

# Noteworthy lichenicolous fungi and lichens from Russia

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**Abstract:** Notes are presented on seven species of lichenicolous, non-lichenized and lichenized fungi found in the Asian part of Russia. *Endococcus pseudocarpus* is reported for the first time for Northern Asia as well as for the Irkutsk Region of Russia. *Plectocarpon hypogymniae* and *P. nephromeum* are reported new to the Irkutsk Region, *Taeniolella diploschistis* new to the Republic of Sakha (Yakutia), *Steinia geophana* new to Chukotka Autonomous Area, and *Epigloea soleiformis* new to the north of the Krasnoyarsk Territory of Russia. *Hypogymnia physodes* is reported as a new host species for *Plectocarpon hypogymniae*.

**Keywords:** biodiversity, biogeography, lichen parasites, Siberia

## INTRODUCTION

This publication continues a series of notes by the author on findings of lichenicolous fungi and lichens from the Holarctic that are of interest in terms of their taxonomy, geography, or ecology (see also: Zhurbenko, 2009a, b; 2010; 2020; 2021). This paper is based on material collected by the author and by I. I. Makarova and A. N. Titov in arctic and subarctic biomes of Central and North-Eastern Siberia and the Russian Far East, as well as in boreal biomes of Southern Siberia. All collection sites are located in the Asian part of Russia and administratively belong to its Chukotka Autonomous Area, Irkutsk Region, Krasnoyarsk Territory or Sakha-Yakutiya Republic.

## MATERIAL AND METHODS

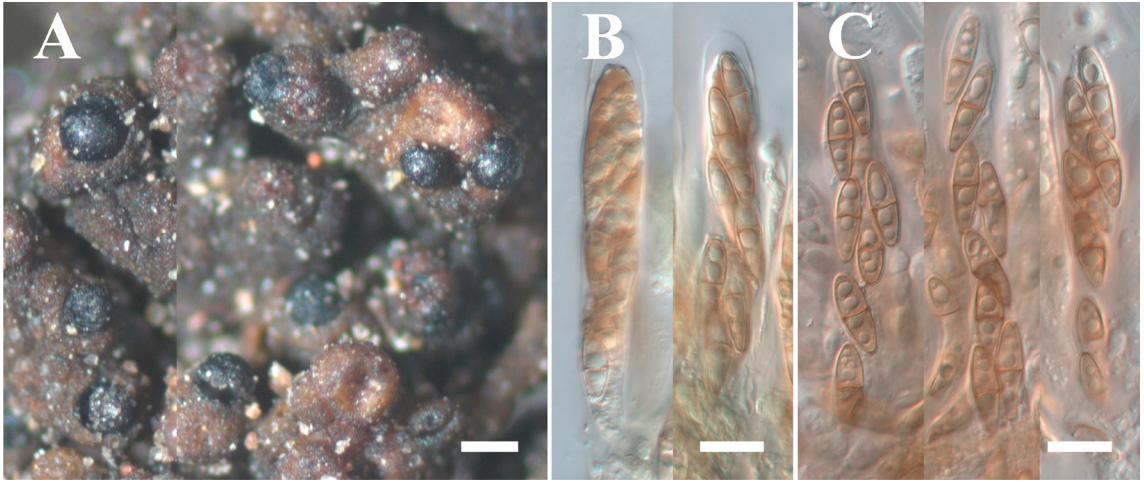
The material used for this study is deposited in the mycological herbarium of the V. L. Komarov Botanical Institute in St. Petersburg, Russia (LE). Microscopic examinations and photography were carried out using a Zeiss Stemi 2000-CS dissecting microscope, fitted with an AxioCam MRC 5 digital camera, and a Zeiss Axio Imager A1 compound microscope equipped with Nomarski differential interference contrast optics, fitted with an AxioCam 506 digital camera. Microscopic characters were studied using razor blade cut sections mounted in water, 10% potassium hydroxide (K), concentrated nitric acid (N) or Lugol's iodine, directly (I) or after a K pre-treatment (K/I). Measurements were taken from water mounts and rounded to the nearest 0.5  $\mu\text{m}$ . The length, width, and length/width ratio (l/w) of ascospores are given (when  $n > 10$ )

as (min–) ( $\bar{x}$ –SD)–( $\bar{x}$ +SD)(–max), where ‘min’ and ‘max’ are the extreme values observed, ‘ $\bar{x}$ ’ the arithmetic mean, and ‘SD’ the corresponding standard deviation. The examined specimens of lichenicolous fungi were collected by the author or found by him in the lichen collections of I. I. Makarova and A. N. Titov, which were made available to him by the collectors.

## THE SPECIES

ENDOCOCCUS PSEUDOCARPUS Nyl.

Perithecia black, glossy, with a rather smooth surface, subglobose, ostiolate, 160–250  $\mu\text{m}$  diam., protruding in the ostiolar area, up to  $\frac{1}{2}$  exposed above the host surface (Fig. 1). Asci subcylindrical to very narrowly clavate, 66–76  $\times$  9–11  $\mu\text{m}$ , 8-spored. Ascospores brownish orange, narrowly ellipsoid or oblanceolate, 1-septate, sometimes with slightly narrower and longer lower cell, upper cell length/lower cell length = 0.8–1 ( $n = 20$ ), with rather acute ends, (11–)13–16.5(–18.5)  $\times$  4–4.5(–5)  $\mu\text{m}$ , l/w = (2.6–)2.9–3.9(–4.4) ( $n = 24$ ), not constricted at the septum, usually with 1–2 large guttules in each cell, irregularly 1–2-seriate in the ascus. According to the literature, the size of the ascospores of this species varies considerably: 9–18  $\times$  5–7  $\mu\text{m}$  (protologue; Nylander, 1873), 12–17  $\times$  3–6  $\mu\text{m}$  (Heiðmarsson et al., 2012), 15.5–20  $\times$  5.5–6.5 (Kocourková–Horáková, 1998), 8.5–15.5  $\times$  3.5–5  $\mu\text{m}$  (Zhurbenko, 2013), 14–15  $\times$  3.5–4.5  $\mu\text{m}$  (Etayo, 2010), 10–15  $\times$  3.5–5 (Brackel, 2014). It is possible that this variation, as well as the rather wide range of hosts, is due to the presence of cryptic taxa.



**Fig. 1.** *Endococcus pseudocarpus* (Zhurbenko 05200). A – habitus of ascomata on the thallus of *Enchylium polycarpon*; B – asci, in I; C – ascospores, in water (scale bars: A = 200  $\mu$ m; B, C = 10  $\mu$ m).

This species was described from the French Pyrenees as growing on host lichen probably representing *Peltula euploca* (as “*Heppia guepinii* var. *nigrolimbata*”; Hawksworth & Diederich, 1988). It was subsequently found in various countries in Europe from Sweden to Spain (Brackel, 2014), in Western Asia (Turkey and the Russian Caucasus; Halıcı et al., 2007; Urbanavichus & Urbanavichene, 2014), Canary Islands (van den Boom, 2013), and Northern Africa (Morocco; Maire & Werner, 1938). It is confined to cyanolichen genera *Callome*, *Enchylium*, *Lathagrium*, *Peltula*, *Placynthium* and *Scytinium*. The species is newly documented here in Northern Asia. In Russia, it was known from the Murmansk Region, Komi Republic, Republic of Adygeya, and Stavropol Territory (Zhurbenko, 2013; Urbanavichus & Urbanavichene, 2014; Urbanavichus, 2016; Urbanavichene & Urbanavichus, 2018), and is reported here for the first time from the Irkutsk Region.

Specimen examined. RUSSIA. Irkutsk Region. Baikal Siberia, 4 km SW of Elantsy, 52°46'N, 106°21'E, elev. 590 m, calcareous rocks on steppe slope among taiga forest, on *Enchylium polycarpon* (thallus), 8 June 2005, M. P. Zhurbenko 05200 (LE 310204)

#### EPIGLOEA SOLEIFORMIS Döbbeler

This fungus is associated with algal films growing on various substrates, including lichens (Chambers & David, 2009), and thus is often noted

in lists of lichens and lichenicolous fungi. It is characterized by gelatinous green- or grey-black, glossy perithecia, prosoplectenchymatous, thin exciple, simple, apically not enlarged paraphyses, non-fissitunicate, 8-spored asci with I+ and K/I+ blue wall, and hyaline, sole-shaped, 1-septate ascospores without appendages (Döbbeler, 1984). This inconspicuous and therefore probably much overlooked species (Sérusiaux et al., 1999) is known from scattered finds in Europe, Asia, North America, South America, New Zealand, and the Subantarctic Islands (Döbbeler, 1984; Fryday, 2000; Buck & Harris, 2002; Motiejūnaitė et al., 2019; Zhurbenko & Ohmura, 2019). It has not been reported from the Arctic (Kristinsson et al., 2010), and is listed here for the second time for the Subarctic where it was previously known from Iceland (Berger, 2000). This fungus was known in Russia from the Altai Territory, south of the Krasnoyarsk Territory (Eastern Sayan Mountains), and Trans-Baikal Territory (Zhurbenko, 2010; Zhurbenko et al., 2016; Zhurbenko & Pino-Bodas, 2017). It is reported here for the first time from the north of the Krasnoyarsk Territory/Central Siberia.

Specimen examined. RUSSIA. Krasnoyarsk Territory. Putorana Plateau, Kapchuk Lake, 69°28'N, 91°02'E, elev. 200 m, boulder field in sparse *Larix* taiga forest, on algal films in close association with *Psora globifera* growing on soil, 11 August 1982, A. N. Titov (LE 310186).

**MICAREA INTRUSA** (Th. Fr.) Coppins & H. Kilius  
 This lichenicolous lichen is characterized by a poorly developed thallus, black apothecia with a disappearing margin, blue- or black-green, N+ red epihymenium, colourless to pale brownish-yellow hypothecium, an exciple formed by radially diverging hyphae, with a dark marginal zone, and hyaline, ellipsoid to oblong, 0(–4)-septate ascospores (Andreev, 2003). It mostly grows in close association with *Rhizocarpon geographicum* and *Lecidea lapicida* (Hafellner, 2004), but also with many other epilithic lichens, such as *Amygdalaria panaeola*, *Aspicilia cinerea*, *Calvitimela aglaea*, *C. melaleuca*, *Euopsis* cf. *granatina*, *Lecidea atrobrunnea*, *Rhizocarpon lecanorinum*, *Schaereria fuscocinerea* and *Varicellaria lactea* (Rambold & Triebel, 1992; Aptroot et al., 1997; Berger, 2000; Hafellner, 2004; Santesson et al., 2004). The species is widespread in the Holarctic (Hinds et al., 2002; Hafellner, 2004; Zhurbenko, 2009a) and was also reported from Papua New Guinea (Aptroot et al., 1997). In Russia, it has been known from scattered localities in the Chukotka Autonomous Area, Komi Republic, Leningrad Region, Murmansk Region, Primorye Territory, Republic of Altai, Republic of Karelia, and Sakhalin Region (Andreev, 2003; Urbanavichus & Urbanavichene, 2009; Zhurbenko, 2009a; Skirina, 2010; Czernyadjeva et al., 2020; Konoreva et al., 2020).

Specimen examined. RUSSIA. Chukotka Autonomous Area. The surroundings of Puoten Bay, 65°50'N, 170°32'W, dwarf shrub tundra, on *Amygdalaria panaeola* (thallus), 23 July 1972, I. I. Makarova (LE 207404).

**PLECTOCARPON HYPOGYMNAE** Zhurb. & Diederich (Fig. 2)

This fungus is characterized by superficial, brownish-black, convex, stromatic ascomata with labyrinthiform or lirellate ornamented surface, containing Atra-brown pigment in stromata, with numerous locules 100–170 µm diam., I+ red, K/I+ blue hymenium, branched and anastomosed paraphyses, 8-spored, *Opegrapha*-type asci with K/I+ blue apical ring, hyaline, fusiform to narrowly skittle-shaped, 3-septate ascospores, (12–)13–15.5(–17) × (3–)3.5–4(–4.5) µm, and its confinement to species of *Hypogymnia* (Zhurbenko et al., 2008). To date, this species is known only from Asia, where it was reported from Russia: Republic of Sakha (Yakutia), Republic of Tuva (holotype), and Trans-Baikal

Territory (Zhurbenko et al., 2008; Zhurbenko & Vershinina, 2014; Zhurbenko & Yakovchenko, 2014), and Mongolia (Zhurbenko et al., 2019), growing on *Hypogymnia bitteri* and *H. tubulosa*. It is reported here as new to the Irkutsk Region of Russia. *Hypogymnia physodes* is a new host species.

Specimen examined. RUSSIA. Irkutsk Region. Baikal Siberia, 2 km SE of Anchuk, Bol'shaya Bystraya River, 51°44'N, 103°29'E, elev. 700 m, *Larix-Picea-Pinus* taiga forest, on *Hypogymnia physodes* (thallus), 9 June 2005, M. P. Zhurbenko 0558 (LE 310183).



**Fig. 2.** *Plectocarpon hypogymniae* (Zhurbenko 0558). Habitus of ascomata on the thallus of *Hypogymnia physodes* (scale bar = 500 µm).

**PLECTOCARPON NEPHROMEUM** (Norman) R. Sant.

This species differs from other members of the genus by its mainly 2-septate ascospores, dark greenish, not granular, K+ green intensifying, N+ orange brown stromatic pigment, the holarctic distribution, and by its confinement to *Nephroma* species, mostly to *N. bellum* (Ertz et al., 2005; Spribille et al., 2020). It was previously known from scattered localities in Europe (Norway, Komi Republic and Murmansk Region of Russia, Sweden), Asia (Kamchatka Territory of Russia), and North America (Canada, U.S.A.) (Goward et al., 1996; Diederich, 2003; Ertz et al., 2005; Urbanavichus et al., 2007; Zhurbenko, 2009b; Spribille et al., 2010; Zhurbenko et al., 2012). It is reported here as new to the Irkutsk Region of Russia.

Specimen examined. RUSSIA. Irkutsk Region. Baikal Siberia, the foothills of the Khamar-Daban Range, Snezhnaya River valley, 51°23'N, 104°39'E, elev. 550 m, *Pinus-Abies* taiga forest,

on *Nephroma bellum* (thallus), 17 June 2005, M. P. Zhurbenko 05304 (LE 310187).

#### STEINIA GEOPHANA (Nyl.) Stein

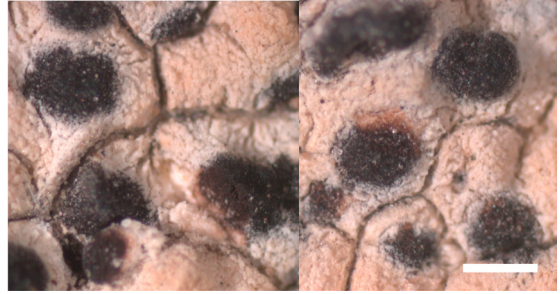
This subcosmopolitan lichen is characterized by an inconspicuous thallus resembling algal soil crusts, small, brown-black convex apothecia with rudimentary true exciple, I+ blue hymenial gel, unitunicate, 16-spored asci with a K/I+ blue tholus, and hyaline, subglobose, thick-walled ascospores (Fletcher et al., 2009). Poelt and Vězda (1990) classified it as a short living lichen, often settled on unstable substrates, like disturbed soil or aged lichen thalli, especially those of the *Peltigera* species. When it grows on lichens, it often looks like a lichenicolous fungus because of its inapparent thallus and is therefore included in this paper along with the truly lichenicolous species. The species has been documented in many regions of Russia (Urbanavichus, 2010), but has not been reported from the Chukotka Autonomous Area so far.

Specimen examined. RUSSIA. Chukotka Autonomous Area. Gil'mylinei hot springs, 15 km SE of Ioni Lake, 65°48'N, 173°15'W, dwarf shrub-forb-lichen tundra, on the thallus of *Gyalecta* sp. and plant remnants on soil, 19 July 1977, I. I. Makarova (LE 310188).

TAENIOLELLA DIPLOSCHISTIS Heuchert, U. Braun, Diederich & Zhurb. (Fig. 3)

This hyphomycete is distinct amongst the other lichenicolous *Taeniolella* species by the formation of stromatic aggregations of swollen hyphal cells up to 80 µm wide, rugose, irregularly verrucose, rhagadiose to distinctly rimulose-areolate conidia up to 45 µm long, with up to 7 transverse septa, and its confinement to species of *Diploschistes* (Heuchert et al., 2019). This recently described species was known from France, Luxembourg (holotype), and the Krasnoyarsk Territory of Russia (Heuchert et al., 2019). It is newly reported here for the Republic of Sakha (Yakutia) of Russia.

Specimen examined. RUSSIA. Sakha-Yakutiya Republic. Eastern Siberia, Lena River delta, Stolb (Ebe-Khaya) Island, 72°24'N, 126°40'E, elev. 50 m, rocks among tundra vegetation, on *Diploschistes scruposus* (thallus), 12 August 1998, M. P. Zhurbenko 98417 (LE 310182).



**Fig. 3.** *Taeniolella diploschistis* (Zhurbenko 98417). Colonies on the thallus of *Diploschistes scruposus* (scale bar = 500 µm).

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