Polish Botanical Journal 57(2): 473–477, 2012

REVISED DISTRIBUTION OF THE LICHEN SPECIES *HAEMATOMMA OCHROLEUCUM* IN POLAND

ANNA ZDUŃCZYK & MARTIN KUKWA

Abstract. The paper presents the distribution of *Haematomma ochroleucum* (Neck.) J. R. Laundon in Poland. It has been considered a common species there, but revision of all available material indicates that it is very rare, known from only a few localities in the Carpathians (5 localities), Sudety Mts (1 locality) and northeastern Poland (1 locality). Both *H. ochroleucum* var. *ochroleucum* and *H. ochroleucum* var. *porphyrium* (Pers.) J. R. Laundon are reported from Poland. The taxonomy, distribution and habitat requirements of *H. ochroleucum* are discussed, with notes on similar taxa.

Key words: chemotaxonomy, *Lecanora*, *Lecanora thysanophora*, sorediate lichens

Anna Zduńczyk, Department of Botany and Genetics, Pomeranian University in Słupsk, ul. Arciszewskiego 22B, 76-200 Słupsk, Poland; e-mail: azdunczyk@apsl.edu.pl
Martin Kukwa, Department of Plant Taxonomy and Nature Protection, University of Gdańsk, Al. Legionów 9, 80-441 Gdańsk, Poland, e-mail: dokmak@ug.edu.pl

INTRODUCTION

The genus *Haematomma* A. Massal. (Haematommataceae, Lecanorales, Lecanoromycetes, Ascomycota; see Lumbsch & Huhndorf 2010) comprises crustose lichen species characterized by lecanorine apothecia with bright red to orange-red pigmented discs containing haematommone, russulone or ivorione, *Lecanora*-type asci, slightly anastomosing paraphyses with slightly swollen tips and transversely septate to muriform ascospores (Staiger & Kalb 1995; Elix 2004; Nelsen *et al.* 2006; Brodo *et al.* 2008). About 40 species have been recognized worldwide (Nelsen *et al.* 2006; Brodo *et al.* 2008), of which *H. ochroleucum* (Neck.) J. R. Laundon is one of the most widely distributed taxa (see Wolseley *et al.* 2009). This species has been reported from Poland and is the only member of the genus known from the country (Fałtynowicz 2003). *Haematomma ochroleucum* was thought to be common in Poland (see Fałtynowicz 2003), but the revision of many specimens labeled *H. ochroleucum* revealed that most of specimens were misidentified and belong to the morphologically similar *Lecanora thysanophora* R. C. Harris (Kukwa 2005). As no more research dealing with *H. ochroleucum* has been done since then, its true distribution in Poland has remained unknown. This prompted us to study all specimens of this taxon not previously checked. The results are presented here.

MATERIAL AND METHODS

Lichen metabolites, an important diagnostic character for the identification of *H. ochroleucum*, were studied using thin layer chromatography (TLC, methods according to Orange *et al*. 2001). The material was obtained from the following herbaria: KRA, KRAM, KTC, POZ, UGDA (abbreviations according to Thiers 2011) and the herbarium of Gorce National Park (GPN). Abbreviations of the authors of lichen names follow Brummitt and Powell (1992). The localities of the specimens are given in the ATPOL grid square system (Cieśliński & Fałtynowicz 1993).

THE SPECIES

Haematomma ochroleucum (Neck.) J. R. Laundon

Lichenologist **4**(4): 299. 1970. – *Lichen ochroleucus* Neck., Method. Muscor.: 52. 1771.

CHARACTERISTICS OF SPECIES AND INFRASPECIFIC VARIATION. The mature thalli of the species

are almost entirely covered with soredia grouped in granular consoredia, and esorediate areoles may be developed at the edge of the thalli only in young specimens; the color of soredia and areoles ranges from pale to greenish gray (specimens lacking usnic acid) to yellow-green or yellow-gray (specimens containing usnic acid). The prothallus usually is conspicuous, white, cottony and in some specimens fibrillose. Apothecia are rarely present (in Polish material present in 6 of 12 specimens, but mostly immature), lecanorine, with a scarlet disc; ascospores are 3–8-septate, 30–60 × 5–7 µm (Tønsberg 1992; Staiger & Kalb 1995; Wolseley *et al.* 2009). The species always contains atranorin, zeorin with additional unidentified terpenoids (those cause the development of needle-like crystals in older herbarium specimens), porphyrilic acid and, when apothecia are present, also russulone in the epihymenium; often it also produces usnic and bourgeanic acids (Tønsberg 1992; Staiger & Kalb 1995; Wolseley *et al.* 2009). Staiger and Kalb (1995) and Brodo *et al.* (2008) reported psoromic acid also, but this substance appears as a very rare secondary metabolite in the species. The presence or absence of usnic acid often has been considered taxonomically important, and individuals containing this substance are recognized as a typical variety, *H. ochroleucum* var. *ochroleucum*, and those lacking this substance as *H. ochroleucum* var. *porphyrium* (Pers.) J. R. Laundon (Laundon 1970; Tønsberg 1992; Wolseley *et al.* 2009). Some authors consider them chemotypes, however (see Staiger & Kalb 1995; Brodo *et al.* 2008). In this paper we distinguish them as varieties, as usnic acid production appears to be a discrete feature and is clearly present or completely absent. Additionally, no transitional forms have been observed between thalli with and without usnic acid, and even when growing together and fusing they always retain their individuality (Laundon 1978). The varieties also seem to differ in distribution in some regions (e.g., Laundon 1970; also this paper, Fig. 1). Those facts argue for two phylogenetically distinct taxa. Production of usnic acid has been shown to be taxonomically important in *Parmeliopsis ambigua* (Wulfen) Nyl. and *P. hyperopta* (Ach.) Arnold (Tehler & Källersjö 2001), and may play the same role in the taxonomy of *H. ochroleucum* s.l. Nevertheless, the status of *H. ochroleucum* specimens with and without usnic acid needs to be determined by molecular analysis.

According to Brodo *et al.* (2008), some European specimens of *H. ochroleucum* lack porphyrilic acid. We have also studied such specimens from Denmark, Great Britain and Holland, but we think they may belong to an as yet undescribed species of *Lecanora* (Kukwa, personal observation).

Chemistry of Polish specimens. Both varieties of *H. ochroleucum* occur in Poland. The typical variety was represented by five specimens (collected from three localities); they contained atranorin, zeorin (often together with unidentified terpenoids), usnic and porphyrilic acids, and in two specimens also bourgeanic acid, accompanied in one of them by an unidentified fatty acid. The presence of bourgeanic acid is reported for the first time from *H. ochroleucum* var. *ochroleucum*. The material of *H. ochroleucum* var. *porphyrium* consisted of seven specimens (collected from five localities); atranorin, porphyrilic acid and zeorin were always present, and in five specimens bourgeanic acid was detected, accompanied by an unidentified fatty acid in four of them. Sometimes traces of unidentified terpenoids were also detected.

Notes. When fertile, *Haematomma ochroleucum* is easily distinguishable from similar species on account of its sorediate thallus, scarlet red apothecial discs, and the production of atranorin, porphyrilic acid, zeorin and often usnic acid (e.g., Tønsberg 1992; Wolseley *et al.* 2009). When sterile, however, it can be mistaken for several species. In Poland the corticolous material can be easily confused with the morphologically and chemically similar *Lecanora thysanophora*. Both taxa can develop white prothalli (but sometimes they are hardly visible) and contain atranorin, zeorin, usnic (only in *Haematomma ochroleucum* var. *ochroleucum*) and porphyrilic acids (not found in European material of *Lecanora thysanophora* so far), but they differ predominantly in the production of unidentified terpenoids called ‘thysanophora unknowns’: they are present in *L. thysanophora* and

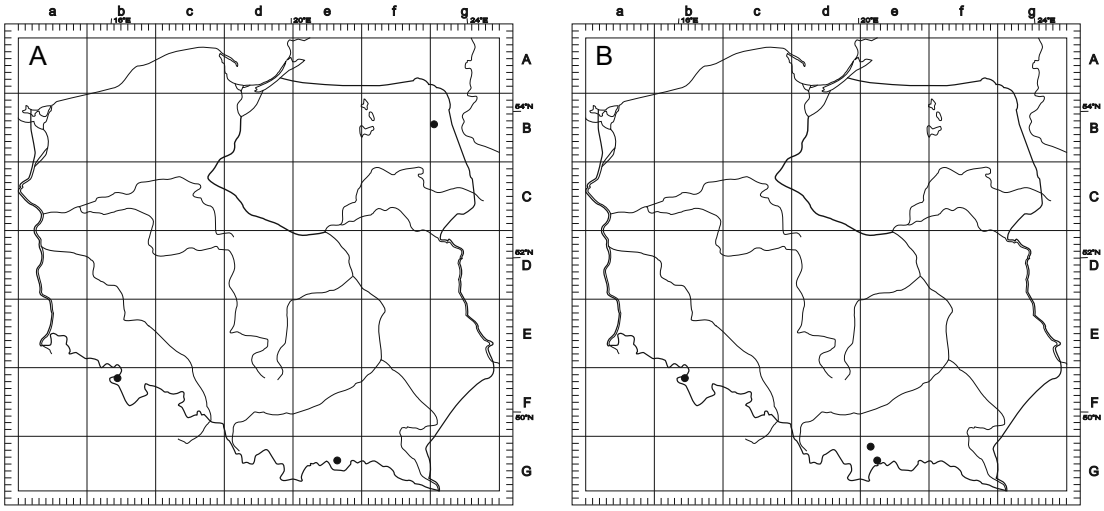

Fig. 1. Distribution of *Haematomma ochroleucum* (Neck.) J. R. Laundon var. *ochroleucum* (A) and *H. ochroleucum* var. *porphyrium* (Pers.) J. R. Laundon (B) in Poland.

absent in *H. ochroleucum*. Additionally, *H. ochroleucum* produces soredia from thalline areoles and some areoles remain esorediate, and its prothallus is often continuous and only rarely forms zonate strands, whereas in *L. thysanophora* areoles are lacking and soredia are produced directly from the prothallus, which often is fibrous and blue-white zonate (Harris *et al.* 2000; Kukwa 2005).

The corticolous representatives of the species can also be confused with two other epiphytic *Lecanora* species containing usnic acid, *L. compallens* van Herk & Aptroot and *L. expallens* Ach. They both lack porphyrilic acid and do not contain large amounts of atranorin, and *L. expallens* additionally produces xanthones (Tønsberg 1992; Herk & Aptroot 1999). A distinct prothallus also is present in *Phlyctis argena* (Spreng.) Flot., but that species contains norstictic and connorstictic acids (Tønsberg 1992; Kukwa 2005).

When saxicolous, *H. ochroleucum* is often almost entirely sorediate and can be mistaken for some *Lepraria* species. However, *Lepraria* species never have esorediate areoles and never produce atranorin, zeorin, usnic and porphyrilic acids together in one species (Kukwa 2006; Saag *et al.* 2009).

HABITAT REQUIREMENTS. The species is predominantly a saxicolous lichen growing on acidic or slightly calcareous, relatively dry rock. It has been reported rarely from tree bark (Tønsberg 1992; Wolseley *et al.* 2009). In the Polish material, 12 specimens were collected on rock and only one on bark of *Quercus* sp.

DISTRIBUTION IN POLAND. *Haematomma ochroleucum* was thought to be a common and widely distributed species in Poland, especially in southern and northeastern parts of the country (see Fałtynowicz 2003 and literature cited therein). Kukwa (2005) revised part of the material referred to *H. ochroleucum* and concluded that most records were erroneous and belong to other taxa, particularly to *Lecanora thysanophora*. Our revision of the remaining specimens indicates that the species is very rare, known from scattered localities in northeastern Poland and the Sudety Mts (Góry Stołowe Mts) and a few in the Western Carpathians (Gorce Mts, Beskid Sądecki Mts) (Fig. 1). As many records more than 20 years old, it is possible that the species risks extinction.

The varieties of *H. ochroleucum* differ in distribution and frequency in Poland. The records of *H. ochroleucum* var. *porphyrium* are more numerous (five in three ATPOL grid squares) but are only from the Sudety Mts and Carpathians. *H. ochroleucum* var. *ochroleucum* is less common

(three localities) but was also found in the Polish lowlands (Fig. 1). Both varieties were growing together in only one locality, in the Sudety Mts.

GENERAL DISTRIBUTION. *Haematomma ochroleucum* is widespread in Europe, though some records may be erroneous. It has been reported from Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Romania, Russia, Slovenia, Spain, Sweden and Switzerland (Laundon 1970; Tønsberg 1992; Staiger & Kalb 1995; Scholz 2000; Suppan *et al.* 2000; Hafellner & Türk 2001; Llimona & Hladun 2001; Scheidegger & Clerc 2002; Søchting & Alstrup 2002; Aptroot *et al.* 2004; Santesson *et al.* 2004; Randlane *et al.* 2006; Brodo *et al.* 2008; Liška *et al.* 2008; Nimis & Martellos 2008; Wolseley *et al.* 2009; Seaward 2010; Urbanavichus 2010; Diederich *et al.* 2011). The records from Lithuania were erroneous and belong to *Lecanora thysanophora* (Kukwa & Motiejűnaitë 2005). Outside Europe the species was recorded in Argentina (Calvelo & Liberatore 2002), Turkey (Yildiz *et al.* 2002) the United States and Canada (Brodo *et al.* 2008), Madeira (Staiger & Kalb 1995) and the Asiatic part of Russia (Urbanavichus 2010).

SPECIMENS OF *HAEMATOMM OCHROLECUM* VAR. *OCHROLEUCUM* EXAMINED. POLAND. BESKID SĄDECKI MTS: Jaworzyna Krynicka range, Hala Krajnia alp, alt. 1000 m, ATPOL grid square Ge-36, on a rock, 13 June 1991, *L. Śliwa s.n.* (KRA, two specimens); GÓRY STOŁOWE MTS: by road between Karłów and Radków towns, *ca* 5 km from Karłów town, ATPOL grid square Fb-14, rock wall, on sandstone, 18 July 1951 & 24 Sept. 1951, *Z. Tobolewski s.n.* (POZ, two specimens); KOTLINA BIEBRZAŃSKA BASIN: Puszcza Augustowska forest, Kozi Rynek Nature Reserve, ATPOL grid square Bg-40, on *Quercus* sp., 22 Sept. 1986, *S. Cieśliński s.n.* (KRAM L-31824, KTC).

SPECIMENS OF *HAEMATOMM OCHROLECUM* VAR. *PORPHYRIUM* EXAMINED. POLAND. GORCE MTS: Biała Skała rock on NE slope of Lubań Mt., below Hala Tylmanowa alp, rock cliff, ATPOL grid square Ge-32, on a rock, 4 Aug. 1968, *K. Glanc s.n.* (KRAM L-34489 & 26437); E slope of Lubań Mt., alt. 960 m, N-exposed rock, ATPOL grid square Ge-32, on sandstone, 6 Sept. 1973, *K. Glanc s.n.* (KRAM L-26436, UGDA L-17264); Gorczański National Park, Figurki Dolne glade, in Zapalac stream valley, alt. 1140 m, ATPOL grid square Ge-11, on sandstone, 3 Sept. 1996, *P. Czarnota s.n.* (GPN 1461/94); Koniński Baca rock outcrop, below Kudłoń Mt. in Zapalac stream valley, alt. 1120 m, ATPOL grid square Ge-11, on sandstone, 29 Sept. 1995, *P. Czarnota s.n.* (GPN 1723/94); GÓRY STOŁOWE MTS: by road between Karłów and Radków towns, *ca* 5 km from Karłów town, ATPOL grid square Fb-14, rock wall, on sandstone, 17 June 1951, *Z. Tobolewski s.n.* (POZ).

ACKNOWLEDGEMENTS. We are grateful to the Curators of KRA, KRAM, KTC and POZ for the loan of specimens for this study. Two anonymous reviewers are thanked for their comments and suggestions on the manuscript.

REFERENCES

APTROOT A., VAN HERK C. M., SPARRIUS L. B. & SPIER J. L. 2004. Checklist van de Nederlandse Korstmossen en korstmosparasieten. *Buxbaumiella* **69**: 17–55.

BRODO I. M., CULBERSON W. L. & CULBERSON C. F. 2008. *Haematomma* (Lecanoraceae) in North and Central America, including the West Indies. *Bryologist* **111**(3): 363–423.

BRUMMITT R. K. & POWELL C. E. 1992. Authors of plant names. Royal Botanic Garden, Kew.

CALVELO S. & LIBERATORE S. 2002. Catálogo de los líquenes de la Argentina. *Kurtziana* **29**(2): 7–170.

CIEŚLIŃSKI S. & FAŁTYNOWICZ W. (eds) 1993. Atlas of the geographical distribution of lichens in Poland. Part 1. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

DIEDERICH P., ERTZ D., STAPPER N., SÉRUSIAUX E., BROECK VAN DEN D., BOOM VAN DEN P. & RIES C. 2011. The lichens and lichenicolous fungi of Belgium, Luxembourg and northern France. http://www.lichenology.info.

ELIX J. A. 2004. Haematommataceae. In: P. M. MCCARTHY & K. MALLETT (eds), *Flora of Australia. 56A. Lichens* **4**: 4–10. Australian Biological Resources Study, Melbourne.

FAŁTYNOWICZ W. 2003. The lichens, lichenicolous and allied fungi of Poland – an annotated checklist. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.

HAFELLNER J. & TÜRK R. 2001. Die lichenisierten Pilze Österreichs – eine Checkliste der bisher nachgewiesenen Arten mit Verbreitungsangaben. *Stapfia* **76**: 1–167.

HARRIS R. C., BRODO I. M. & TØNSBERG T. 2000. *Lecanora thysanophora*, a common leprose lichen in North America. *Bryologist* **103**(4): 790–793.

HERK C. M. VAN & APTROOT A. 1999. *Lecanora compallens* and *L. sinuosa*, two new overlooked corticolous lichen species from Western Europe. *Lichenologist* **31**(6): 543–553.

KUKWA M. 2005. *Lecanora thysanophora* (Lecanoraceae, lichenized Ascomycota) in Poland. *Fragm. Florist. Geobot. Polonica* **12**(2): 385–391 (in Polish with English summary).

KUKWA M. 2006. The lichen genus *Lepraria* in Poland. *Lichenologist* **38**(4): 293–305.

KUKWA M. & MOTIEJŪNAITĖ J. 2005. Notes on *Haematomma ochroleucum* and *Lecanora thysanophora* lichens in Lithuania. *Botanica Lithuanica* **11**(4): 247–249.

LAUNDON J. R. 1970. Lichens new to the British flora: 4. *Lichenologist* **4**(4): 297–308.

LAUNDON J. R. 1978. *Haematomma* chemotypes form fused thalli. *Lichenologist* **10**(2): 221–225.

LIŠKA J., PALICE Z. & SLAVÍKOVÁ Š. 2008. Checklist and Red List of lichens of the Czech Republic. *Preslia* **80**: 151–182.

LLIMONA X. & HLADUN N. L. 2001. Checklist of the lichens and lichenicolous fungi of the Iberian Peninsula and Balearic Islands. *Bocconea* **14**: 1–581.

LUMBSCH H. T. & HUHNDORF S. M. 2010. Myconet Volume 14. Part One. Outline of Ascomycota–2009. Part Two. Notes on Ascomycete Systematics. Nos. 4751–5113. *Fieldiana: Life and Earth Sciences, N.S.* **1**: 1–64.

NELSEN M. P., LÜCKING R., CHAVES J. L., SIPMAN H. J. M., UMAÑA L. & NAVARRO E. 2006. A first assessment of the Ticolichen biodiversity inventory in Costa Rica: the genus *Haematomma* (Lecanorales: Lecanoraceae). *Lichenologist* **38**(3): 251–262.

NIMIS P. L. & MARTELLOS S. 2008. ITALIC – The Information System on Italian Lichens. Version 4.0. http://dbiodbs.univ.trieste.it.

ORANGE A., JAMES P. W. & WHITE F. J. 2001. Microchemical methods for the identification of lichens. British Lichen Society, London.

RANDLANE T., SAAG A. & SUIJA A. 2006. Lichenized, lichenicolous and allied fungi of Estonia. [Version 24 April 2006]. http://www.ut.ee/lichens/fce.html.

SAAG L., SAAG A. & RANDLANE T. 2009. World survey of the genus *Lepraria* (Stereocaulaceae, lichenized Ascomycota). *Lichenologist* **41**(1): 25–60.

SANTESSON R., MOBERG R., NORDIN A., TØNSBERG T. & VITIKAINEN O. 2004. Lichen-forming and lichenicolous fungi of Fennoscandia. Museum of Evolution, Uppsala University, Uppsala.

SCHEIDEGGER C. & CLERC P. 2002. Rote Liste der gefährdeten Arten der Schweiz: Baum- und erdbewohnende Flechten. Hrsg. Bundesamt für Umwelt, Wald und Landschaft BUWAL, Bern, und Eidgenössische Forschungsanstalt WSL, Birmensdorf, und Conservatoire et Jardin botaniques de la Ville de Genève CJBG. BUWAL-Reihe Vollzug Umwelt.

SCHOLZ P. 2000. Katalog der Flechten und flechtenbewohnenden Pilze Deutschlands. *Schriftenreihe Vegetationsk.* **31**: 1–298.

SEAWARD M. R. D. 2010. Census catalogue of Irish lichens. 3rd edition. National Museum Northern Ireland, Belfast.

SØCHTING U. & ALSTRUP V. 2002. Danish lichen checklist. Botanical Institute, University of Copenhagen, Copenhagen.

STAIGER B. & KALB K. 1995. *Haematomma*-studien. I. Die Flechtengattung *Haematomma*. *Biblioth. Lichenol.* **59**: 1–198.

SUPPAN U., PRÜGGER J. & MAYRHOFER H. 2000. Catalogue of the lichenized and lichenicolous fungi of Slovenia. *Biblioth. Lichenol.* **76**: 1–215.

TEHLER A. & KÄLLERSJÖ M. 2001. *Parmeliopsis ambigua* and *P. hyperopta* (Parmeliaceae): species or chemotypes?. *Lichenologist* **33**(5): 403–408.

THIERS B. 2011. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium [August 2001]. http://sweetgum.nybg.org/ih.

TØNSBERG T. 1992. The sorediate and isidiate, corticolous, crustose lichens in Norway. *Sommerfeltia* **14**: 1–331.

URBANAVICHUS G. 2010. A checklist of the lichen flora of Russia. Nauka, Sankt Petersburg.

WOLSELEY P. A., COPPINS B. J. & BRIGHTMAN F. H. 2009. *Haematomma* A. Massal. (1852). In: C. W. SMITH, A. APTROOT, B. J. COPPINS, A. FLETCHER, O. L. GILBERT, P. W. JAMES & P. A. WOLSELEY (eds), *The lichens of Great Britain and Ireland*, pp. 424–425. British Lichen Society, London.

YILDIZ A., JOHN V. & YURDAKULOL E. 2002. Lichens from the Cangal Mountains (Sinop, Turkey). *Cryptog. Mycol.* **231**: 81–88.

Received 29 December 2011