary community, 2 m², leg. S. Rosadziński, 25 Jul 2011, POZG; near the **Lake Brodzkie**, 51°47'15.91"N, 14°45'40.35"E, decaying log of *Betula pendula* in ash-alder forest *Fraxino-Alnetum*, 20 cm², leg. S. Rosadziński, 26 Jul 2011, POZG; 1.66 km SE of **Koło** village, 51°49'23"N, 14°47'18.94"E, private forest, decaying log of the *Quercus robur* in *Galio sylvatici-Carpinetum*, 1 m², leg. S. Rosadziński, 11 Apr 2009, POZG; Forest Inspectorate Gubin, forest district Suchodół, 1.98 km SW of Węgliny village, **Uroczysko Węglińskie Nature Reserve**, forest section No. 238g, 51°48'39.92"N, 14°42'0.89"E, decaying log of *Quercus robur* in acidophilous oak forest *Calamagrostio arundinaceae-Quercetum petraeae*, 1 m², leg. S. Rosadziński, 23 Sept 2011, POZG; 0.8 km SE of **Węgliny** village, forest section No. 219 i/g, 51°49'4.04"N, 14°43'30.12"E, bark of *Quercus robur* and *Betula pendula*, 1.5 m², leg. S. Rosadziński, 23 Sept 2011, POZG.

Da 64 – Wzniesienia Gubińskie: Forest Inspectorate Lubsko, forest district Jezioro Dolne, 1.5 km SW of **Grodziszczce** village, forest section No. 1b, 51°49'12.88"N, 14°48'24.83"E, stump of *Quercus robur* in wet-ground forest *Galio sylvatici-Carpinetum*, 30 cm², leg. S. Rosadziński, 20 Sept 2011, POZG; Kotlina Zasięcka: forest district Mierków, forest section No. 292a, 1.45 km NW of **Chełm Żarski** village, 51°47'15.89"N, 14°52'44.62"E, bark of *Alnus glutinosa* in ash-alder forest *Fraxino-Alnetum*, 50 cm², leg. S. Rosadziński, 21 Sept 2008, POZG.

Da 65 – Kotlina Zasięcka: **Dłużek**, forest of Lubsko commune, 51°46'26.87"N, 14°55'44.47"E, stumps of *Carpinus betulus* in wet-ground forest *Galio sylvatici-Carpinetum*, 20 cm², leg. S. Rosadziński, 14 Oct 2011, POZG.

Da 73 – Kotlina Zasięcka: Forest Inspectorate Lubsko, forest district Zasięki, **Brożek**, forest section No. 421j, 51°42'50.32"N, 14°41'27.24"E, decaying log of *Quercus robur* in wet-ground forest *Galio sylvatici-Carpinetum*, 1.1 m², leg. S. Rosadziński, 18 Oct 2011, POZG.

Da 76 – Wzniesienia Żarskie: Forest Inspectorate Lubsko, forest district Łukaw, forest section No. 247t, 51°42'53.94"N, 15°7'57.10"E, bark of *Alnus glutinosa* in alder-turf forest *Sphagno-Alnetum*, 10 cm², leg. S. Rosadziński, 20 Jul 2009, POZG.

Dd 56 – Nizina Środkowomazowiecka, Zgierz district: **Grądy nad Moszczenicą Nature Reserve**, in *Tilio-Carpinetum* forest (a) 51°55'28"N, 19°29'52"E, log, 8 cm²; (b) 51°55'25"N, 19°29'54"E, log, 20 cm²; (c) 51°55'27"N, 19°29'45"E, log, 25 cm²; (d) 51°55'20"N, 19°30'01"E, log, 35 cm²; (e) 51°55'30"N, 19°29'56"E, stump, 6 cm²; (f) 51°55'21"N, 19°30'07"E, stump, 24 cm²; (g) 51°55'18"N, 19°30'11"E, bark of *Quercus robur*, 15 cm²; (h) 51°55'25"N, 19°30'19"E, bark of *Betula pendula*, 10 cm² (all collected by G.J. Wolski, 3 Aug 2011, LOD).

Dd 66 – Wzniesienia Południowomazowieckie; Łódź: **Las Łagiewnicki Nature Reserve**, in *Calamagrostio-Quercetum* forest (a) 51°50'05"N, 19°28'16"E, log, 30 cm²; (b) 51°50'04"N, 19°28'17"E, stump, 3 cm²; (c) 51°50'05"N, 19°28'20"E, bark of *Pinus sylvestris*, 8 cm²; (d) 51°50'04"N, 19°28'14"E, bark of *Quercus robur*, 20 cm²; (e) 51°50'04"N, 19°28'15"E, bark of *Betula pendula*, 75 dm²; in *Potentillo albae-Quercetum* forest (f) 51°49'47"N, 19°28'16"E, bark of *Quercus robur*, 5 dm²; (g) 51°50'01"N, 19°28'16"E, bark of *Betula pendula*, 50 dm² (all collected by G.J. Wolski, 18 Nov 2011, LOD).

Dd 75 – Nizina Południowowielkopolska, Łódź: **Polesie Konstanyńskie Nature Reserve** (a) bark of *Alnus glutinosa*, leg. D. Woźniak, 14 Oct 1990, LOD; in *Tilio-Carpinetum* forest (b) 51°45'34"N, 19°25'03"E, log, 30 cm²; (c) 51°45'30"N, 19°24'59"E, bark of *Betula pendula*, 20 dm² (b and c collected by G.J. Wolski, 6 May 2010, LOD).

Dd 76 – Wzniesienia Południowomazowieckie, Łódź: **Adam Mickiewicz city park**, 51°48'12"N, 19°26'42"E, stump, 15 cm², leg. G.J. Wolski, 14 May 2011, LOD.

Dd 82 – Nizina Południowowielkopolska, Zduńska Wola district: **Jamno Nature Reserve**, in *Tilio-Carpinetum* forest (a) 51°42'12"N, 18°53'42"E, stump, 5 cm²; (b) 51°42'14"N, 18°53'41"E, small fragments of wood, 4 cm²; (c) 51°42'04"N, 18°54'02"E, log 25 cm²; (d) 51°42'05"N, 18°53'58"E, bark of *Abies alba*, 5 cm²; (e) 51°42'09"N, 18°54'10"E, bark of *Abies alba*, 10 cm²; (f) 51°42'13"N, 18°53'57"E, bark of *Abies alba*, 14 cm²; (g) 51°42'11"N, 18°53'43"E, bark of *Abies alba*, 5 cm²; (h) 51°42'02"N, 18°54'07"E, bark of *Abies alba*, 18 cm²; (i) 51°42'12"N, 18°53'41"E, bark of *Quercus robur*, 15 cm²; (j) 51°42'06"N, 18°54'06"E, bark of *Betula pendula*, 50 cm² (all collected by G.J. Wolski, 11 Aug 2011, LOD).

Dd 99 – Wzniesienia Południowomazowieckie, Tomaszów Mazowiecki district: **Kruszewiec Nature Reserve**, in *Tilio-Carpinetum* forest (a) 51°35'24"N, 19°59'37"E, log, 10 cm²; (b) 51°35'22"N, 19°59'30"E, log, 15 cm²; (c) 51°35'21"N, 19°59'29"E, stump, 4 cm²; (d) 51°35'27"N, 19°59'24"E, bark of *Abies alba*, 5 cm²;

(e) 51°35'29"N, 19°59'20"E, bark of *Sorbus aucuparia*, 8 cm² (all collected by G.J. Wolski, 10 Jul 2010, LOD).

De 02 – Nizina Południowielkopolska, Zduńska Wola district: **Korzeń Nature Reserve** 51°28'50"N, 18°53'28"E, log near peat bog, 30 cm², leg. G.J. Wolski, 25 Jul 2011, LOD.

De 03 – Nizina Południowielkopolska, Łask district, **Jodły Łaskie Nature Reserve**: (a) 51°32'17"N, 19°06'17"E, stump in *Vaccinio uliginosi-Pinetum* forest, 5 cm²; in *Tilio-Carpinetum* forest (b) 51°32'10"N, 19°06'18"E, log, 35 cm²; (c) 51°32'14"N, 19°06'24"E, log, 20 cm²; (d) 51°32'09"N, 19°06'26"E, log, 10 cm² (all collected by G.J. Wolski, 19 Sept 2011, LOD).

De 91 – Wzniesienia Południowomazowieckie: Spalski Landscape Park, **Struga Liciężny valley**, 51°33'56.81"N, 20°14'27.6"E, bark of deciduous trees in *Tilio-Carpinetum* forest, 5 cm², leg. M. Majda, 2 Sept 2010, LOD.

Ea 16 – Bory Dolnośląskie: Forest Inspectorate Lubsko, forest district **Jagodzin**, 51°21'53.82"N, 15°15'29.17"E, forest section No. 293n, bark of *Betula pendula* in *Vaccinio uliginosi-Betuletum pubescentis* forest, 20 cm², leg. S. Rosadziński, 24 Aug 2010, POZG.

Ea 89 – Sudety Zachodnie: **Karpacz**, outcrop in spruce forest 0.5 km E of Wang stave church, leg. M. Szczepański, 20 Jul 2008, hb. M. Szczepański.

Eb 48 – Silesian Lowland, Odra valley, Wrocław: **Park Szczytnicki**, bark of *Acer platanoides* and *Quercus robur* and rotten stump, 0.2 dm², 1 dm² and 2 dm², leg. E. Fudali, 10 Jun 2011, KRAM; Wrocław: **Park Zachodni**, bark of *Quercus robur*, 0.5 dm², leg. E. Fudali, 12 Jun 2011, KRAM.

Ec 77 – Silesian Lowland, Równina Opolska: **Smolnik Nature Reserve**, bark of *Betula pendula* in mixed forest, 1 dm², leg. A. Stebel, 16 Jul 2011, SOSN.

Ee 00 – Wzniesienia Południowomazowieckie, Tomaszów district: **Jeleń Nature Reserve**, in *Tilio-Carpinetum* forest (a) 51°29'17"N, 20°05'49"E, bark of *Betula pendula*, 15 cm²; (b) 51°29'15"N, 20°06'09"E, log, 5 cm² (all collected by G.J. Wolski, 15 Aug 2011, LOD).

Ee 76 – Góry Świętokrzyskie Mountains: **Mt Agata**, northern slope, among stones in thicket, 593 m a.s.l., leg. R. Piwowarczyk, 6 Oct 2009, SOSN.

Ef 37 – Wyżyna Lubelsko-Lwowska: Lublin, linden-oak-hornbeam forest '**Stary Gaj**' at the edge of the city, bark of *Betula pendula*, 0.5 m², leg. L. Armata, 10 Dec 2011, LBL.

Fb 14 – Sudetes, Góry Stołowe Mountains: **Karłów**, shaded rock near the road to Kudowa-Zdrój, 1 dm², 746 m a.s.l., leg. A. Stebel, 21 Aug 2011, SOSN; **Mt Szczeliniec Wielki**, shaded rock near shelter-house, 905 m a.s.l., leg. A. Stebel, 21 Aug 2011, SOSN.

Fc 27 – Wyżyna Śląska, Chełm: **Boże Oczko Nature Reserve**, bark of *Fagus sylvatica* trunk and stump and lower part of *Larix decidua* in beech forest, 1 m², leg. A. Stebel, 16 Sept 2010, SOSN; **Grafik Nature Reserve**, bark of *Betula pendula* in mixed forest, 0.3 m², leg. A. Stebel, 16 Sept 2010, SOSN.

Fc 49 – Wyżyna Śląska, Płaskowyż Rybnicki: **Stanice-Górniki**, bark of *Quercus robur* trunk in mixed forest, 0.3 m², leg. A. Stebel, 10 Nov 2008, SOSN.

Fd 15 – Wyżyna Woźnicko-Wieluńska, Warta river valley: **Kopaniny**, forest between Mrzygłód-Włodowice

road and Kolonia Nierada settlement, forest section No 346, bark of *Quercus robur* in *Tilio-Carpinetum* forest, 0.2 m², leg. A. Stebel, 27 Apr 2009, SOSN.

Fd 52 – Wyżyna Śląska, Wyżyna Katowicka: **Katowice-Kopaniny**, bark of *Quercus robur* trunk in deciduous forest near the Rolnicza Street, 0.2 m², leg. A. Stebel, 8 Jun 2010, SOSN.

Fd 53 – Wyżyna Śląska, Wyżyna Katowicka: Katowice-Murcki, **Płone Bagno Ecological Area**, bark of *Betula pendula* trunk in mixed forest, 5 cm², leg. A. Stebel, 24 Sept 2010, SOSN.

Fd 73 – Kotlina Oświęcimska, Vistula river valley: '**Zapadź**' peat bog in Góra village, bark of *Betula pubescens* in *Fraxino-Alnetum* riverside carr, 0.4 m², leg. A. Stebel, 8 May 2011, SOSN.

Fg 01 – Roztocze, Roztoczański National Park: **Świerszcz stream valley**, forest section No. 274b, bark of *Abies alba* in the *Abietetum polonicum*, 10 cm², leg. S. Rosadziński, 16 Sept 2011, SOSN.

Note. Locality from the Sokole Góry Nature Reserve (STEBEL et AL. 2008) lies in the ATMOS grid square number Ed 94.

DISCUSSION

Orthodicranum tauricum grows on rotten logs and stumps as well as bark of trees and trunk bases, preferably in damp and shady situations. In last decades its occurrence has increased markedly in many areas, possibly due to acidification (HEDENÄS and BISANG 2004, MEINUNGER and SCHRÖDER 2007). Assuming that the air quality in Poland in the last couple of years has evidently improved, the air pollution appears to be only one of the factors that enable expansion. The most recent collections from the Caucasus, forest-steppe and steppe zones of European Russia and hemiboreal zone near Moscow show how far the species has reached in the continental area (IGNATOVA and FEDOSOV 2008). In some other countries, like Hungary (NÉMETH 2009), the frequency of *O. tauricum* is also reported as increased markedly. Hence, it is an important task to document the nature of expansion process which could be of major significance to our knowledge of moss migration and their reaction to the environmental changes caused by human management. The current state of knowledge about the distribution of species in Poland is still incomplete. While there are many localities known in western and central parts of the country, the species seems to be much rarer in the eastern part (Fig. 1). This could be, however, a result of insufficient exploration of this area, so further investigation is needed.

CONCLUSIONS

1. *Orthodicranum tauricum* in Poland still spreads. Currently the number of its localities exceeds 200. They are located in 123 ATMOS grid squares including 22 squares reported for the first time in this paper.

2. Most localities of the species are known from western and central parts of Poland, but it is rather

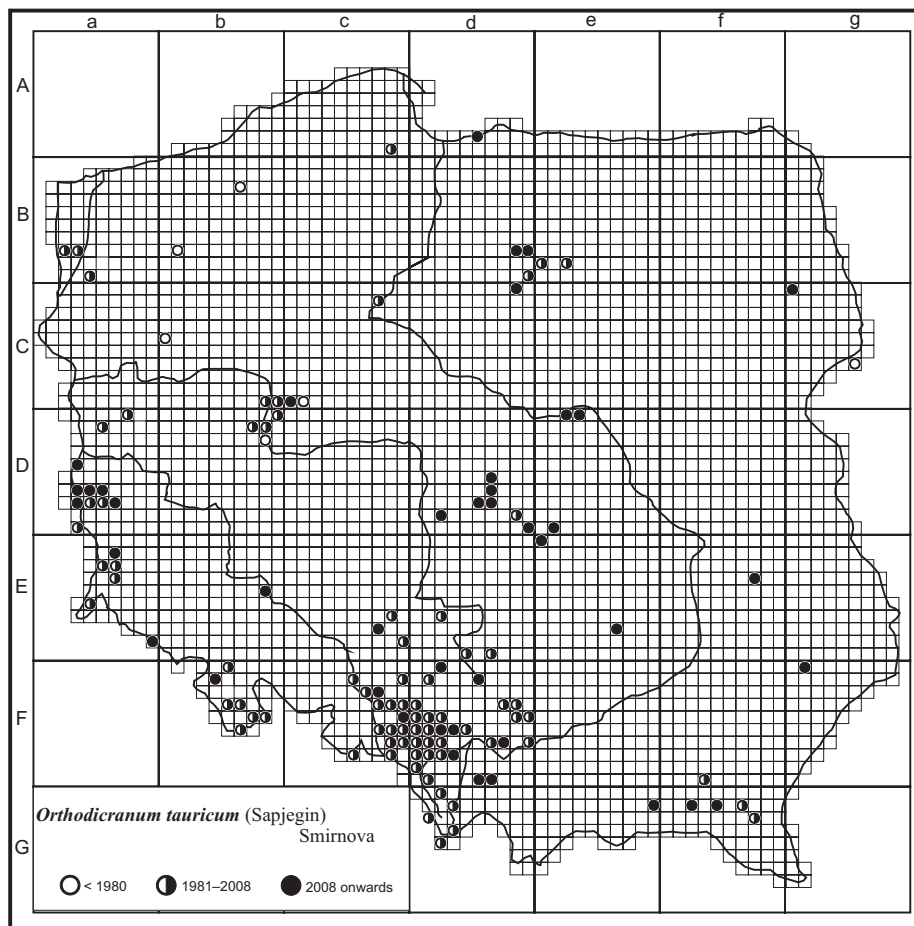


FIG. 1. Current distribution of *Orthodicranum tauricum* in Poland

a result of better recognition of these areas and *O. tauricum* is probably more frequent in the whole area of the country.

3. Data published in this paper expand the local range of *O. tauricum* towards north, north-east and east.

4. Over half (57%) of records of *O. tauricum* published here origin from epiphytic habitats, 37% from various kinds of rotten wood (logs 61%, stumps 33% and small pieces of wood lying on forest floor 6%) and 6% from various types of rock and boulders. The species occurs mainly on bark of trees and shrubs, such as *Betula pendula*, *Alnus glutinosa* and *Quercus robur*. In this paper four new phorophytes for this species from Poland are reported, namely *Abies alba*, *Betula pubescens*, *Larix decidua* and *Pseudotsuga menziesii*.

6. *Orthodicranum tauricum* prefers damp forest patches and trees growing near lakes, ponds, streams etc. Although it was observed in urban areas, they were mainly outskirts of towns. New discovered populations in Wrocław and Łódź indicate, that this species starts to colonize epiphytic and epixylic habitats towards centres of towns as well.

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