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## *Collemopsidium kostikovii* sp. nov. (*Collemopsidales*, *Xanthopyrenaceae*), a new algicolous fungus on terricolous *Nostoc* crust from Ukraine

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**Abstract.** *Collemopsidium kostikovii* Khodos. & Darmostuk sp. nov. (*Collemopsidales*, *Xanthopyrenaceae*) is described as a new for science species of algicolous fungi. The new species is characterized by pseudothecia fully immersed in algal crust, (80–)90–170(–200) μm wide, not widening ostiole, 10–20 μm diam., 8-spored asci and 1-septate hyaline ascospores, (14.8–)16–19.6(–23) × (6.3–)6.4–7.8(–9.0) μm. It is morphologically similar to *C. iocarpum*, but differs by its not widening ostiole and association with terricolous cyanobacterial crust with dominant *Nostoc muscorum*.

**Keywords:** *Nostoc*, *Pyrenocollema*, saline soil, Poltava Region

### Introduction

*Collemopsidium* Nyl. (*Xanthopyrenaceae*) is a paraphyletic genus within the recently described order *Collemopsidales* (Pérez-Ortega et al., 2016) characterized by pseudothecia with fissitunicate asci, paraphysoids, pale lower part of the ascomatal walls, two-celled hyaline ascospores and association with various genera of cyanobacteria, and rarely with green algae. Most of its species grow within colonial algal crusts, e.g. *Collemopsidium iocarpum* in terrestrial *Xanthocapsa* (Grube, 2005), *C. chlorococcum* in terrestrial chlorococcoid green algae (Aptroot, Boom, 1998), or on seaweed branches, e.g. *C. pelvetiae* on marine *Pelvetia* (Kohlmeyer et al., 2004). This association is named as "borderline lichens" (Kohlmeyer et al., 2004); however, we prefer the term "algicolous" fungi (Brackel, 2015). According to recent studies (Pérez-Ortega et al., 2016), the molecular marine clade of *Collemopsidium* must be separated in a different genus. Poorly known terrestrial species, including *Collemopsidium iocarpum* (type species of the genus), form association with different genera of saxicolous or terricolous cyanobacteria, but not with *Nostoc*. Recently, we collected *Nostoc* films with some unknown *Collemopsidium*, which is described here as a species new for science.

### Materials and methods

Specimens were examined using standard light microscopy techniques with LOMO microscopes (MBS–1, Micromed–2). Microscopical examination was done in water, 10% KOH (K), Lugol's iodine, directly (I) or after KOH pretreatment (K/I). We measured its in water to 0.25 μm accuracy for ascospores, asci and ascomatal cells, and to 5 μm accuracy for ascomata. Measurements are given as (min–)mean– SD–mean+SD(–max). Photographs were taken with a Levenhuk C510 NG camera. All examined specimens are deposited in the Lichenological Herbarium of Kherson State University (*KHER*).

### Results and discussion

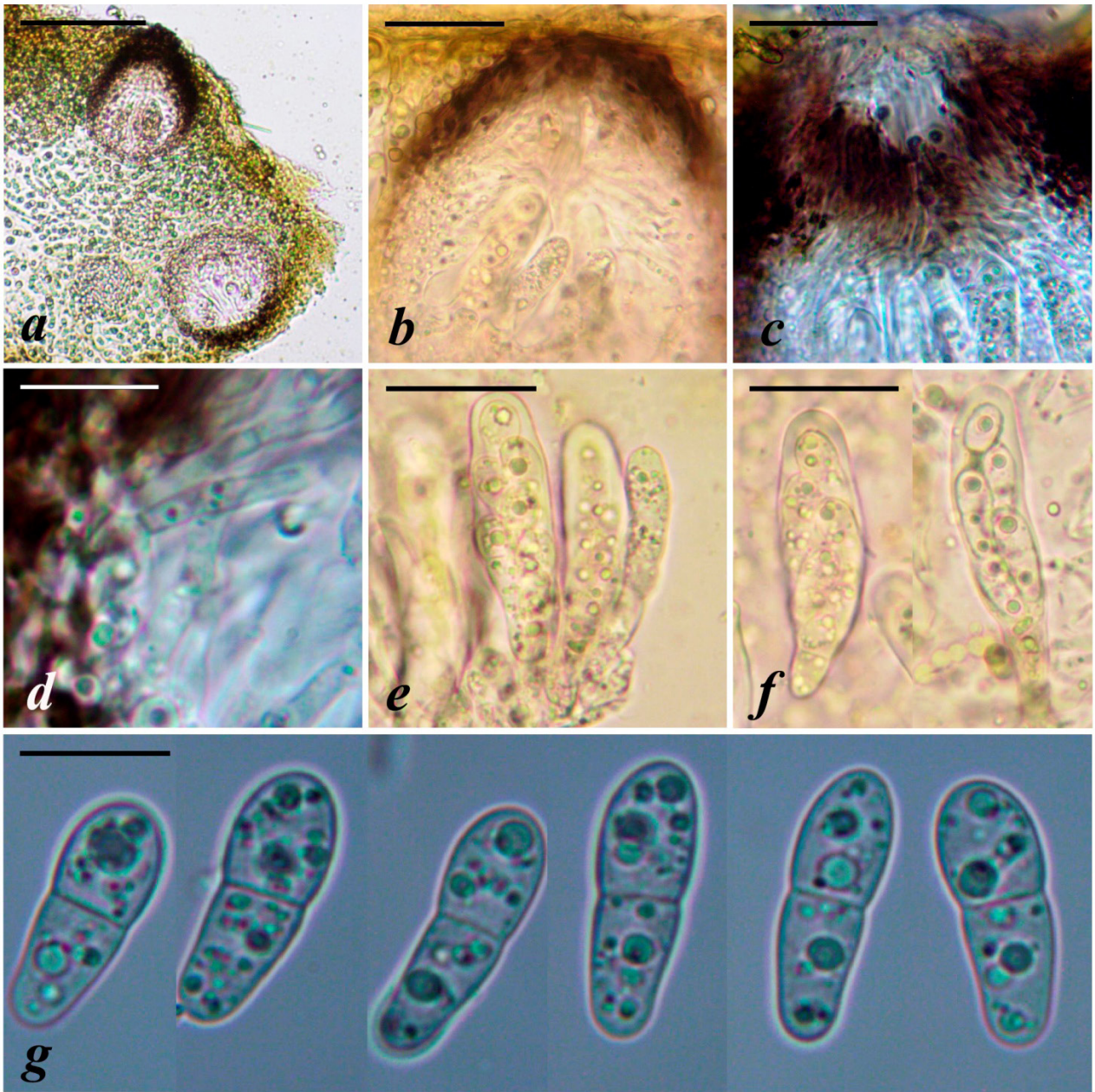
*Collemopsidium kostikovii* Khodos. & Darmostuk sp. nov. (Figure).

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**Diagnosis.** Morphologically similar to *Collemopsidium iocarpum*, but differs by its not widening ostiole and association with terricolous *Nostoc* cyanobacteria.

**Type:** Ukraine. Poltava Region. Semenivsky district, near Obolon village, saline soil, on *Nostoc*, 49°33'02.17" N, 32°51'35.8" E, 3 May 2016, A. Khodosovtsev & V. Darmostuk (*KHER* 9867 – Holotype).

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Morphology of *Collemopsidium kostikovii* (all from the holotype): *a* – section through ascomata (scale 100  $\mu\text{m}$ ); *b* – upper part of ascomatal wall (scale 50  $\mu\text{m}$ ); *c* – ostiole (scale 20  $\mu\text{m}$ ); *d* – periphysoids (scale 10  $\mu\text{m}$ ); *e, f* – asci (scale 10  $\mu\text{m}$ ); *g* – ascospores (scale 15  $\mu\text{m}$ )

Vegetative hyphae hyaline, *c.* 1.5–2.5  $\mu\text{m}$  thick, intermingled with terricolous colonies of *Nostoc*, haustoria not observed. *Pseudothecia* fully immersed in algal crust, grouped in small areas, globose to broadly ellipsoid, (80–)90–170(–200)  $\mu\text{m}$  [*n* = 11] wide; ostiole not widening, *c.* 10–20  $\mu\text{m}$  diam; involucrellum absent; pseudothecial wall composed of isodiametric cells, irregularly arranged and more or less wavy in section, 5–20  $\mu\text{m}$  thick, in upper part medium brown, (10–)15–17(–22)  $\mu\text{m}$  [*n* = 10] thick, with brown pigment deposited mostly in the intercellular spaces, sometimes finely granular, in lower part hyaline to light brown, (5–)7–8(–10)  $\mu\text{m}$  [*n* = 10] thick, cells *c.* 5–7(–10)  $\times$  2–3.5  $\mu\text{m}$ . *Hamathecium* composed of rare filamentous, branched and anastomosing cellular paraphysoids, *c.* 2–2.5(–3.0)  $\mu\text{m}$  thick; paraphysoids fine developed in upper part of ascumata, *c.* 25–35  $\times$  2–2.5  $\mu\text{m}$ . *Asci* bitunicate, (40–)57–51(–65)  $\times$  (10–)13–17(–18)  $\mu\text{m}$  [*n* = 15], endotunica thickened in the upper half of the ascus, 8-spored. *Ascospores* hyaline, straight to slightly curved, smooth, 1-septate, (14.8–)16–19.6(–23)  $\times$  (6.3–)6.4–7.8(–9.0)  $\mu\text{m}$  [*n* = 25], constricted at the septum and broader upper cell, cells with 1–3 oil drops. Pycnidia not observed.

**Etymology.** The epithet "*kostikovii*" honors the Ukrainian algologist Professor Igor Kostikov, a participant of our lichenological excursions, who indicated a biotope with a new species.

**Ecology.** The species grows on *Nostoc* cf. *muscorum* C. Agardh ex Bornet & Flahault crust on salt soil with lichenized species *Enchylium tenax* and young squamules of '*Collema*' sp. infected by lichenicolous *Pronectria diplococca*.

**Notes.** *Collemopsidium kostikovii* is similar to *C. iocarpum* Nyl., but the last one differs by widening disk-like ostiole (60–120  $\mu\text{m}$  diam. vs. 10–20  $\mu\text{m}$  diam. in *C. kostikovii*) and association with saxicolous *Xanthocapsa* cyanobacteria (Grube, 2005). *C. subarenisedum* (G. Salisb.) Coppins & Aptroot has ascospores of similar size, but differs by lichenized immersed whitish or ashy grey thallus, longer asci (70–100  $\mu\text{m}$  long vs. 40–65  $\mu\text{m}$  long in *C. kostikovii*) and interacted with cells of the calcicolous cyanobacteria *Hyella* (Smith et al., 2009). Poorly known terricolous *C. argilospilum* (Nyl.) Coppins & Aptroot has semi-immersed ascumata, grows on inland wet sand banks with unknown cyanobacteria (Smith et al., 2009). The known in Ukraine *Collemopsidium halodytes* (Khodosovtsev, Redchenko, 2002) and other marine taxa differ by developed involucrellum (Mohr

et al., 2004). *Collemopsidium angermannicum* (Degel.) A. Nordin differs by longer asci (up to 100  $\mu\text{m}$  long vs. up to 65  $\mu\text{m}$  long) and slightly larger ascospores (17–26  $\times$  6–12  $\mu\text{m}$  vs. 14.8–23  $\times$  6.3–9  $\mu\text{m}$  in *C. kostikovii*) and is lichenized with saxicolous cyanobacteria (Khodosovtsev, 2007). *Pyrenocollema epigloea* (Nyl.) R.C. Harris and *Magmopsis pertenella* Nyl. are algicolous on *Nostoc*-like cyanobacteria. Both species differ from *C. kostikovii* by uniformly brown pigmented in upper and lower parts of the ascumatal wall (Grube, 2005). Moreover, *M. pertenella* has narrow ascospores (5–6  $\mu\text{m}$  thick vs. 6.3–9  $\mu\text{m}$  thick in *C. kostikovii*).

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Ходосовцев О.Є.<sup>1</sup>, Дармостук В.В.<sup>1,2</sup> *Collemopsidium kostikovii* sp. nov. (*Collemopsidales, Xanthopyrenaceae*) – новий вид альгофілних грибів на епігейній кірці *Nostoc* з України. Укр. бот. журн., 2017, 74(5): 431–434.

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Уперше для науки описано альгофілний гриб *Collemopsidium kostikovii* Khodos. & Darmostuk sp. nov. (*Collemopsidales, Xanthopyrenaceae*). Він характеризується псевдотеціями (80–)90–170 (–200) μm у діам., які повністю занурені у водоростеву кірку, не розширеною остіолярною частиною 10–20 μm у діам., 8-споровими сумками та двоклітинними безбарвними аскоспорами, (14,8–)16–19,6(–23) × (6,3–)6,4–7,8 (–9,0) μm. Новий вид морфологічно подібний до *S. iocarpum*, але відрізняється вузьким вивідним отвором та асоціацією з ґрунтовими ціанобактеріями *Nostoc muscorum*.

**Ключові слова:** *Nostoc, Pyrenocollema*, солончаки, Полтавська область

Ходосовцев А.Е.<sup>1</sup>, Дармостук В.В.<sup>1,2</sup> *Collemopsidium kostikovii* sp. nov. (*Collemopsidales, Xanthopyrenaceae*) – новий вид альгофілних грибів на епігейній корці *Nostoc* из Украины. Укр. бот. журн., 2017, 74(5): 431–434.

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Впервые для науки описан альгофильный гриб *Collemopsidium kostikovii* Khodos. & Darmostuk sp. nov. (*Collemopsidales, Xanthopyrenaceae*). Он характеризуется углублёнными в водоростевую корку псевдотециями (80–)90–170 (–200) μm в диам., не расширенной остиолярной частью 10–20 μm в диам., 8-споровыми сумками и двухклеточными бесцветными аскоспорами, (14,8–)16–19,6(–23) × (6,3–)6,4–7,8(–9,0) μm. Новый вид морфологически близок к *S. iocarpum*, однако отличается узким выводным отверстием и ассоциацией с почвенными цианобактериями *Nostoc muscorum*.

**Ключевые слова:** *Nostoc, Pyrenocollema*, солончаки, Полтавская область