

## *Perigrapha cetrariae*, a new lichenicolous ascomycete on *Cetraria* from Japan

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**Abstract:** *Perigrapha cetrariae* growing on *Cetraria laevigata* is described from Japan. The new species differs from the generic type in having loculi completely embedded in a stroma and ascospores without caudate appendages.

**Keywords:** lichen-inhabiting fungi, new species, Japan

### INTRODUCTION

*Perigrapha* Hafellner is an ascomycetous genus of uncertain position within Arthoniales comprising species of non-lichenized obligately lichenicolous fungi (Lawrey & Diederich, 2018). The genus occurs in both hemispheres and previously included four species, each of which is confined to a particular genus of macrolichens (Ertz et al., 2005; Hafellner, 1996; Pérez-Vargas et al., 2013; Zhurbenko et al., 2015). The aim of this paper is to describe a new species of *Perigrapha* found on *Cetraria laevigata* Rass. in Japan.

### MATERIAL AND METHODS

The specimens were examined using Zeiss Stemi 2000-CS and Axio Imager A1 microscopes equipped with Nomarski differential interference contrast optics. Microscopical examinations were done in water, 10 % KOH (K), Lugol's iodine directly (I) or after KOH pre-treatment (K/I), and concentrated nitric acid (N). Measurements were taken from water mounts and are indicated as (minimum–){X–SD}–{X+SD}(–maximum), where X is the arithmetic mean and SD the corresponding standard deviation, followed by the number of measurements. The length/breadth ratio of ascospores is indicated as l/b and given in the same way. Examined specimens are deposited in the herbaria LE and TNS.

### *Perigrapha cetrariae* Zhurb. sp. nov. (Fig. 1)

Mycobank No.: MB 825585

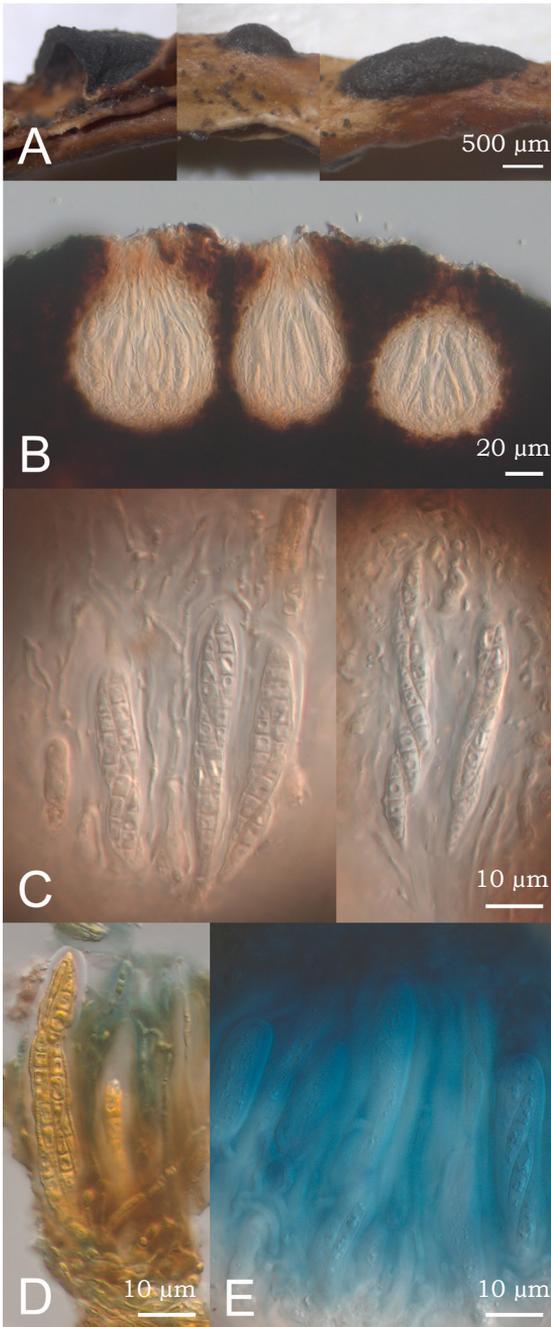
Lichenicolous fungus. Morphologically similar to *Perigrapha phaeophysciae* Etayo & Pérez-

Vargas, but distinguished mainly by the reddish brown vs. greenish brownish to blackish sterile stromatic tissue, somewhat narrower ascospores, (13.5–)14.5–18(–19.5) × (2.5–)3–4 μm vs. (12–)13–18 × 4–5 μm, and a different host, *Cetraria* vs. *Phaeophyscia*.

Type – Japan, Honshu, Prov. Shinano, trail from Mt. Kokushi to Mt. Kobushi, 35°53–54'N, 138°41–43'E, elev. 2200–2500 m, on *Cetraria laevigata* (lobes, mainly their lower parts), 22.07.1954, S. Kurokawa 540276 (TNS – holotype, LE – isotype).

Etymology – The epithet refers to the host lichen genus *Cetraria* Ach.

Description – *Ascomata* stromatic, superficial, convex, initially roundish when viewed from above, later usually elongated along the host lobes, blackish, more or less shiny, surface rough, minutely pitted, without labyrinthiform or lirellate ornamentation, not cracked, not pruinose, up to 2.5 mm long, 150–350 μm thick, dispersed. *Stroma* multilocular, sterile stromatic tissue medium to dark reddish brown, partly carbonized (appearing as blackish in thick sections), K+ brown to grayish brown, N+ more bright orange brown, stromatic pigment resembling *Atra-brown* sensu Meyer & Printzen (2000); upper stromatic layer never breaking; loculi numerous, subspherical to somewhat extended upwards, (40–)60–85(–100) μm diam. (n = 29), without any differentiated wall, surrounded on all sides by sterile stromatic tissue, eventually erumpent, with a punctiform 'ostiole',



**Fig. 1.** *Perigrappa cetrariae*. A: habitus of ascomata; note ascoma in section on the left (left, holotype; center and right, Shibuichi 4286, TNS). B: erumpent loculi embedded in a stroma (in water, holotype). C: asci, spores and paraphyses (in water, holotype). D: hymenium with asci (in I+, holotype). E: hymenium with asci (in K/I, holotype).

occasionally contiguous. *Hymenium* hyaline to occasionally pale orange yellow above, 60–80 µm high; epihymenium indistinct; subhymenium hyaline to occasionally pale orange yellow, ca. 10 µm high; hymenial gel I+ orange red to partly blue above, K/I+ blue. *Paraphyses* 1–2.3 µm thick, branched, occasionally anastomosing, septate, apically not obviously enlarged. *Asci* narrowly clavate to subcylindrical, endoascus somewhat thickened above, (42–)45–53(–55) × (7–)7.5–9(–10) µm (n = 12), wall I–, K/I–, except for a faint apical K/I+ blue ring, 8-spored. *Ascospores* fusiform, occasionally slightly thicker above, with rather acute apices, without appendages, hyaline and smooth-walled, occasionally becoming pale orange yellow and verruculose under maturation, (13.5–)14.7–17.9(–19.4) × (2.7–)3.0–3.8(–4.0) µm, l/b = (3.8–)4.2–5.4(–6.3) (n = 30), (1–)3(–possibly rarely 4)-septate, sometimes slightly constricted at the septa, distinct perispore not seen, often with large guttules, mainly irregularly biseriolate in the ascus. *Conidiomata* not observed.

**Distribution and hosts** – The new species is known from three collections/localities in alpine to subalpine habitats of central Japan, growing on lobes (mainly their lower pars) of *Cetraria laevigata*. It does not visibly damage the host thallus or induce galls.

**Notes** – By its morphoanatomical characters the new species is most consistent with the enlarged generic concept of *Perigrappa* (Hafellner, 1996; Ertz et al., 2005) and differs well from the four previously known species of the genus. *Perigrappa lobariae* Zhurb. growing on *Lobaria japonica* (Zahlbr.) Asahina agg. differs from the new species in such features as the coarsely white pruinose ascomata surrounded by radiating dark hyphal strands, I+ blue hymenial gel, and much larger ascospores, (19–)23.5–28(–30) × (4.5–)5–6(–6.5) µm, with distinct perispore (Zhurbenko et al., 2015). *Perigrappa nitida* Ertz, Diederich, Christnach & Wedin growing on *Pseudocyphellaria glabra* (Hook. f. & Taylor) C.W. Dodge is distinct by its blackish, K+ deep greyish to bluish green, N+ greyish red sterile stromatic tissue reduced to a clypeus-like layer covering the fertile loculi, 4-spored asci, and larger ascospores, (15.5–)18–24.5 × 3.5–6 µm, with distinct perispore (Ertz et al., 2005). *Perigrappa phaeophysciae* growing on *Phaeophyscia* cf. *orbicularis* (Necker) Moberg mainly differs

in having greenish brownish to blackish, K+ greenish intensifying sterile stromatic tissue, and somewhat wider ascospores, (12–)13–18 × 4–5 μm (Pérez-Vargas et al., 2013). *Perigrapha superveniens* (Nyl.) Hafellner, the generic type, growing on *Parmelia squarrosa* Hale and *P. sulcata* Taylor (host of the holotype) is readily distinguished by its sterile stromatic tissue reduced to a clypeus-like layer covering the fertile loculi and the ascospores with a long caudate appendage at one end (Hafellner, 1996; Zhurbenko et al., 2015).

By its loculi embedded in a stroma, *Perigrapha cetrariae* differs from the type species of the genus and strongly recalls some species of *Plectocarpon* Fée, particularly those which, like *Plectocarpon melanohaleae* Christnach, Ertz & Diederich, are characterized by convex black ascomata without distinct ornamentation, absence of visible galls, the stromatic pigment Atra-brown, and 3-septate ascospores (Ertz et al., 2005). However, it differs from species of this genus by its erumpent loculi with a punctiform ‘ostiole’, giving the ascomatal surface a pitted appearance, and by the absence of a distinct perispore and brown granules on the aged ascospore wall.

Additional specimens examined (both on lobes, mainly their lower parts, of *Cetraria laevigata*): **JAPAN. Honshu:** Prov. Musashi, Karisaka Pass, Chichibu, 35°53'N, 138°47'E, elev. 2200 m, 24.05.1970, S. Kurokawa 70126 (TNS); Prov. Shinano, Mt. Kinpu, Minamisakugun, 35°52'N, 138°37'E, elev. 2550 m, 24.07.1970, H. Shibuichi 4286 pr.p. (TNS).

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