

Candelariella boikoi, a new lichen species from Eurasia

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Candelariella boikoi sp. nov. is characterized by golden-yellow apothecia and an uneven tuberculate, grey-green thallus without a cortical layer. The new species grows on small twigs of vascular plants in the southernmost steppes and semi-deserts of Eurasia. It is compared with a number of other sparse-pigmented *Candelariella* spp. and a key is given.

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Smaller twigs, plant debris and small patches of soil are the main habitats of lichen-forming fungi in the semi-desert steppes of Ukraine. The special ecological conditions caused by desertification processes are the base for the adaptations of lichens to these extreme conditions. A few lichen species are known only from these localities, namely *Lecania zinaidae* (Oxner 1931) and *Caloplaca scythica* (Kondratyuk et al. 1998), described from small twigs of *Halocnemum strobilaceum* (Chenopodiaceae). An interesting species of *Candelariella* with an uneven tuberculate grey-green thallus and golden-yellow apothecia was found on small twigs on several localities in southern Ukraine. Detailed anatomical and morphological studies of numerous specimens within the group of 8-spored species of *Candelariella* with a grey thallus revealed that the species was undescribed. Furthermore, additional specimens of the new species was found in recent collections from Russia and Kazakhstan.

After the monograph of *Candelariella* by Hakulinen (1954) there have been many contributions to the knowledge of this group of lichens. Examples of new taxa described from the southern Holarctic and the Himalayan region are, *C. grimmiae*, *C. himalayana*, *C. nepalensis*, *C. soresdiosa* (Poelt & Reddi 1969); *C. senior* (Poelt 1958); *C. rodax*, *C. plumbea* (Poelt & Vězda 1976); *C. minuta* (Galun & Reichert 1971); *C. oleaginescens* (Rondon, 1966); *C. faginea* (Nimis et al. 1989) and *C. viae-lacteeae* (Thor & Wirth 1990) from Southern Europe and the Mediterranean. *C. fugiensis*, *C. ossicola* and *C. isidiata* were described from Chile by Dodge (1966). However, the status of some taxa described by Dodge from the Antarctic region have been questioned (Castello & Nimis 1994).

Material and methods

The results presented here are based mainly on herbarium material kept in BM, KHER, KW, LE, LD, and TSB. Anatomical structures of

lichen thalli and apothecia were studied with a Zeiss Axioscope light microscope.

Candelariella boikoi Khodosovtsev & S.Kondratyuk, *sp. nov.*

A simili *C. deflexa* differt: thallus crustaceus, areolatus, griseo-viridis; areolae tuberculosae; stratum corticale non evolutum; apothecia lecanorina, flava, aggregata; sporae octonae; spermatia ellipsoidea.

Type: Ukraine, Kherson oblast, Genichesk district, northern part of Chongar peninsula, on *Halocnemum strobilaceum*, 6 May 1996, Mishustin (KW holotype; KW, KHER, LD, isotypes).

Thallus pale grey to greyish-green, (0.3–)0.5–0.8(–1.5) mm thick, with uneven tuberculate surface, forming extensive spots around branches of twigs; areoles constrained, tuberculate, overlapping, convex, 0.2–0.4 mm diam.; *prothallus* dull white or invisible; *cortex* not developed, algae found in a plecten-

chymatous tissue to 50–90 μm thick cells 2.7–3.7 rarely up to 7.5–10.5 μm across, surrounded/overlayered by a 2–4 μm thick hyaline layer; algal cells 7–14 μm .

Apothecia numerous, sessile, (0.3–)0.5–1.2(–1.5) mm; disc dull yellowish, concave to flat; thalline margin golden yellowish, crenulated; cortex paraplectenchymatous containing 3–4 layers of cells 2.5–3.0 \times 4.0–5.0 μm , in mature apothecia mainly composed of algal plectenchyma; subhymenium and hymenium hyaline; paraphyses unbranched, 1.6–1.8 μm thick, apical cells 2.5–3.0 μm ; asci with 8 spores. *Spores* (10.5–)14.5–17.5(–19) \times (3.8–)4.2–5.0(–6.0) μm . (Figure 1b). *Pycnidia* immersed, indistinct, sometimes with a yellowish ostiole, conidia ellipsoid, 3.0–3.5 \times 1.5–1.8 μm (Figure 1c).

The new species is named in honor of prof. Dr. M. F. Boiko, Kherson State University, Ukraine, who has made important contributions to the knowledge of the steppe zone of Ukraine.

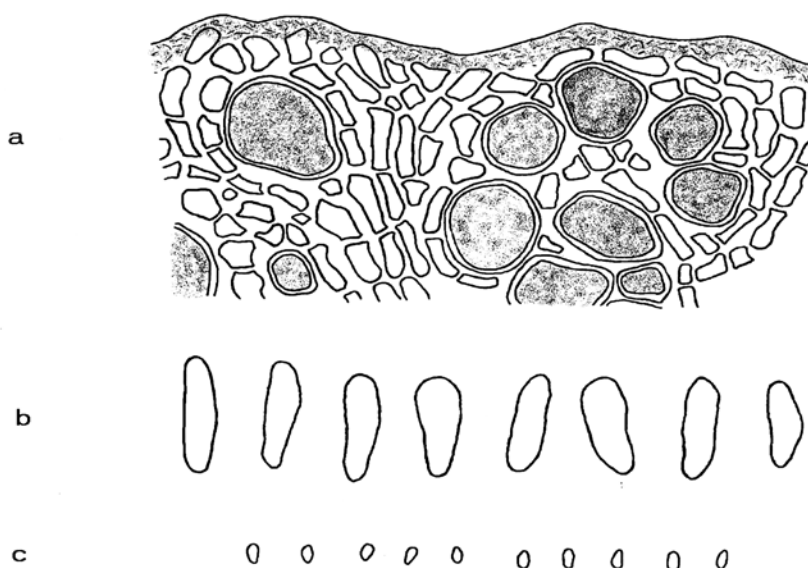


Figure 1. *Candelariella boikoi*: a. algal plectenchymatous cortex, b. spores, c. conidia. Bar = 10 μm .

Table 1. Character states of *Candelariella boikoi* and allied 8-spored species.

	<i>C. boikoi</i>	<i>C. oleaginescens</i>	<i>C. viae-lacteae</i>	<i>C. subdeflexa</i>	<i>C. plumbea</i>	<i>C. aurella</i>	<i>C. deflexa</i>
Color of thallus	pale-grey to greenish	grey to dark-grey	grey	grey	lead-grey	yellowish-grey to yellowish-green	grey (prothallus)
Character of thallus	uneven to tuberculate	flattened to granulate	granular to coralloid or squamulate	poorly developed	granulate to squamulate	granulate to squamulate	poorly developed
Thickness of thallus (mm)	0.3–0.6–1.0	0.2–0.3	0.07–0.2	near 0.05	0.5–1.0	0.2–0.3	near 0.05
Vegetative diaspores	-	-	blastidia	-	isidia-like protuberances, soredia	-	-
Apothecia	lecanorine, aggregated	lecanorine, dispersed	lecanorine, dispersed	biatorine, dispersed	lecanorine, dispersed,	lecanorine, dispersed to aggregated	lecanorine, dispersed,
Size of apothecia (mm)	0.6–1.2(–1.8)	0.3–0.6	0.3–0.8	0.2–0.4 (–0.6)	(0.2–)0.5–1.0	0.2–0.6(–1.2)	0.2–0.4(–0.6)
Color of apothecial margin	golden-yellow	yellow to dark yellowish	yellow or grey	yellowish	grey-yellowish to grey	yellowish	yellowish
Spores (µm)	14.5–17.5 x 4.2–5.0	15–25 x 4–7	14–17(–18) x 5–6	11–18 x 3.5–5.5	14–18(–20) x 4–5	13–15 (–18) x 5.0–7.0	11–15(–18) x 4.5–6.0
Spermatia	3.0–3.5 x 1.5–1.8	-	-	-	-	3.0–3.5 x 1.5–1.8	-
Ecology	small twigs in semi-desert steppes	limestone	bark of deciduous trees	bark of deciduous trees	shaded limestone	bark, stone, lignum and soil	bark in warm regions
References	The present paper	Rondon 1966	Thor & Wirth 1990	Poelt 1969	Poelt & Vězda 1976	Poelt 1969	Poelt 1969

Candelariella boikoi has mainly been found on small twigs of shrubs, growing on salty soils in the semi-desert steppes of Southeast Europe and Central Asia. It was mainly collected on thicker parts of small twigs of *Halocnemum strobilaceum* (Chenopodiaceae).

Candelariella boikoi was also found on bark of thinner twigs and trunks of shrubs in arid regions. Lichens on twigs are generally quite rare in this region, but a few can be found, for example *Lecania zinaidae*, *Caloplaca ferrugineoides* coll., *C. polycarpoides*, *C. saxicola* aggr., *C. scythica*, *Lecanora hagenii* and *Rinodina pyrina*.

Taxonomical notes. The group of species within the genus *Candelariella* lacking yellowish thallus pigments is rather small. It includes *C. oleaginescens*, described by Rondon (1966) from limestone in France, *C. plumbea*, growing on shaded limestone in southern Europe (Poelt & Vězda 1975), and *C. viae-lactea*, a corticolous species from Central and Southern Europe (Aragón & Martínez 2002, Thor & Wirth 1990, Tretiach 1997). A greenish-grey pigmented thallus has been observed in some forms of *C. aurella*, *C. vitellina* (f. *flavovirella*), *C. rhodax* and *C. medians*. The areoles and also the apothecia of these species usually lose their yellow pigmentation in unexposed localities. The

thallus pigmentation in *Candelariella boikoi* does not seem to be affected by light. The colour of the thalline margin of *C. boikoi* is normally golden-yellow, contrasting with the greyish thallus.

Candelariella boikoi resembles *C. oleaginescens*, a saxicolous species with more flattened and dispersed grey areoles (Table 1). In *C. plumbea* the squamulose lead-grey areoles develop isidia-like protuberances and soredia. The corticolous *C. viae-lactea* develops blastidia. *Candelariella boikoi* also resembles *C. deflexa*, but this species is characterized by a less well developed thallus, smaller apothecia and spores (Table 1). *Candelariella aurella* is characterized by yellow pigmented areoles, and a distinctive paraplectenchymatous cortex. In *C. boikoi* no distinct cortical layer is developed, apart from a layer of algal plectenchyma (Figure 1a).

Specimens examined: **Ukraine.** 'Melitopol-shina', Novotroizk district, near Novodmitrovka, on *Halocnemum strobilaceum*, 16 July 1927, Kotov (KW 24038); Kherson oblast, Genichesk district, Chongar peninsula, on *Halocnemum strobilaceum*, 15 May 1996, Mischustin (KHER); Chongar peninsula, near Sivash station, on *Halocnemum strobilaceum*, 5 May 1995, Khodosovtsev (KHER); Birjuchy island, on plant debris, 9 May 1995, Redchenko (KHER); Crimean Autonomous Republic, Nizhnechorsk district, near Kulichky, 45°38'N 35°01'E, on *Halocnemum strobilaceum*, 8 June 2003 Khodosovtsev (KHER). **Russia.** Astrakhan region, near Basckunchak Lake, 8 May 2001, Redchenko (KHER, KW). **Kazakhstan.** Almatinskaya oblast, Alma-Aty, botanical garden, on *Spizdeanthus shrenkianum*, 11 April 1998, Kondratyuk (KW).

Key to sparse-pigmented species of *Candelariella*

- 1 Thallus yellow to yellowish-green, rarely greyish-yellow, but yellowish areoles present 2
 - Thallus pale-grey, greyish-green, greenish or absent, apothecia, pycnidial ostioles or apothecial primordia yellowish 3
- 2 Asci 12–24-spored, areoles dispersed, on siliceous rocks *Candelariella vitellina* f. *flavovirella*
 - Asci 8 spored, areoles dispersed, on calcareous rocks *Candelariella aurella*
- 3 Thallus with vegetative diaspores 4
 - Vegetative diaspores absent 5
- 4 Thallus blastidiate, blastidia 50–70 µm, greenish-grey, on bark.... *Candelariella viae-lactea*
 - Thallus squamulate, grey to lead-grey with isidia-like protuberance, often with soredia, on shaded limestone *Candelariella plumbea*
- 5 Thallus smooth or absent, less than 0.1 mm thick 6
 - Thallus areolated, well developed, more than 0.1 mm thick 8
- 6 Apothecia more or less biatorine, convex, dispersed, 0.2–0.4 mm, thalline margin reduced; thallus not visible; on bark *Candelariella subdeflexa*
 - Apothecia with fine thalline margin, flat or slightly convex, dispersed, 0.2–0.7 mm. 7
- 7 On bark *Candelariella deflexa*
 - On calcareous rocks *Candelariella minuta*
- 8 Cortex indistinct, areoles aggregated, uneven to tuberculate, to 1.5 mm thick, apothecia aggregated, to 1.8 mm, margin golden-yellow, on bark *Candelariella boikoi*
 - Cortex well developed, paraplectenchymatous, areoles dispersed, apothecia dispersed, to 0.8 mm, margin dirty yellowish, on limestone..... *Candelariella oleaginescens*

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