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**CANDELARIELLA ANTENNARIA NEW TO RUSSIA, KAZAKHSTAN, NEPAL AND INDIA**

**CANDELARIELLA ANTENNARIA – НОВЫЙ ВИД ДЛЯ РОССИИ, КАЗАХСТАНА, НЕПАЛА И ИНДИИ**

**Summary:** *Candelariella antennaria* is reported from Russia, Kazakhstan, Nepal and India for the first time. Its distribution, ecology and differences from similar species are discussed.

**Key words:** Asia, Candelariaceae, floristic finding.

**Аннотация:** *Candelariella antennaria* впервые приводится для России, Казахстана, Непала и Индии. Рассмотрены вопросы распространения, экологии и отличия от близких таксонов.

**Ключевые слова:** Азия, Candelariaceae, флористическая находка.

Among *Candelariella* Müll. Arg. there is a small number of species which are characterized by having a non-yellow thallus. The species are 8-spored with lecanorine apothecia, growing on calcareous rocks (*C. plumbea* Poelt & Vezda, *C. oleaginescens* Rondon) or bark and wood (*C. viae-lactae* G. Thor & V. Wirth, *C. antennaria* Räsänen and *C. boikoi* Khodos. & S.Y. Kondr.). *Candelariella subdeflexa* (Nyl.) Lettau, also with grey thallus and 8-spored asci, differs from the others by its biatorine apothecia. They are predominately distributed in the temperate zone in open woodlands, forests and forest-steppes and prefer dry, exposed conditions.

Of the 22 *Candelariella* species known from Russia (Urbanavichus, 2010) there is only one species from this group – *C. boikoi*, reported from the southern part of European Russia (Khodosovtsev et al., 2004). During an investigation of material in the herbaria of H, S and UPS and fresh material from Dagestan, we have found a corticolous *Candelariella* with a grey thallus growing on *Populus*, *Larix*, *Acer*, *Betula*, *Cercis*, *Cotoneaster* as well as shrubs which we have identified as *Candelariella antennaria*. The specimens from Russia, Kazakhstan and Nepal were found under the name *C. aurella* in the herbaria. In

the Helsinki herbarium we have also found a specimen from India which was annotated as *C. deflexa* (Nyl.) Zahlbr., by Hakulinen, that belongs to *C. antennaria* (see discussion). *Candelariella antennaria* was described by Räsänen (1939) and is considered as a distinct taxon (Hakulinen, 1954; Westberg, 2007b). The species is known from Crete (Vondrák et al., 2008), Austria and Switzerland (Westberg & Clerc, 2012), South and North America (Westberg, 2007b), Afghanistan (Westberg & Sohrabi, 2012), Iran (Moniri et al., 2011; Seaward et al., 2008; Westberg & Sohrabi, 2012) and Australia (Filson, 1992). In literature it has also been reported from Tadzhikistan (Kudratov & Mayrhofer, 2002) and Uzbekistan (Hakulinen, 1958) as *Candelariella deflexa*. This species is reported here as new to Russia, Kazakhstan, Nepal and India. *Candelariella antennaria* is not included in the latest checklists of these countries (Andreeva, 1983; Awasthi, 1991; Poelt & Reddi, 1969; Singh & Sinha, 2010; Urbanavichus, 2010) and we have not found any reports of this species in later studies. In addition we confirm the presence of the species in Tadzhikistan.

The description below is based on material from Russia and Kazakhstan only. It agrees well with

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the description in Westberg (2007b). Measurements were made on the samples: 314a (S F70279); 314b (H); 444j (S F70281); (DAG 0485); (H L78107). Most characters are only described by their range of minimum – maximum value observed. For apothecium diameter we also provide the mean value (underlined) and spore measurements are presented as (minimum value observed–)range including 85% of the variation and mean value in the center and underlined(–maximum value observed).

*Candelariella antennaria* Räsänen, 1939, *Anales Soc. Ci. Argent.*: 128; 137.

Type: Argentina, Mendoza Depto. Las Heras, pr. Quebrada de la Meina la Atala, 2 July 1937, A. Ruiz Leal (H – holotype!).

Thallus crustose, indistinct or visible as a more or less entirely amorphous or somewhat granular crust, sometimes poorly developed and occurring only at the base of the apothecia, without vegetative diaspores. Granules 0.1–0.2 mm in diameter, first rounded, adnate and moderately convex, then developing into areoles 0.2–0.5 mm wide which are irregular in outline, adpressed and flattened, scattered or coalescing and then organized in an uneven crust. The surface is pale to medium greyish to greyish brown, smooth, matt to ± shiny, epruinose. Prothallus absent. Thallus in section with a thin, 5–15 µm thick, indistinct cortex, 1–2(–3) cell-layers thick, composed of ± isodiametric, thin-walled cells 3–7 µm wide, covered by an epinecral layer, formed by dead, elongated, compressed hyphae, 5–18 µm thick; Algae chlorococcoid, 5–20 µm in diameter.

Apothecia common, lecanorine, epruinose, widely attached to somewhat constricted at base, crowded to scattered, 0.2–0.4–0.75 mm wide (N=55). Disc rounded to irregular in outline or somewhat angular, plane to slightly convex, ochre-yellow to yellow. Proper margin not visible from the outside. Thalline margin yellow (paler than the disc), often greyish in the outer side, distinct, persistent, smooth, normally at the same level as the disc or lower when disc becomes convex, entire to slightly incised, 0.025–0.05 mm thick.

Apothecium anatomy. Thalline margin with a thin, 4–18 µm thick, indistinct cortex, 1–2(–3) cell-layers thick, composed of thin-walled, ±isodiametric cells, 3–8 µm wide, covered by a 4–10 µm thick layer of yellowish-brown to reddish-brown, irregular, angular crystals. Proper margin prosoplenchymatous, consisting of branched, radiating hyphae, fan-shaped and 27–40 µm wide in the uppermost part, with rectangular cells 5–15 × 2–3 µm, which

become shorter and rounded towards the surface and are finally similar to the cells of the cortex, below the hypothecium the cells are rounder or somewhat elongated, thin-walled and do not form a stipe penetrating downward through the algal layer. Epithymenium reddish-yellow to yellow-brown of irregular, angular crystals, 5–12 µm tall; hymenium hyaline, with oil drops, 50–70 µm tall; hypothecium hyaline, with oil drops, 20–50 µm tall; asci 8–spored, clavate to broadly clavate, 40–53 × 13–18 µm, *Candelariella*- or *Lecanora*-type; spores hyaline, simple, rarely 1-septate, straight to slightly curved, oblong to narrowly ellipsoid (11–)12–15–17(–20) × 4.0–5.0–6.0(–7.0) µm (N=60); paraphyses septate, simple or branched near the tips or in the midhymenium, with anastomoses in the midhymenium, 1.5–2.0 µm wide in midhymenium, with cylindrical or clavate tips, 3–6 µm wide.

Pycnidia: not seen.

Chemical spot reactions: Thallus K–, disc K+ weakly orange; Thallus KC–, disc KC–; Thallus C–, disc C–; Hymenium I+ blue; Medulla, excipulum, hypothecium I–.

Specimens examined: [RUSSIA]. Guv. Jenisejsk: Krasnojarsk, 3 Verst [3.2 km] above Krasnojarsk. 56°N. On *Cotoneaster*. 13 VI 1876. M. Brenner. 314a (S F70279); 314b (H); 314c (UPS); [RUSSIA]. Guv. Jenisejsk: Krasnojarsk. 56°N. On *Betula*. 10 VI 1876. M. Brenner. 376d (S F70284); [RUSSIA]. Guv. Jenisejsk: Verknje Imbolsk. 63°15'N. On *Betula*. 25 IX 1876. M. Brenner. 444j (S F70281); RUSSIA. Sibiria orientalis, ad fl. Lena inf., prope ostia flum Aldan. On *Larix dahurica*. 17 VII 1901. A.K. Cajander. 15a (H); RUSSIA. Sakha Republic (Yakutia): Khangalasskiy Dist. (Ulus), 5 km S of Tabaga, above steep river bank Tabaginskiy utës on W bank of Lena River (opposite to Khaptagay), on SE slope of Myachey-Sise Range. Field number 56/02. 61°46'N, 129°39'E. Alt. 200 m. *Pinus sylvestris*-*Populus tremula*-*Larix* woodland with wide steppe patches. On *Populus tremula*. 30 VI 2002. Teuvo Ahti. (H 61446); RUSSIA. Eastern Caucasus: Daghestan, Tlyaratinskiy district, vicinity of Tlyarata village. 42°06'52.7"N, 46°20'60.8"E. Alt. 1740 m. Mixed *Pinus*-*Betula* forest. On *Betula* bark. 19 IV 2011. Ismailov. (DAG 0485); KAZAKHSTAN. Taldy-Kurgan: c. 25 km E of Tekeli, just above the mining community. Field number K4/03. 44°47'N, 78°59'E. Alt. 1600 m. Narrow valley. On *Populus*. 09 VI 1993. Roland Moberg & Anders Nordin. (H L78253), (UPS 139516); KAZAKHSTAN. Vost. Kazakhstanskaja oblast: just N of Uspenka. Field number K23/03. 48°37'N, 86°00'E. Alt. 1300 m.

Meadow at the small river Belessek. On *Populus*. 13 VI 1993. Roland Moberg & Anders Nordin. (H L78107), (UPS 139370); NEPAL. Palma district: 66 km NW Pokhara, 3 km NE Jomson. Field number 1507. 28°45'N, 83°45'E. Alt. 2745 m. On shrub near base in desert. 05 XII 1979. G. Thor. (S F70287); INDIA. Jammi & Kashmir: Achhabal. Alt. 7000 ft. [2.1 km]. On *Populus*. 1949. D.D. Awasthi (H 546); TADZHIKISTAN. N slope of Sanglokh Range, NE of Shar-Shar Pass. Alt. c. 1000 m. *Cercis griffithii* woodland in valley. On *Cercis*. 15 VII 1975. Teuvo Ahti. (H 30092b); TADZHIKISTAN. Varzob valley: c. 5 km NW of Kondara, Kvak field station at end of Kondara Gorge. c. 38°50'N, 68°50'E. Alt. 1850 m. Mesic *Acer turkestanicum* forest. On *Acer*. 13 VII 1975. Teuvo Ahti. (H 30331b).

### Discussion

The key characters of the species are a greyish, indistinct or amorphous crustose thallus, yellow, lecanorine apothecia, surrounded by a persistent thalline margin that is paler than disc, and 8-spored asci (Fig. 1). It differs from *C. aurella* in its pale to medium grey to greyish-brown thallus, which could be seen at least at the base of the apothecia even if it is poorly developed, whereas *C. aurella* normally has a yellow, granular to areolate thallus. Anatomically it differs from *C. aurella* by the proper exciple, which is composed of non-gelatinized, thin-walled hyphae with  $\pm$ isodiametric cells and that does not form a stipe through the algal layer into the thallus below (Fig. 2). In contrast, the proper exciple of *C. aurella* consists of strongly gelatinized, thick-walled hyphae with elongated to rectangular cells, forming a distinct stipe penetrating downward



Fig. 1. *Candelariella antennaria*, habitus. Russia: Guv. Jenisejsk. Brenner 444j (S F70281).

through the algal layer (Westberg, 2007b). There are two other corticolous grey-thalline species, *C. subdeflexa*, which has biatorine apothecia, i. e., lacking a thalline margin in all stages of apothecium development and has a distinct, usually well-developed squamulose thallus with conidiophores on the lower side of the squamules (Westberg, 2007a), and *C. viaelacteae* characterized by its thallus, composed of crowded, round granules (Thor & Wirth, 1990).

According to the protologue (Räsänen, 1939) and the monograph by Hakulinen (1954), *C. antennaria* has no thallus. However, in our studies of the holotype (at H) we observed a thin, poorly-developed but visible grey thallus. *Candelariella antennaria* shows a wide variation in thallus morphology and could include a complex of species (Westberg & Sohrabi, 2012). Hakulinen (1954) also recognized another 8-spored, grey-thalline species, *Candelariella deflexa* only known from the type growing on glass. Hakulinen (1958) later used the name for corticolous specimens from North America and Uzbekistan and the name has since mostly been used in that sense. The name *C. deflexa* was considered a synonym to *C. aurella* by Westberg (2007b) who proposed that *C. antennaria* should be the correct name for the corticolous taxon studied here.

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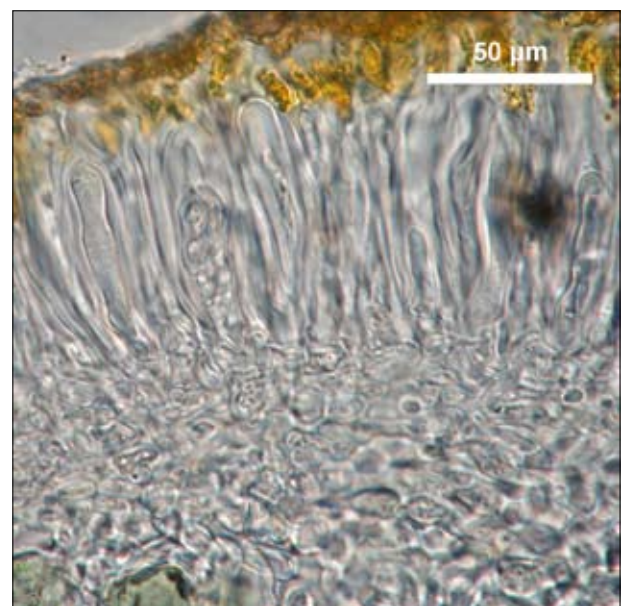


Fig. 2. *Candelariella antennaria*, section of an apothecium showing the base of the proper exciple. Russia: Guv. Jenisejsk. Brenner 444j (S F70281).

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