

NEW RECORDS OF LICHENS AND LICHENICOLOUS FUNGI FROM THE POLISH TATRA MOUNTAINS

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Abstract. Of the seven interesting lichens and lichenicolous fungi reported, *Rhizocarpon cinereovirens* (Müll. Arg.) Vain., *Rinodina calcarea* (Arnold) Arnold and *Muellerella ventosicola* (Mudd) D. Hawksw. are new to the whole Tatra range, and *Catillaria contristans* (Nyl.) Zahlbr., *Rinodina laevigata*, *Endococcus propinquus* (Körb.) D. Hawksw and *E. rugulosus* Nyl. are new to the Polish Tatras. Brief taxonomic, distributional and ecological notes are provided for each of the taxa.

Key words: lichenized fungi, lichenicolous fungi, subalpine belt, Tatra Mts, Western Carpathians, Poland

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INTRODUCTION

The Tatra Mountains are the highest mountain range in Central Europe, with an alpine climate and fully developed vegetation belts. Their lichen biota is the richest of the Carpathian range, with 1119 lichens and 60 lichenicolous fungi recorded to date (Lisická 2005). More than 900 lichens and 30 lichenicolous fungi have been reported from the Polish Tatra Mts (Olech 2004), but our knowledge of them is still incomplete.

During the course of lichenological research in the dwarf pine belt in the Polish High Tatras, new species of lichens and lichenicolous fungi, previously recorded from the Sudety Mts, Western Beskidy Mts and northern Poland, were noted. This paper provides information on their taxonomy, occurrence and ecology: the lichens *Rhizocarpon cinereovirens* and *Rinodina calcarea* are new to the whole Tatra range, *Catillaria contristans* is new to the Polish Tatras, and *Rinodina laevigata* is reported for the first time from the Polish Carpathians; the lichenicolous fungi *Endococcus propinquus* and *E. rugulosus* are new to the Polish Tatras, and *Muellerella ventosicola* is reported for the first time from the whole Tatra range.

Catillaria contristans, *Rhizocarpon cinereovirens* and *Rinodina laevigata* are very rare in Po-

land, but they are not classified as endangered on the ‘Red List’ (Cieśliński *et al.* 2006). In Poland, these species were previously found only in the Sudety Mts (Körber 1865; Eitner 1895; Kossowska 2006) and the South Baltic lakeland (Lettau 1912) in the 19th and early 20th centuries.

MATERIAL AND METHODS

All species of lichens and lichenicolous fungi were recorded during field work on the lichens of the dwarf pine belt (subalpine belt) in the Polish High Tatras during 2002–2005. The collections were identified by routine lichenological methods (water or 10% KOH mounted hand-sectioned specimens examined by light microscopy, spot reactions with 10% KOH [K], sodium hypochlorite [C], p-phenylenediamine in ethanol [P] and nitric acid [N]).

For each species, notes on taxonomy, occurrence and distribution are presented. All characteristics of the species are based on personal observations. The maps (Figs 1 & 2) present the distribution of new species in the Polish High Tatras. The distribution of the species is plotted on ATPOL grid squares (Zajac 1978; Cieśliński & Fałtynowicz 1993). Nomenclature follows Santesson *et al.* (2004). The herbarium material is housed in the Herbarium of the Institute of Botany of the Jagiellonian University (KRA). Lichenicolous fungi are marked with an asterisk (*).

LIST OF SPECIES

Catillaria contristans (Nyl.) Zahlbr. Fig. 1

Thallus warty-granular, whitish to dark grey or grey-brown. Apothecia 0.2–0.6 mm diam., disc convex, black and glossy. Epithecium dark green, K-, N+ red to purple. Hymenium 35–45 µm high, olivaceous to aeruginose above, pale green to colorless or pale brown below. Hypothecium colorless to pale brown. Ascospores 9.0–16.5 × 2.5–4.5 µm, 1-septate, oblong to ovoid-oblong, constricted at septum.

On bryophytes or plant debris on rock or on the ground, in higher mountains, in acid habitats.

The thallus and apothecia are similar to *Micarea lignaria*, *Toninia squalescens* and *Protomicarea limosa*, but can be distinguished microscopically since *Micarea lignaria* has 3- to 7-septate ascospores, the epithecium of *Toninia squalescens* has no reactions with N, and *Protomicarea limosa* does not have septate ascospores.

Until now this species was not recorded from the Polish Tatra Mts. There are two records from the Velicka Dolina valley and Velicke Pleso lake in the Slovakian part (Lisická 2005). In Poland it was reported from the Sudety Mts as *Toninia squalescens* (Nyl.) Th. Fr. (Körber 1865).

SPECIMENS EXAMINED. POLAND. HIGH TATRA MTS: Ge 50 – Dolina Gašenicowa valley, Dwoisty Staw lake, S shore of lake, alt. 1650 m, 49°13'56"N/20°00'19"E, on plant debris on granite, 27 August 2005, *Węgrzyn 2541* (KRA); Dolina Pańszczyca valley, Czerwony Staw lake, S shore of lake, alt. 1650 m, 49°14'21"N/20°02'11"E, on soil, 10 June 2004, *Węgrzyn 1851* (KRA); Dolina Pięciu Stawów Polskich valley, Buczynowa Dolinka, above yellow trail to Przełęcz Krzyżne pass, alt. 1700 m, 49°13'13"N/20°02'37"E, on mosses, 30 July 2005, *Węgrzyn 2470* (KRA); Ge 60 – Wyżni Zagon, above yellow trail to Przełęcz Krzyżne pass, alt. 1750 m, 49°12'53"N/20°02'20"E, on mosses, 30 July 2005, *Węgrzyn 2459* (KRA); Niedźwiedź, slope of Miedziane Mt., alt. 1810 m, 49°12'26"N/20°02'54"E, on plant debris on granite, 27 June 2004, *Węgrzyn 2096* (KRA); on soil, 27 June 2004, *Węgrzyn 2090* (KRA); Dolina Rybiego Potoku valley, Mokra Wanta, slope of Żabia Grań Mt., alt. 1695 m, 49°11'33"N/20°04'43"E, on plant debris on granite, 19 June 2004, *Węgrzyn 1954* (KRA); Dolina za Mnichem valley, Staw Staszica lake,

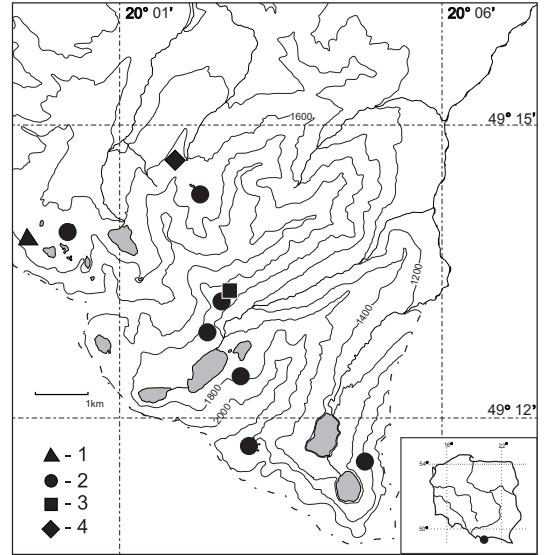


Fig. 1. Distribution of lichen species in the Polish High Tatra Mts. 1 – *Rinodina calcarea* (Arnold) Arnold, 2 – *Catillaria contristans* (Nyl.) Zahlbr., 3 – *Rinodina laevigata* (Ach.) Malmé, 4 – *Rhizocarpon cinereovirens* (Müll. Arg.) Vain.

alt. 1780 m, 49°11'50"N/20°03'13"E, on plant debris on granite, 25 July 2004, *Węgrzyn 2130* (KRA); on soil, 25 July 2004, *Węgrzyn 2147* (KRA).

****Endococcus propinquus* (Körb.) D. Hawksw.**

Fig. 2

HOST. *Rhizocarpon reductum* Th. Fr. (thallus), *Lecidea lithophila* (Ach.) Ach. (thallus), *Porpidia macrocarpa* (DC.) Hertel & A. J. Schwab in Hertel (thallus).

Perithecia (100–)150–200(–300) µm diam., half immersed to superficial, black. Asci 35–50 × 10–15 µm. Ascospores 8.5–12.5 × 5.0–7.5 µm, smooth-walled, with relatively thick septum, medium to dark brown.

This species parasitizes thalli of the genera *Porpidia*, *Aspicilia* and *Lecidea*, and the species *Rhizocarpon obscuratum* and *Verrucaria nigrescens*, in lowland and mountains.

This is a new species for the Polish Tatra Mts. It is mentioned in the Polish checklists of the Tatra Mts (Olech 2004), Polish Carpathians (Bielczyk 2003) and Poland (Fałtynowicz 2003), but incorrectly, based on a record (on *Ophioparma ventosa*) from Żabi Staw in the Slovakian part of the Tatras

(Hazslinsky 1859; Rehman 1879; Boberski 1886). However, it is known from scattered localities in the Polish Carpathians (Starmachowa & Kiszka 1965; Kukwa & Czarnota 2006).

Worldwide this species has been recorded from the Czech Republic (Kocourková 2000), Slovakia (Lisicka & Lackovičova 1999), Estonia (Suija & Jüriado 2003; Suija 2005), Karelia Keretina, Russia (Zhurbenko & Himelbrant 2002), Belgium, Luxembourg and northern France (Diederich *et al.* 2007), Britain and Ireland (Hawksworth 2003) and North America (Cole & Hawksworth 2001).

SPECIMENS EXAMINED. POLAND. HIGH TATRA MTS: Ge 50 – Dolina Gašenicowa valley, ruins of Edmund Sieczka's shelter, alt. 1710 m, 49°13'56"N/19°59'29"E, 24 October 2004, *Węgrzyn 2228, 2237* (KRA); Dolina Waksmundzka valley, alt. 1380 m, 49°14'48"N/20°04'07"E, 12 September 2004, *Węgrzyn 2205* (KRA); Ge 60 – Dolina Rybiego Potoku valley, Mokra Wanta, alt. 1700 m, 49°11'33"N/20°04'43"E, 19 June 2004, *Węgrzyn 1964* (KRA).

****Endococcus rugulosus* Nyl.**

Fig. 2

HOST. *Aspicilia* sp. (thallus).

Perithecia 100–200 µm diam., half immersed in the thallus. Asci to 40(–60) µm in length. Ascospores 13–16 × 5.5–6.0 µm, 1-septate, thick-walled, dull brown.

Triebel (1989) determined as *E. rugulosus* all specimens that grow on *Amygdalaria*, *Aspicilia*, *Ionaspis*, *Lecanora*, *Placopsis*, *Rhizocarpon* and *Verrucaria* and which have brown, thick and smooth-walled ascospores 13–16 × 6.0–7.5; however, some authors accept only specimens growing on *Verrucaria* as this species (Sérusiaux *et al.* 1999).

The species is new to the Polish Tatra Mts; in the Slovakian part it is common and widely distributed (Alstrup 1996) on *Aspicilia* in the subalpine belt. In Poland it was previously known only from the central region (Kukwa & Czarnota 2006). It is widespread worldwide (Kocourková 2000); recently it has been reported from Belgium, Luxembourg and northern France (Diederich *et al.* 2007), Spain (Perez-Ortega & Alvarez-Lafuente 2006), Slovakia (Lisicka & Lackovičova 1999), Estonia

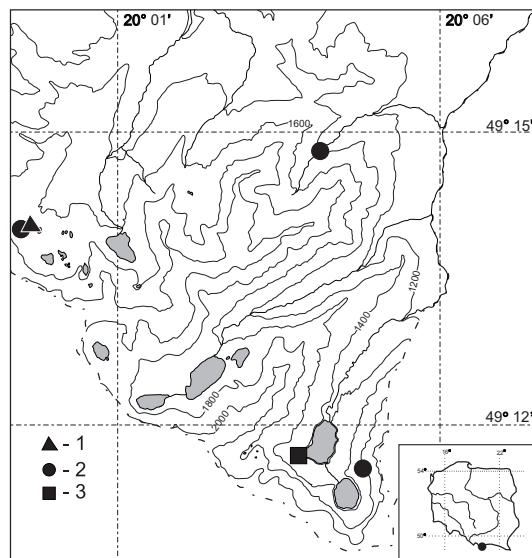


Fig. 2. Distribution of lichenicolous fungi in the Polish High Tatra Mts. 1 – *Endococcus rugulosus* Nyl. s.l., 2 – *Endococcus propinquus* (Körb.) D. Hawksw., 3 – *Muellerella ventosicola* (Mudd) D. Hawksw.

(Suija & Jüriado 2003; Suija 2005) and Spitsbergen (Alstrup & Olech 1993).

SPECIMENS EXAMINED. POLAND. HIGH TATRA MTS: Ge 50 – Dolina Gašenicowa valley, ruins of Edmund Sieczka's shelter, alt. 1710 m, 49°13'56"N/19°59'29"E, 24 October 2004, *Węgrzyn 2245* (KRA); Ge 60 – Dolina Pięciu Stawów Polskich valley, Gładkie Kopki, alt. 1760 m, 49°12'24"N/20°01'19"E, 25 July 2004, *Węgrzyn 2183* (KRA).

****Muellerella ventosicola* (Mudd) D. Hawksw.**

Fig. 2

HOST. *Rhizocarpon* sp. (thallus).

Perithecia 200–250(–300) µm diam., on the margin of areoles of thallus, half immersed, black. Asci to 60(–70) µm in length with 32 ascospores. Ascospores (6.0–)6.6–7.5 × 4.2–4.8(–5.0) µm, ovoid, wide, with thick wall 0.6–0.7 µm, 1-septate, dark brown.

Muellerella ventosicola was described by Hawksworth (2003) as a new combination of *M. pygmaea* var. *ventosicola* (Mudd) Triebel (Triebel 1989). This taxon differs from members of the genus *Endococcus* in having multispored

asci (Hawksworth 1983). *Muellerella ventosicola* is similar to other species of this genus occurring in Poland, although they usually do not appear on the thalli of the genus *Rhizocarpon*. *M. lichenicola* grows mainly on lichens in basic or highly calcareous locations and *M. pygmaea* is common on siliceous rocks, mainly on the genera *Lecidea* and *Porpidia* (Hawksworth 1979).

This species is new to the entire Tatra Mts. The record from Poland by Kocourková (2000) as *Tichothecium gemmiferum* is based on Stein (1879). However, Fałtynowicz (2003) referred the records of *T. gemmiferum* to *Endococcus propinquus* (Körb.) D. Hawksw. These reports are uncertain since the authors did not examine Stein's original material; the latter is in need of reexamination. *Muellerella ventosicola* has been recently reported from the Karkonosze Mts (Kukwa 2005).

It is known from Norway, Sweden, Britain, Germany, Switzerland, Austria, Spain, Italy, Greece, the U.S.A. (Triebel 1989), Greenland (Alstrup *et al.* 2000), Lithuania (Motiejūnaitė *et al.* 2005), Belgium, Luxembourg and northern France (Sérusiaux *et al.* 1999; Diederich *et al.* 2007).

SPECIMEN EXAMINED. POLAND. HIGH TATRA MTS: Ge 60 – Dolina Rybiego Potoku valley, W shore of Morские Oko lake, Dwoista Siklawa stream, alt. 1420 m, 49°11'41"N/20°03'55"E, 30 May 2004, *Węgrzyn 1629* (KRA).

***Rhizocarpon cinereovirens* (Müll. Arg.) Vain.**
Fig. 1

Thallus cracked to bullate, white to pale grey with K+ intensive red; prothallus present at margins, black. Apothecia 0.8(–1.0) diam., flat with clear exciple proper, black. Epithymenium green-black with K+ greenish-blue and N+ red-brown. Hymenium to 60(–90) μm high, hyaline, I+ blue. Paraphyses 2.0–2.5 μm thick, richly branched, with olivaceous, very slightly swollen apex. Ascospores 15.0–16.6 \times 9.0–9.3 μm , 1-septate, hyaline. Hypothecium dark to brown. Excipulum constructed of radiating hyphae, hyaline to pale brown within, and green-black cortex.

Rhizocarpon cinereovirens occurs on exposed siliceous rocks. It is new to the whole Tatra Mts.

In Poland it was recorded only from the Eastern Karkonosze Mts in the 19th century, as *Catocarpus seductus* Nyl. (Eitner 1895) and also as *Catocarpus seductus* var. *turgidus* (Eitner 1911; Kossowska 2006). Worldwide it is recorded from Britain, Finland, Sweden, Switzerland, Canada and the U.S.A. (Fryday 2002).

SPECIMEN EXAMINED. POLAND. HIGH TATRA MTS: Ge 50 – N slope of Żółta Turnia Mt., below Zadni Uplaz, alt. 1650 m, 49°14'37"N/20°01'36"E, on block of sandstone, 10 June 2004, *Węgrzyn 1813* (KRA).

***Rinodina calcarea* (Arnold) Arnold** Fig. 1

Thallus strongly developed, cracked areolate. Areoles often irregularly warty, grey to grey-brown. Apothecia 1 mm diam., sunken or raised, usually sparse with permanent thalloid margin; disc black to grey-black, flat. Ascospores 18–24 \times 9–15 μm , 1-septate, *Tunicata*-type.

Rinodina calcarea grows on exposed calcareous rocks. It is new to the whole Tatra Mts range. In the Polish Carpathians it has been noted from the Beskid Sądecki Mts and the Pieniny Mts (Bielczyk 2003).

SPECIMEN EXAMINED. POLAND. HIGH TATRA MTS: Ge 50 – Dolina Gąsienicowa valley, above Litworowy Staw lake, alt. 1760 m, 49°13'52"N/19°59'34"E, on limestone, 29 June 2003, *Węgrzyn 1314* (KRA).

***Rinodina laevigata* (Ach.) Malme** Fig. 1

Thallus thin, areolate, white to grey, with grey or brown thin prothallus. Apothecia 1.0–1.5 diam., disk flat to convex, brown to black, margin brown to grey. Epithymenium bright yellow-brown, K-, N-. Paraphyses simple, with slightly swollen apex and yellow-brown cap. Hymenium 60–80 μm high, hyaline, J+ blue. Hypothecium hyaline to yellowish, I+ blue. Excipulum in the margin hyaline. Ascospores 19.5–20.0(–21.0) \times (7.0)–8.0–9.3 μm , 1-septate, apical walls convex inside, *Physcia*-type, olive-brown.

Rinodina laevigata grows on the bark of *Populus*, *Alnus*, *Sorbus aucuparia*, *Fraxinus* and *Juniperus*, rarely on the wood. It is new to the Polish Tatra Mts. In the Slovak Tatra Mts it occurs in Las Łomnicki forest on the bark of *Salix* sp. (Lisická

2005). From Poland it has been noted from only one location in Pomerania (Lettau 1912).

SPECIMEN EXAMINED. POLAND. HIGH TATRA MTS: Ge 50 – Dolina Pięciu Stawów Polskich valley, Buczynowa Dolinka dale, above yellow trail to Przełęcz Krzyżne pass, alt. 1700 m, 49°13'13"N/20°02'37"N, on sere wood of *Picea abies*, 30 July 2004, *Węgrzyn 2490* (KRA).

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