

## *Lecania cuprea* and *Micarea pycnidiophora* (lichenized Ascomycota) new to Poland

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### Abstract

Two lichenized fungi, *Lecania cuprea* and *Micarea pycnidiophora*, are reported for the first time from Poland. *Lecania cuprea* is also recorded as a new lichen species to the Western Beskidy Mts and the Pieniny Mts and *M. pycnidiophora* is new to the Carpathians. Illustrated descriptions, taxonomic notes, habitat requirements and known distributions for both species are provided.

**Keywords:** lichens; calciphilous lichens; old-growth forest lichens; Polish Carpathians

### Introduction

Recent lichenological exploration by the author in the Polish Western Carpathians has significantly extended our knowledge of lichen diversity in this mountainous area. Many species unrecorded to date in Poland in this region have already been reported (e.g. [1–10]), but data on several others have yet to be published; details of two such species, *Lecania cuprea* and *Micarea pycnidiophora*, collected in 2004 and 2014 are presented here. *M. pycnidiophora*, previously known only in Central Europe from České Švýcarsko (= the Bohemian Switzerland) in western part of the Czech Republic, is also reported for the Carpathians.

### Material and methods

Specimens were determined by standard microscopy and simple spot test reactions. Hand-made apothecial and thallus sections mounted in water were used to measure all anatomical characters. In the case of *Lecania cuprea*, KOH was used to study its apothecial pigmentation.

Specimens have been deposited in the Herbarium of Gorce National Park (GPN). Nomenclature and synonyms of the presented taxa follow MycoBank (<http://www.mycobank.org>). Localities are mapped (Fig. 1) according to the Polish Atpol grid square system [11] modified for lichens by Cieřliński and Fałtynowicz [12]. Brief descriptions of diagnostic characters are based on Polish collections.

### Results and discussion

#### *Lecania cuprea* (A. Massal.) v.d. Boom & Coppins

Nova Hedwigia 54(1–2): 234. 1992.  $\equiv$  *Bilimbia cuprea* A. Massal., Lotos Prague 6: 77. 1856.  $\equiv$  *Bacidia cuprea* (A. Massal.) Lettau, Hedwigia 52: 132. 1912.

#### Diagnostic characters

Thallus pale greyish-green to green, effuse, rimose to irregularly granular-warted, thin (Fig. 2a–d). Apothecia lecideoid, beige to orange-brown, simple or clustered in small groups, 0.3–0.7 mm in diam., sessile, plane to convex, at the beginning distinctly marginate, later often immarginate; thallus margin excluded and proper margin usually darker than the disc especially when moist. Apothecial section colorless except for pinkish-brown, K+ pink to purplish, upper part of excipulum and epithecium (in darker apothecia). Ascospores 12–26  $\times$  2–3.5  $\mu$ m, narrowly fusiform or baciliform, (1–)3(–5)-septate. For further details see descriptions by van den Boom [13] and Fletcher et al. [14].

#### Notes

*Lecania cuprea* markedly differs in phenotypic characters from the type species for the genus, *L. cyrtella* (Ach.) Th. Fr. It has no thalline margin, and its ascospores are narrowly fusiform and 3(–5)-septate while *L. cyrtella* has a distinct amphithecium in young development stage of ascocarps and 1-septate, narrowly ellipsoid ascospores. These characters and a distinct proper margin, which is usually darker colored than the disc (see Fig. 2a), as well as entirely  $\pm$  stout excipular hyphae make this species similar to representatives of the genera *Bacidia* De Not. or *Bilimbia* De Not. However, phylogenetic relationships of *L. cuprea* have not been confirmed to date.

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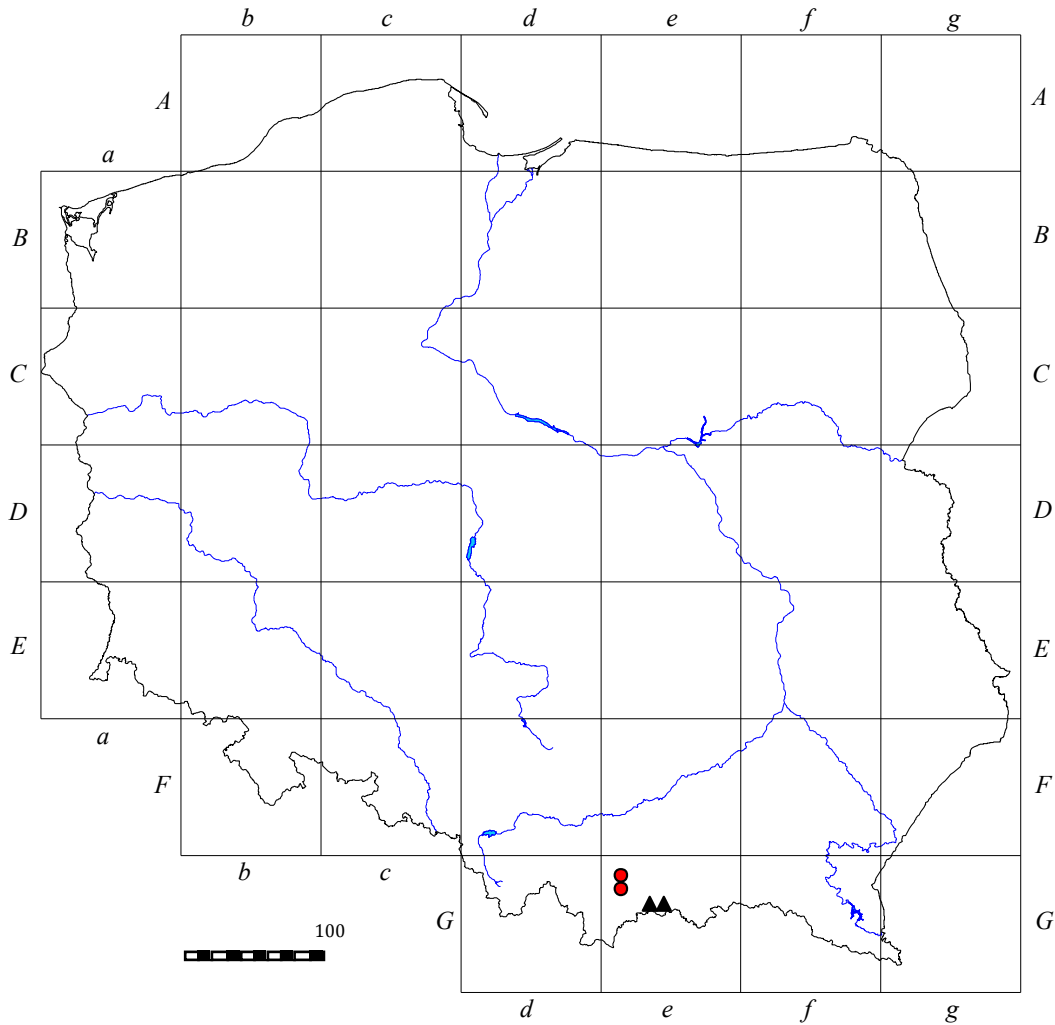


Fig. 1 Localities of *Lecania cuprea* (triangle) and *Micarea pycnidiophora* (circle) in Poland.

According to Fletcher et al. [14], the lumina of excipular fungal cells widen towards the outer edge of the proper margin. However, in Polish collections apices of the hyphae are not distinctly wider but the whole excipulum is made of stout hyphae up to 2–3  $\mu\text{m}$  wide.

An epibryophytic pale coloured form of *Lecania cuprea* (Fig. 2b) morphologically resembles *Bacidina delicata* (Larbal. ex Leight.) V. Wirth & Vězda and “*Bacidia*” *pycnidiata* Czarnota & Coppins, other microlichens inhabiting bryophytes. From these two species *L. cuprea* differs in narrowly fusiform ascospores, the structure of non-granular thallus, and the excipular K+ purplish pigmentation. The ascospores of *Bacidina* species and “*Bacidia*” *pycnidiata* are needle-like, their thallus is granular and they have no internal excipular pigmentation at all.

#### Distribution and habitat requirements

Generally, *Lecania cuprea* is rarely reported throughout Europe from the British Isles up to northern and central parts of European Russia (e.g. [14–23]). However, it is frequently found regionally in areas of calcareous rocks. In central Europe it is scarcely reported, e.g. from the Bavarian Forest [24] and the Czech Republic [25]. Close to Poland it

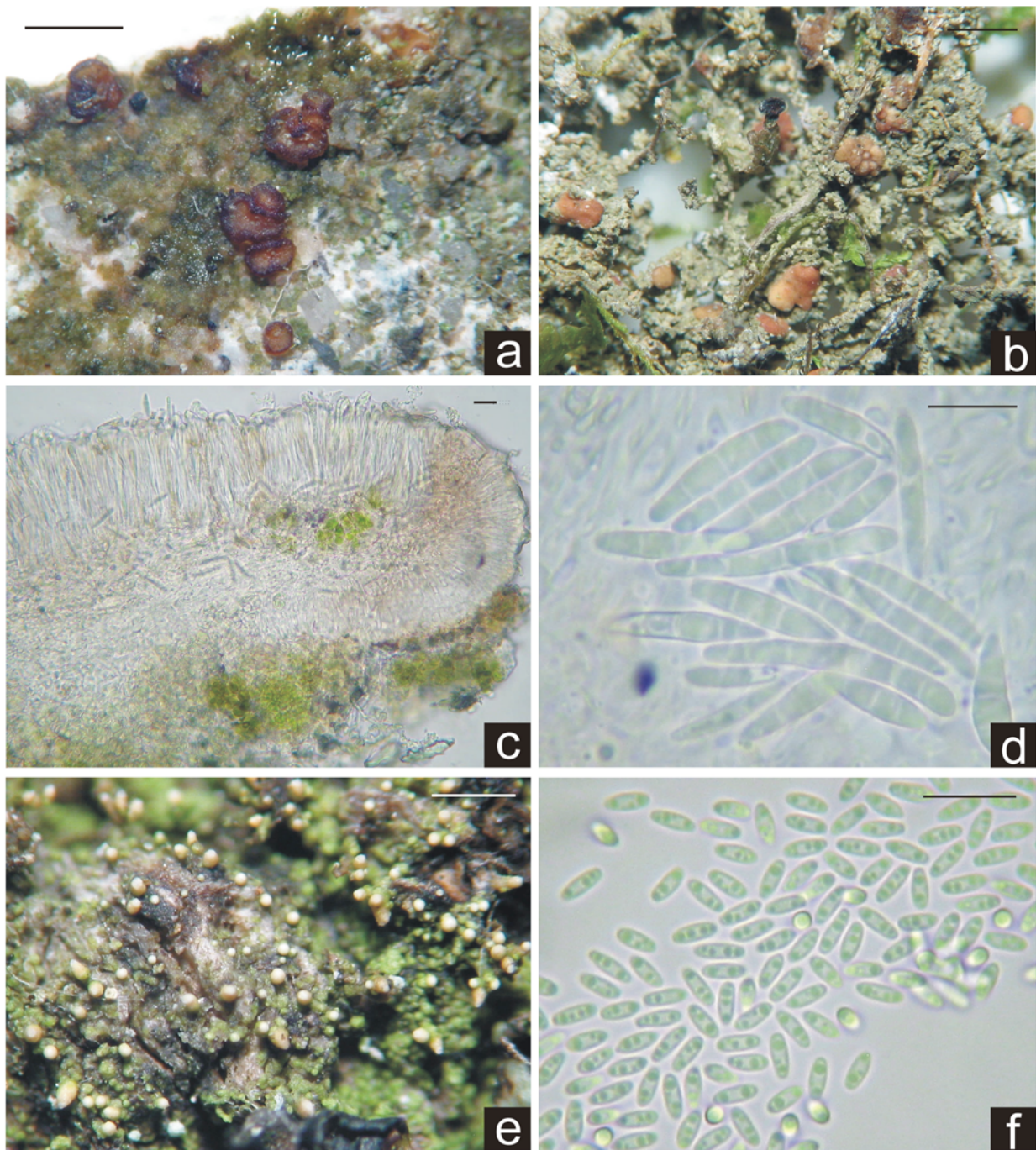
has been recorded in the Slovak Tatra Mts [26] and Ukrainian Carpathians [27], but in both instances many years ago. Localities of *L. cuprea* are also known outside Europe, in the Azores [14], North America [28–30] and southern Siberia [23].

*Lecania cuprea* is a calciphilous species usually growing on under-hangs or vertical rock surfaces in woodlands, sometimes over-growing epilithic mosses, but its most recent Lithuanian collection was on a siliceous boulder influenced by a basic stream water [24].

The Polish records are the first for the Western Beskidy Mts (including Czech and Slovak part of the flysch Carpathians) and the calcareous Pieniny Mts (including Slovak part).

#### Specimens examined

Poland, Carpathians: Atpol **Ge-33**, Pieniny National Park, forest section No. 7, valley of Ociemny stream, 49°25'46" N, 20°25'41" E, alt. ca. 600 m, on limestone and saxicolous bryophytes, 13.05.2004, leg. P. Czarnota 3845 (GPN); Atpol **Ge-34**, Beskid Sądecki Mts, Radziejowa range, close to “Baniska” Nature Reserve, 49°26'48" N, 20°36'39" E, alt. ca. 1060 m, on calcareous sandstone rocks, 4.11.2004, leg. P. Czarnota 4377 (GPN).



**Fig. 2** Characteristics of Polish collections of *Lecania cuprea* (a–d) and *Micarea pycnidiophora* (e–f). *Lecania cuprea*: (a) habit of waterlogged saxicolous specimen (P. Czarnota 4377); (b) habit of epibryophytic specimen overgrowing limestone rock (P. Czarnota 3845), (c) apothecial section in water and (d) ascospores. *Micarea pycnidiophora*: (e) habit and (f) conidia. Scale bars: a, b, e 1 mm; c, d, f 10 µm.

***Micarea pycnidiophora* Coppins & P. James**

Lichenologist 11: 153 (1979).

**Diagnostic characters**

Thallus green, uneven, finely warted, sometimes indistinct (Fig. 2e–f). Photobiont micareoid, 5–7 µm in diam. Pycnidia white to cream-colored, numerous, sessile to stalked, C+ red due to gyrophoric acid. Conidia bacilliform to ellipsoid, 4–6 × 1–1.5 µm. Apothecia not seen in Polish collections. For more details, especially apothecial characters, see Coppins [31].

**Notes**

In its morphology and anatomy, *M. pycnidiophora* most closely resembles *M. stipitata* Coppins & P. James and *M. neostipitata* Coppins & May, by forming stipitate, pale pycnidia and immarginate apothecia. Main differences between these three species are in their chemistry: *M. pycnidiophora* produces gyrophoric acid with C+ red reaction of pycnidia, thallus and apothecia, while *M. stipitata* has no lichen secondary compounds and *M. neostipitata*, to date found only in North America, produces fumarprotocetraric and lobaric acids and contains K+ violet Sedifolia-grey

pigment in its apothecial and pycnidial sections [32]. Differences in dimensions of their conidia are also emphasized, but they are not so distinct in *M. pycnidiophora* and *M. neostipitata*;  $3.8\text{--}6 \times 1\text{--}1.5 \mu\text{m}$  vs.  $3.8\text{--}4.8 \times 1\text{--}1.5 \mu\text{m}$  [32].

#### Distribution and habitat requirements

*Micarea pycnidiophora* is a corticolous species very rarely reported from both sides of the northern Atlantic. It has been recorded in Britain, France and the Canary Islands [31], Belgium and Luxembourg [16,33], NW Spain [34] and south-eastern USA [32]. Recently it has also been discovered in the Czech Republic [35] and the Leningrad region in Russia [36], as well as in the Himalayas [37]. The records presented here are new to Poland and the Carpathians. Except for Russia, where *M. pycnidiophora* was collected for the first time on conifers (*Picea*), it is found on old deciduous trees (*Fagus*, *Acer*, *Alnus*, *Quercus*) or shrubs (e.g. *Ilex*, *Rhododendron*) [34,38].

The British population of *M. pycnidiophora* is said to be the richest in the World [39], but concentrated occurrences of this species on the European continent have also been found in the Ardennes Forest, in Belgium and Luxembourg [16]. These occurrences and the North American range of

*M. pycnidiophora* could suggest that this species belongs to a subatlantic element in the lichen biota. In the light of this, both known Central European populations of this lichen in the Czech Republic and Poland (and indeed the Himalayas) appear to be isolated. Palice et al. [35] suggest that this species may represent a relic of formerly much richer epiphytic lichen biota as it was found in association with other lichen peculiarities. In the Polish Carpathians, *M. pycnidiophora* was associated with several old-growth forest lichens such as *Loxospora elatina*, *Ochrolechia androgyna*, *Thelotrema lepadinum* and *Usnea* spp., growing within one of the best preserved spruce–fir–beech forest in the Western Carpathians.

#### Specimens examined

Poland, Carpathians, Gorce range, Gorce National Park: Atpol **Ge-11**, valley of the Gorcowy stream, forest section No. 80,  $49^{\circ}34'58.84''$  N,  $20^{\circ}11'55.9''$  E, alt. 950 m, on bark of *Fagus sylvatica*, 30.04.2014, leg. P. Czarnota 7597 (GPN); Atpol **Ge-21**, valley of the Kamienica stream, forest section No. 95,  $49^{\circ}33'41.7''$  N,  $20^{\circ}12'03.8''$  E, alt. 860 m, on bark of old *Fagus sylvatica*, 27.01.2014, leg. P. Czarnota 7557 (GPN).

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## Competing interests

No competing interests have been declared.

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