



# Three lichen species of *Micarea* (Pilocarpaceae) new to Belarus

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## Abstract

*Micarea elachista*, *M. micrococca* and *M. misella* are reported for the first time from Belarus. Their phenotypic characters, distribution and ecological preferences are given.

**Keywords:** Ascomycota; lichenized fungi; crustose lichens; biodiversity; pine forest; Gomel region

## Introduction

The genus *Micarea* was described by Fries [1] to accommodate a crustose species with a green granular thallus and convex immarginate apothecia named *M. prasina* Fr. Currently the genus comprises ca. 100 species [2,3] and is considered to be polyphyletic combining a large number of phenotypically variable species, as well as a heterogeneity of infrageneric characters [4,5]. Further studies will probably provide stronger support for the delimitation of at least some distinct phylogenetic lineages obtained by Andersen and Ekman [5] and based on mtSSU sequences, will legitimate descriptions of several new genera. Some steps towards a new nomenclature of these species have recently started, with Harris [6] transferring *Micarea erratica* (Körb.) Hertel, Rambold & Pietschm. into the new genus *Leimonis* R.C. Harris, and Ekman and Svensson [7] introducing the genus *Brianaria* S. Ekman & M. Svensson for species of the former *Micarea sylvicola* group.

Nearly 60 species of *Micarea* s.lat. are currently known from Europe (e.g. [2,8–13]), of which only 10 have been reported from Belarus, namely *M. cinerea* (Schaer.) Hedl.,

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*M. denigrata* (Fr.) Hedl., *M. erratica*, *M. lynceola* (Th. Fr.) Palice, *M. melaena* (Nyl.) Hedl., *M. nitschkeana* (Lahm ex Rabenh.) Harm., *M. peliocarpa* (Anzi) Coppins & R. Sant., *M. prasina*, *M. sylvicola* (Flot.) Vězda & V. Wirth, *M. tuberculata* (Sommerf.) R.A. Anderson [14–16]. However, *M. lynceola* was reported at the beginning of the 20th century [17] and never confirmed. Furthermore, since the specimens of *M. prasina* were neither tested by TLC nor critically re-examined, this species should be widely treated in the country as *M. prasina* s.lat. Hence, our knowledge of *Micarea* in Belarus is still far from complete.

During a recent fieldwork in the Gomel region in southeastern Belarus, three *Micarea* species new to the country were discovered and details of these records are presented here.

## Material and methods

The lichen biota of 14 study plots established in 2011–2013 in different types of Scots pine forests were investigated; these were selected to represent: *Cladonia*-type, *Calluna vulgaris*-type, *Vaccinium vitis-idaea*-type, *Pleurozium schreberi*-type, *Pteridium aquilinum*-type, *Vaccinium myrtilus*-type, *Oxalis acetosella*-type, *Polytrichum commune*-type and *Ledum palustre*-type stands. The size of each plot was limited by forest sub-blocks and occupied 2–12 ha. In each plot, 10 trees were randomly selected and all lichens were registered within them. Secondary chemistry of the sorediate crustose lichens was analyzed by thin-layer chromatography (TLC) in solvent C according to the methods of Orange et al. [18].

Voucher specimens are deposited in the Belarusian Polesye Scientific Herbarium of Francisk Skorina Gomel State University (GSU) and the collection of *Micarea elachista* in the Herbarium of the Gorce National Park (GPN).

## Results and discussion

### ***Micarea elachista* (Körb.) Coppins & R. Sant., Bull. Br. Mus. nat. Hist., Bot. 11(2): 131 (1983)**

Thallus composed of corticate small warts, pale greenish-grey with numerous immersed or emergent, widely opened pycnidia which are a slightly darker than the thallus. Mesoconidia ellipsoid,  $3.5\text{--}4.5 \times 1.2\text{--}1.5 \mu\text{m}$ . Apothecia very rare, globose, brown, immarginate with Elachista-brown pigment (K+ dissolving and fading into solution) in upper part of the hymenium. Ascospores 1-septate, oblong-fusiform, slightly curved,  $10\text{--}15 \times 2\text{--}3 \mu\text{m}$ . No substances detected by TLC.

HABITAT. *Micarea elachista* was found in old-growth *Vaccinium myrtilus*-type pine forest on the bark of two *Pinus sylvestris* L. trees. The sample plot contained some boggy areas with *Ledum palustre* and *Sphagnum* spp. and was untypical of “*Pinetum myrtillosum*” in terms of the degree of humidity. *Micarea elachista* occurred together with *Chaenotheca* spp., *Chaenothecopsis pusilla* (Ach.) A.F.W. Schmidt, *Cladonia* spp., *Hypocnomyce scalaris* (Ach. ex Lilj.) M. Choisy (often supporting *Clypeococcum hypocnomycis* D. Hawksw.), *Hypogymnia physodes* (L.) Nyl., *Lecanora compallens* van Herk & Aptroot, *Lecidea nylanderii* (Anzi) Th. Fr., *Lepraria* spp., *Micarea denigrata* (Fr.) Hedl., *M. melaena* (Nyl.) Hedl. and *M. micrococca* (Körb.) Gams ex Coppins.

Coppins [19] showed *M. elachista* to be a predominantly lignicolous species in Europe colonizing decorticate trunks or large stumps of old trees, but Czarnota [10] has also reported it frequently on the bark of *Pinus sylvestris* in NE Poland.

GENERAL DISTRIBUTION. The lichen is distributed in boreal and temperate Europe, occurring in countries neighboring Belarus – Lithuania [20], Poland [10] and adjacent regions of Russia [21], as well as in North America [2] and Asia [21,22].

SPECIMEN EXAMINED. Belarus, Gomel region, Gomel district: Pribor forest, 1.5 km SW of Pribor village, 52°22'N, 30°45'E, 9 Oct. 2012, leg. A. Tsurykau (GPN/7650).

***Micarea micrococca* (Körb.) Gams ex Coppins, Checklist of Lichens of Great Britain and Ireland: 86 (2002)**

Thallus composed of bright to dull green granules (goniocysts) with numerous immersed, small, white pycnidia producing microconidia  $5-7 \times 0.8-1 \mu\text{m}$ . Apothecia usually present, whitish, translucent when wet, immarginate, up to 0.3 mm in diam. Apothecial section colorless. Excipulum strongly reduced. Ascospores 1-septate, ovoid to oblong,  $8-12 \times 3-4 \mu\text{m}$ . Substance detected by TLC: methoxymicareic acid.

NOTE. According to phylogenetic analysis, *M. micrococca* is a polyphyletic taxon. For almost 20 years prior to 2002, this group of taxa was included in *M. prasina* [23] despite their different chemistry [19]. However, the chemistry appeared to be a sufficiently diagnostic character in further studies and today the presence of methoxymicareic acid is the main feature distinguishing the *M. micrococca* complex from other members of the *M. prasina* group. Visual identification of *M. micrococca* s.str. is possible when it is fertile, since its apothecia are white or cream while other representatives of the *M. micrococca* complex have at least some greyish apothecia due to a trace of Sedifolia-grey pigment which turns  $K_{\pm}$  violet and  $C_{\pm}$  violet. The darkest morphs containing methoxymicareic acid may also belong to the recently separated *M. byssacea* (Th. Fr.) Czarnota, Guzow-Krzemińska & Coppins which probably also occurs in Belarus since it is found in neighboring regions [11] (and Czarnota, unpublished data).

In Belarus, both *M. micrococca* s.str. and *M. micrococca* s.lat. represent two distinct lineages of the complex [11], but the description, habitat and list of collections below are only given for *M. micrococca* s.str.

HABITAT. The species was found exclusively on bark of *P. sylvestris* in three pine forest types, all of which were well-lit with a sufficient amount of moisture, ranging from the wet *Polytrichum*-type to the medium humid *Pleurozium schreberi*-type.

GENERAL DISTRIBUTION. It is difficult to evaluate the true world distribution of *M. micrococca* s.str. as representatives of the *M. micrococca* complex were critically revised only recently [11], but it has been reported so far from the Czech Republic, Estonia, Finland, Germany, Lithuania, Poland, Slovenia and Switzerland [11,24]. However, this corticolous lichen-forming fungus inhabiting acidic bark appears to be frequent in Europe especially within large more or less managed coniferous woodlands.

SPECIMENS EXAMINED. Belarus, Gomel region, Gomel district: Kalinino forest, 1.5 km E of Tereshkovichi village, 52°15'N, 30°59'E, 3 Aug. 2011, leg. A. Tsurykau (GSU/1867); same forest, 1.3 km NE of Tereshkovichi village, 52°15'N, 30°58'E, 2 Oct. 2012, leg. A. Tsurykau (GSU/1868); Pribor forest, 0.5 km S of Pribor village, 52°23'N, 30°47'E, 10 Oct. 2012, leg. A. Tsurykau (GSU/1869); same forest, 1.5 km SW of Pribor village, 52°22'N, 30°45'E, 10 Oct. 2012, leg. A. Tsurykau (GSU/1870).

***Micarea misella* (Nyl.) Hedl., Bih. K. svenska Vetensk Akad. Handl. 18(3): 78 (1892)**

Thallus inconspicuous, partially on pine bark as a thin algal film, and partially on the thallus of *M. denigrata*. Pycnidia numerous, black, stalked, containing Sedifolia-grey pigment, K+ violet, C+ violet. Mesoconidia simple, cylindrical, 5.0–5.5 × 1.4–1.6(–1.9). Apothecia absent in Belarusian material. No substances detected by TLC.

HABITAT. The species was collected in young *Vaccinium vitis-idaea*-type pine forest growing on the edges of bark plates in bark fissures of Scots pine. Kotlov [25] noted that *Micarea misella* is exclusively lignicolous in Russia, and Coppins [26] noted that it is almost always lignicolous and rarely grows on the bark of old trees.

GENERAL DISTRIBUTION. *Micarea misella* is reported from Europe and North America, as well as from South America [2] and the Asian part of Russia [21]. Amongst neighboring countries, it occurs in Lithuania [20], Ukraine [27] and in adjacent regions of Russia [21], and in Poland [10] it is one of the commonest representatives of the genus.

SPECIMEN EXAMINED. Belarus, Gomel region, Gomel district: Staro-Djatlovichskoje forest, 2 km SW of Staryje Djatlovichi village, 52°13'N, 30°49'E, 1 Aug. 2013, leg. A. Tsurykau (GSU/1763).

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## Authors' contributions

The following declarations about authors' contributions to the research have been made: field research and draft of the manuscript: AT; species identification and critical revising: PC; final writing of the manuscript: AT, PC.

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