REDISCOVERY OF THE EPIPHYTIC MOSS *ULOTA COARCTATA* (ORTHOTRICHACEAE) IN POLAND

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**Abstract.** *Ulota coarctata* (P. Beauv.) Hammar was recently collected in Poland after more than half a century. This epiphytic moss was found at four localities in the Pojezierze Lubuskie lakeland in the western part of the country. Its diagnostic features are briefly presented, its habitat requirements are considered, the historical and recent findings of the species in Poland are discussed, and its distribution is mapped. It is suggested that the species status should be changed from ‘endangered’ to ‘critically endangered’ on the red list of mosses in Poland.

**Key words:** Bryophyta, distribution, epiphytes, extinct species, Musci, Pojezierze Lubuskie lakeland, red list, threatened species

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**Introduction**

The moss genus *Ulota* Mohr includes six species in Poland (Ochyra & Bednarek-Ochyra 1991; Ochyra et al. 2003). One additional species, formerly placed in this genus as *U. phyllantha* Brid., was recently placed in the new genus *Plenogemma* Plášek, Sáwicki & Ochyra (Plášek et al. 2015). Most species of *Ulota* are epiphytes; only a few are associated with saxicolous habitats. According to the latest red list of Polish mosses, all species of *Ulota* are considered threatened (Żarnowiec et al. 2004). *Ulota bruchii* Brid., and *U. crispa* (Hedw.) Brid. are in category V (vulnerable), and *U. coarctata* (P. Beauv.) Hammar, *U. drummondii* (Hook. & Grev.) Brid. and *U. Hutchinsiae* (Sm.) Hammar are in category E (endangered). *Ulota rehmannii* Jur., originally described from the Polish Tatras (Juratzka 1864), is listed as extinct (Ex), since it has not been rediscovered at the *locus classicus* since the late 1870s (Chalubinski 1886; Ochyra & Cislo 1999).

Although *U. coarctata* was classified as an endangered species, it had not been recorded for over half a century in Poland, so it should have been considered extinct or nearly so in this country. During bryofloristic fieldwork in Western Poland, however, this species was repeatedly collected in 2013, 2015 and 2016 in the Pojezierze Lubuskie lakeland. In view of its local occurrence and the small size of its populations, at present it would be appropriate to consider *U. coarctata* critically endangered in Poland.

*Ulota coarctata* is a very rare epiphytic species in other Central European countries and regions as well (cf. Kubinská et al. 2001; Sauer 2001; Lauer 2005; Meinunger & Schröder 2007; Zechmeister et al. 2013). As in Poland, the species was rediscovered after a long time in Germany and in the Czech Republic only a few years ago (Frahm 2004; Soldán & Buryová 2001; Daute & Fürstenow 2011).

**Diagnostic features**

*Ulota coarctata* is an epiphytic moss reaching *ca* 1 cm in height. The plants form loose, dull green, yellowish or brownish tufts. The leaves are only slightly twisted when dry, patent when moist, *ca* 3 mm long and taper to a rather blunt tip. The species frequently produces narrowly pyriform,
pale brown capsules which are almost entirely smooth and contracted at the mouth (cf. Sauer 2001). The exothecial bands are noticeable only immediately below the mouth. The peristome teeth are whitish and the calyptra is densely hairy.

_Ulota coarctata_ is easily differentiated from other species in Central Europe by its pale, narrowly pyriform capsules having a very small mouth (Figs 1 & 2).

**Distribution of *Ulota coarctata* in Poland**

All records of _U. coarctata_ from Poland are included below, divided into historical collections arranged chronologically on the basis of the specimens in BP, KRAM, POZG, WA, WRSL and ZAMU; details of a specimen from a single locality for which no collecting date was available on the label; and the latest collection records of _U. coarctata_ from western Poland. A further list is based on literature records for which no voucher collections have been located.

The distribution of _U. coarctata_ in Poland is presented on a map in ATMOS grid squares (Fig. 3). It comprises all localities where the species was recorded in three periods: pre-1900, 1901–1945, and from 1945 onwards. The dots on the map correspond to the localities listed below.

**Historical Localities**

1. **KARPATY ZACHODNIE** [= Western Carpathians], Tatra Mts: ‘E sylvis infraalpinis Tatrorum’, 1844, leg. [J.] Łobarzewski, rev. R. Ochyra & V. Plášek (WA #37506). ATMOS grid square: Gd–59.

2. **SUDETY ZACHODNIE** [= Western Sudetes], Karkonosze range [= Giant Mts]: Karpacz (Germ. Krummhübel), on beech tree, 21.VII.1866, leg. G. Limpricht, rev. R. Ochyra (BP-Limpricht #43254). ATMOS grid square: Eb–80.

3. **SUDETY ZACHODNIE** [= Western Sudetes], Karkonosze range [= Giant Mts]: Karpacz (Germ. Krummhübel), on bark of _Fagus sylvatica_ L., 1.VIII.1866, leg. G. Limpricht [Bryotheca Silesiaca No. 65], rev. V. Plášek & R. Ochyra (BP-Limpricht #8342 & 43262, KRAM B-219725; WRSL #245006, 77892 & 77893). ATMOS grid square: Eb–80.

4. **SUDETY ZACHODNIE** [= Western Sudetes], Karkonosze range [= Giant Mts]: Karpacz (Germ. Krummhübel), on bark of _Fagus sylvatica_ L., 1.VIII.1866, leg. G. Limpricht [Bryotheca Silesiaca No. 65], rev. V. Plášek & R. Ochyra (BP-Limpricht #43352). ATMOS grid square: Eb–80.

5. **KARPATY ZACHODNIE** [= Western Carpathians], Obniżenie Orawsko-Podhalańskie [= Orawa-Podhale Depression], Rów Podtatrzanski [= Subtatra Trough]: Zakopane, 1867, leg. A. Rehman, rev. V. Plášek (KRAM B-1534, WA #37505). ATMOS grid square: Gd–59.
Note. In KRAM there are two specimens collected by Rehman in the Tatras with the following label data, but unfortunately without the collecting date: (1) lasy Tatr [= forests of the Tatras] (KRAM B-26517) and (2) Zakopane, auf Nadelbäumen, in Wälder der Tatra (KRAM B-2338). Probably these are duplicates of the same collection.

6. **Sudepty Zachodnie** [= Western Sudetes], Pogórze Kaczawskie foothills: Bolesławiec (Germ. Bunzlau), 05.IX.1868, *leg. G. Limpricht*, *rev. R. Ochyra* (BP-Limpricht #27526). ATMOS grid square: Ea–29.

7. **Karpaty Zachodnie** [= Western Carpathians], Tatra Mts: Równia Gąsienicowa, 17.VIII.1876, *leg. T. Chałubiński*, *rev. R. Ochyra & V. Plášek* (KRAM B-123672, WA #37503, ZAMU). ATMOS grid square: Gd–59.

8. **Karpaty Zachodnie** [= Western Carpathians], Tatra Mts: Regle [= forest belt] above Dolina Strążyska valley, 16.VIII.1877, *leg. T. Chałubiński*, *rev. R. Ochyra & V. Plášek* (KRAM B-123672, WA #37503, ZAMU). ATMOS grid square: Gd–59.

10. **Północne Podkarpackie** [= Northern Subcarpathia], Brama Krakowska [= Kraków Gate]: Piekary near Tyniec (now within Kraków city limits), X.1877,
leg. J. Krupa, rev. V. Plášek (KRAM B-1429 & 2172). ATMOS grid square: Fd–68.

11. KARPATY ZACHODNIE [= Western Carpathians], Beskid Zachodni [= Western Beskyd], Beskid Żywiecki: Radziechowy, VIII.1878, leg. J. Krupa, rev. V. Plášek (KRAM B-2462) – mixed collection, together with Dorcadion affine (Brd.) Lindb., D. speciosum (Nees) Lindb., D. striatum (Hedw.) Lindb. and Orthotrichum stramineum Brd. ATMOS grid square: Gd–13.

12. KARPATY ZACHODNIE [= Western Carpathians], Tatra Mts: Dolina Rzotoki valley towards a waterfall, 5.VIII.1878, leg. T. Chalubiński, rev. R. Ochyra & V. Plášek (KRAM B-125530, WA #37504, ZAMU) – mixed collection, together with Codriophorus aecicularis (Hedw.) Bednarek-Ochyra & Ochyra. ATMOS grid square: Ge–50.

13. KARPATY ZACHODNIE [= Western Carpathians], Obnienie Orawsko-Podhalanskie [= Orawa-Podhale Depression], Rów Podtatrzanski [= Subtatra Trough]: Zakopane, forest between Bystre and Pardolówka, 04.IX.1878, leg. T. Chalubiński, rev. R. Ochyra & V. Plášek (KRAM B-123687, WA #37499, ZAMU). ATMOS grid square: Ge–50.

14. KARPATY ZACHODNIE [= Western Carpathians], Obnienie Orawsko-Podhalanskie [= Orawa-Podhale Depression], Rów Podtatrzanski [= Subtatra Trough]: Zakopane: in forest beyond Kacprostwo towards ‘regle’ [= forest belt], 24.VII.1879, leg. T. Chalubiński, rev. R. Ochyra & V. Plášek (KRAM B-123684, WA #37502, ZAMU). ATMOS grid square: Gd–59.

15. KARPATY ZACHODNIE [= Western Carpathians], Obnienie Orawsko-Podhalanskie [= Orawa-Podhale Depression], Rów Podtatrzanski [= Subtatra Trough]: Zakopane, Bystre, 10.VIII.1879, leg. T. Chalubiński, rev. R. Ochyra & V. Plášek (KRAM B-123669, WA #37498, ZAMU). ATMOS grid square: Ge–50.

16. POBRZEŻA POŁUDNIOWOBAŁTYCKIE [= South Baltic Coast]: Szczecin, Puszcza Bukowa primeval forest, on bark of Populus tremula L., VIII.1880, leg. J. Winkelmann, rev. E. Fudali (1995) and V. Plášek (POZG). ATMOS grid square: Ba–94.

17. KARPATY ZACHODNIE [= Western Carpathians], Tatra Mts: Rzotoka stream in Dolina Rzotoki valley near so-called Grzmot [= Wodogrzmoty, waterfall], 18.VIII.1880, leg. T. Chalubiński, rev. R. Ochyra & V. Plášek (KRAM B-123689, WA #37500, ZAMU). ATMOS grid square: Ge–50.

18. KARPATY ZACHODNIE [= Western Carpathians], Obnienie Orawsko-Podhalanskie [= Orawa-Podhale Depression], Rów Podtatrzanski [= Subtatra Trough]: Zakopane, VIII.1885, leg. J. Krupa, rev. V. Plášek (KRAM B-1458). ATMOS grid square: Gd–59.

19. POBRZEŻA POŁUDNIOWOBAŁTYCKIE [= South Baltic Coasts]: Szczecin, Puszcza Bukowa primeval forest, peat bog near Prochowy Mlyn (Germ. Pulvermühle), on bark of Populus tremula, VIII.1893, leg. J. Winkelmann, rev. V. Plášek (POZG) – mixed collection, together with Frullania dilatata (L.) Dumort. ATMOS grid square: Ba–93.

20. PÓŁNOCNE PODKARPACIE [= Northern Subcarpathia], Kotlina Sandomierska [= Sandomierz Basin]: Puszcza Niepokolicka (without detailed locality), 8.XI.1909, leg. A. J. Żmuda, rev. V. Plášek (KRAM B-6733). ATMOS grid square: Fe–62.

21. KARPATY ZACHODNIE [= Western Carpathians], Beskid Zachodni [= Western Beskyd], Beskid Śląski: Bielsko-Biała, by road to Kolowrót pass [Germ. Bielitz Weg nach der Kamnitzer Platte] between Mt. Szyniellia and Mt. Dębowiec, on bark of forest tree, alt. ca 600 m a.s.l., 8.VII.1935, leg. A. Graw, rev. V. Plášek (KRAM B-21630). ATMOS grid square: Fd–93.

22. WYŻYNA ŚRODKOWOBAŁTYcka UPLAND, Wyżyna Kielecko-Sandomierska upland, Plaskowyż Suchedniowski plateau: forest near Kruk village by town of Suchedniów, on bark of Populus tremula, 7.VII.1939, leg. K. Kaznowski, rev. V. Plášek (POZG) – mixed collection, together with Orthotrichum stramineum. ATMOS grid square: Ee–55.

23. WYŻYNA ŚRODKOWOBAŁTYcka UPLAND, Wyżyna Kielecko-Sandomierska upland, Garb Gielniowski hummock: Bliżyn village northwest of town of Suchedniów, along track between Dalejów and Suchedniów, on bark of Populus tremula, 7.VII.1939, leg. K. Kaznowski, rev. V. Plášek (POZG) – mixed collection, together with Frullania dilatata. ATMOS grid square: Ee–45.

24. KARPATY Wschodnie [= Eastern Carpathians], Beskid Wschodni [= Eastern Beskyd], Bieszczady Zachodnie: Wielina, on bark of Tilia sp., 19.VII.1954, leg. S. Lisowski, rev. A. Stebel (2010) and V. Plášek (KRAM B-58437, POZG) – mixed collection, together with Orthotrichum pallens. ATMOS grid square: Gf–68.

25. WYŻYNA WschodiNoMałopolska Upland, Wyżyna Lubelska upland, Płaskowyż Świdnicki plateau: in forest near Chmiel village, south of Świdnik, on bark of Acer sp. and Ulmus sp., 13.IX.1957, leg. M. Kuc, rev. V. Plášek (KRAM B-26519 & 26520). ATMOS grid square: Ef–38.

26. WYŻYNA WschodiNoMałopolska Upland, Roztocze Wschodnie heights: beech forest near Hrebenné, southeast of Tomaszów Lubelski, 18.IX.1958, leg. M. Kuc, rev. V. Plášek (KRAM B-26521). ATMOS grid square: Fg–35.
HISTORICAL COLLECTIONS (WITHOUT COLLECTING DATE)

27. SUDETY ZACHODNIE [= Western Sudetes], Kar-konosze range [= Giant Mts]: east of Szklarska Poręba town, Wodospad Szklarki (Germ. Kochelfall), sine dato, leg. J. Milde, rev. V. Plášek (WRS). ATMOS grid square: Ea-78.

RECENTLY DISCOVERED LOCALITIES

28. LUBUSKIE VOIVODESHIP: Pojezierze Lubuskie lakeland, Równina Torzymska [= Torzym Plain], Rzepinek settlement south of Rzepin town, Ilanka river valley, forest section 491b of Rzepin Forest Inspectorate, GPS coordinates (WGS 84): 52°19′15″N, 14°49′20″E, alt. 55 m a.s.l., thicket in mixed forest, site of former building, bark of Acer pseudoplatanus L., one tuft growing with Dorcadion affine, Orthotrichum pulchellum Brunt., O. stramineum, Radula complanata (L.) Dumort., Syntrichia virescens (De Not.) Ochyra, Ulo~ta bruchii and Hypnum cupressiforme Hedw., 24.III.2013, leg. M. Smoczyk, rev. V. Plášek (KRAM B-214940, priv. coll. of M. Smoczyk #3078). ATMOS grid square: Da-04.

29. LUBUSKIE VOIVODESHIP: Pojezierze Lubuskie lakeland, Torzym Plain, 2.6 km southeast of Rzepin town, forest section 427a of Rzepin Forest Inspectorate, GPS coordinates (WGS 84): 52°19′17″N, 14°51′43″E, alt. 70 m a.s.l., cut branch of Quercus petraea (Mat.) Liebl. by forest road, one tuft ca 12 cm² growing with Dorcadion affine, Orthotrichum pulchellum, O. stramineum, Ulo~ta bruchii, U. crispa, Hypnum cupressiforme and lichen Parmelia sulcata Taylor, 15.III.2015, leg. M. Smoczyk, rev. V. Plášek (KRAM B-221054, priv. coll. of M. Smoczyk #5238). ATMOS grid square: Da-04.

30. LUBUSKIE VOIVODESHIP: Pojezierze Lubuskie lakeland, Torzym Plain, 2.3 km southwest of Jerzmanicke Lubuskie railway station, forest section 21c of Cybinka Forest Inspectorate, 52°17′49″N, 14°50′16″E, alt. 55 m a.s.l., on trunk of Carpinus betulus L. at height of 1.7 m with NW exposure, one tuft ca 3 cm² growing with Hypnum cupressiforme, Pylaisia polyantha (Hedw.) Schimp., Dorcadion affine and Ulo~ta crispa, 19.II.2016, leg. M. Smoczyk, rev. V. Plášek (KRAM B-223989, priv. coll. of M. Smoczyk #6539). ATMOS grid square: Ca-94.

LITERATURE RECORDS (NO VOUCHER SPECIMEN LOCATED)

NIZINA ŚLASKA PLAIN, Równina Oleśnicka: Malin (Germ. Mahlen) (Milde 1869); ATMOS grid square: Eb-39.

NIZINA ŚLASKO-ŁUŻYCKA [= Silesian-Lusathian Plain], Równina Szprotawska: Żagań (Germ. Sagan) (Milde 1869); ATMOS grid square: Da-87.

NIZINA ŚLASKO-ŁUŻYCKA [= Silesian-Lusathian Plain], Wysoczyna Lubuńska: Przemków (Germ. Prim-kaua) (Milde 1869); ATMOS grid square: Db-90.

PRZEDGÓRZE SUDECKIE PIEDMONT, Masyw Ślęży [= Ślęża Massif]: Sobótka (Germ. Zobten) (Milde 1869); ATMOS grid square: Eb-76.

SUDETY ZACHODNIE [= Western Sudetes], Góry Izerskie range: Świeradów-Zdrój (Germ. Flinsberg) (Milde 1869); ATMOS grid square: Ea-67.

SUDETY ZACHODNIE [= Western Sudetes], Karkonosze range: Pączkowki rocks (Germ. Corallensteine) (Milde 1869); ATMOS grid square: Ea-78.

SUDETY ZACHODNIE [= Western Sudetes], Pogórze Bolkowsko-Walbrzyskie foothills: Czeszów (Germ. Deutschhammer) (Milde 1869); ATMOS grid square: Eb-73.

SUDETY ZACHODNIE [= Western Sudetes], Pogórze Bolkowsko-Walbrzyskie foothills: Książ (Germ. Fürstenstein) (Milde 1869); ATMOS grid square: Eb-74.

SUDETY ŚRODKOWE [= Central Sudetes], Pogórze Orlickie foothills: Kudowa-Zdrój (Germ. Cudowa) (Milde 1869); ATMOS grid square: Eb-23.

SUDETY ŚRODKOWE [= Central Sudetes], Góry Bystrzyckie range: Duszniki-Zdrój (Germ. Reinerz) (Milde 1869); ATMOS grid square: Fb-24.

SUDETY Wschodnia [= Eastern Sudetes], Masyw Śnieżnika [= Śnieżnik Massif]: Międzywodzie (Germ. Wölflersgrund) (Milde 1869); ATMOS grid square: Fb-47.

EXCLUDENDA

KARPATY ZACHODNIE, Tatra Mts, Zakopane town, 1867, leg. A. Rehman, rev. V. Plášek (KRAM B-6863) – est Ulo~ta crispa.

PÓŁNOCE PODKARPACIE, Puszcza Niegposolicka primeval forest, sine dato, leg. J. Krupa, rev. V. Plášek (KRAM, B-5527) – est Ulo~ta crispa.
Sudeťy Zachodnie, Góry Izerskie Mts, Rozdroże Izerskie plateau, loc. Ludwigsbaude, 900 m a.s.l., 13.VI.1916, leg. F. Kern, rev. V. Plášek (WRSKL) – est Dorcadion speciosum with Orthotrichum stramineum.

Doubious records

Franciszek Błoński collected Ulota coarctata at ‘Straż Okolnicka’ on 22 July 1887 and the voucher specimens are deposited in WA. This locality is one of 12 districts of Puszcza Białowieska [= Białowieża Forest], a famous primeval forest in northeastern Poland situated in Poland and Belarus. A major part (ca 90%) of the ‘Straż Okolnicka’ district is currently situated in Belarus, and only a small part (ca 10% of its area) lies in Poland. This forest district was subsequently divided into sections, but unfortunately the collector gave no section number for the collection site, so its precise location cannot be ascertained. Hence the record of U. coarctata in the Polish part of Puszcza Białowieska is uncertain. It is worth noting that this species is cited in the moss flora of Belarus as occurring in the Belarusian part of Puszcza Białowieska, although without precise details (Rykovsky & Maslovsky 2004). This locality is marked with a question mark in ATMOS grid square Cg–56.

The situation is similar for the specimen collected by Breutel in the Giant Mts [Breutel, Musci frondosi Exsiccati No. 454], which is housed in the Limpricht herbarium at BP-Limpricht #43261. On the label only an imprecise location is given: ‘An Baumstämmen im Riesengebirge, April?, Breutel’, so it is not clear if the locality is in the Polish or Czech part of the Giant Mts.

Finally, also among the literature records are cases of unclear locations. For example, ‘Silesia: Cieszyn – Germ. Teschen (Milde 1869)’. From this information it is not possible to say which part of the town of Cieszyn or its vicinity (whether in Poland or the Czech Republic) the record comes from. This locality is marked with a question mark in ATMOS grid square FD–90.

Discussion

The historical localities of Ulota coarctata in Poland were recorded mostly in mountain areas in the southern part of the country (Fig. 3), including the Carpathians (with many localities in the Tatras confirmed by voucher collections) and the Sudetes (mostly literature data). In the northwestern part of Poland only two localities are known from Puszcza Bukowa near Szczecin. The most recent of the historical records of the species were made by M. Kuc in 1957 and 1958 in the Wyżyna Małopolska upland. The new findings presented here are the first for Poland for more than half a century, and originate from the western part of the country. The nearest recently discovered stations of this species are situated in Brandenburg, Germany (Daute & Fürstenow 2011), ca 130 km southwest of the locality of the recent findings in Poland.

In all new localities, Ulota coarctata was found with sporophytes but only in small populations consisting of single tufts. The species was recently recorded growing on the bark of Acer pseudoplatanus, Carpinus betulus and Padus avium, and on a branch of Quercus petraea. The historical specimens of the species were collected, according to the label data, on bark of various deciduous trees, including Populus tremula, Fagus sylvatica, Acer sp., Sorbus sp., Tilia sp. and Ulmus sp.

Ulota coarctata occurs in synusia of corticolous epiphytic mosses, in communities from the order Orthotricheta Hadač in Klika & Hadač 1944 (Hübschmann 1986; Marstaller 1993), and grows together with Ulota bruchii, U. crispa and other epiphytic species of the broadly conceived genus Orthotrichum Hedw. (cf. Plášek et al. 2015), such as Dorcadion affine, Orthotrichum pulchellum and O. stramineum. In two of the recently found localities, U. coarctata was recorded in an environment of mixed oak-hornbeam forest of the alliance Carpinion betuli Issl. 1931 em. Oberd. 1953, on slopes of a small stream valley and with a microclimate of quite high humidity. The third collection was on branches of an old sessile oak tree growing by a forest road in a complex of acidophilous pine-oak mixed forest of the alliance Dicrano-Pinion (Libbert 1933) W. Mat. 1962. At the last locality the species was found on bark of Padus avium growing in swamp alder forest of the alliance Alnion glutinosae Malcuit 1929 developed on the shore of a lake.

All new localities were found during an intensive bryofloristic survey of the western part of Poland. Probably the species may be rediscovered in the future at additional locations in this part of the country. This region merits special attention for nature conservation.
Since the fact that the present records were made in a very narrow area (ca 17 km²) and the populations are very small, it would be appropriate to treat *Ulota coarctata* as a critically endangered species in Poland – CR category, criteria A2c; C2a(i); D (IUCN 2012).

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