Two new lichenicolous species of *Hainesia* (asexual Ascomycetes) growing on *Cladonia*

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Abstract. The new *Hainesia brevicladoniae* is characterized by relatively short, aseptate conidia, 15.3–17.5 × 1.0–1.1 µm, and is known from Belgium, France and the Netherlands on *Cladonia*. The new *H. longicladoniae* is characterized by large, aseptate conidia, 40–63.5 × 1.1-1.4 µm, and is known from Luxembourg and the Netherlands on *Cladonia*.

1. Introduction

The asexual genus *Hainesia* includes over 30 species, most parasitizing vascular plants (Seifert et al. 2011). Etayo & Diederich (1996) described a first lichenicolous species, *H. pertusariae* Etayo & Diederich, growing on corticolous *Pertusaria* species. Brackel (2009) added a second lichenicolous taxon, *H. xanthoriae* Brackel, a species that recently turned out to be rather common on *Xanthoria parietina* in Central Europe. Very recently, two further lichenicolous species have been described, *H. bryonorae* Zhurb., parasitic on *Bryonora castanea* (Zhurbenko & Brackel 2013), and *H. peltigerae* Zhurb. & Davydov, growing on *Peltigera* species (Zhurbenko 2013). Several additional, unnamed *Hainesia* specimens growing on other hosts have been reported by Brackel (2009), Zhurbenko (2013) and Zhurbenko & Brackel (2013), suggesting the existence of many more lichenicolous species.

The generic type, *Hainesia rhoina* (Sacc.) Ellis & Sacc. (teleomorph *Discohainesia oenotherae* (Cooke & Ellis) Nannf.), belongs to the Dermateaceae (Helotiales) (Seifert et al. 2011). That species has very short, aseptate conidia, and conidiomata present a basal stroma and a reduced lateral wall. Some lichenicolous species on the contrary have much longer conidia, some with septa, and the conidiomata of some species are almost pycnidial when young, with a well-developed wall, becoming cupulate when mature. No lichenicolous species have yet been submitted to a molecular phylogenetic analysis, and therefore the relationship of these species to the genus *Hainesia* has not yet been established with certitude.

In this paper, we describe two new lichenicolous species of *Hainesia*, both apparently confined to *Cladonia* hosts, mainly differing by the morphological characters of conidia.

2. Material and Methods

The studied specimens are kept in BR and in the private collections of the authors. Dry herbarium specimens were examined and measured under a binocular microscope Leica MZ 7.5 (magnification up to 50×), and photographed using a Canon 40D camera with a Nikon BD Plan 10 microscope objective, StackShot (Cognisys) and Helicon Focus (HeliconSoft) for increasing the depth of field. Entire unsectioned conidiomata and hand-made sections were studied in water, 5% KOH and Phloxine B. Microscopic photographs were prepared using a Leica DMLB microscope and a Leica EC3 camera.

3. Results

Hainesia brevicladoniae Diederich & van den Boom sp. nov. (Fig. 1)

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Similar to *Hainesia peltigerae*, but conidia longer and aseptate, (13.5–)15.3–17.5(–18.0) × (1.0–)1.0–1.1(–1.2) µm vs. (0–)1-septate, (8.3–)10.6–14.6(–16.5) × (1.0–)1.1–1.5(–1.7) µm, and to *H. bryonorae* and *H. pertusariae*, but conidia shorter and narrower [they are (12.0–)18.1–24.5(–29.1) × (1.1–)1.3–1.5(–1.6) µm in *H. bryonorae* and 14–22 × 1–1.5 µm in *H. pertusariae*].

Type: Belgium, W of Houffalize, 2 km SW of Nadrin, Le Hérou, forest along Ourthe, on *Cladonia* over fallen tree, 10 Sept. 2010, *P. Diederich* 17123 (BR–holotype; herb. Diederich–isotype).

Mycelium indistinct. *Conidiomata* dispersed over the host thallus, pale to medium reddish brown, rarely dark brown, glossy, initially immersed, soon erumpent and becoming superficial, 50–180 µm diam., at first more or less hemispherical with an irregular opening, later often cupulate, with an opening almost reaching the conidioma diameter,

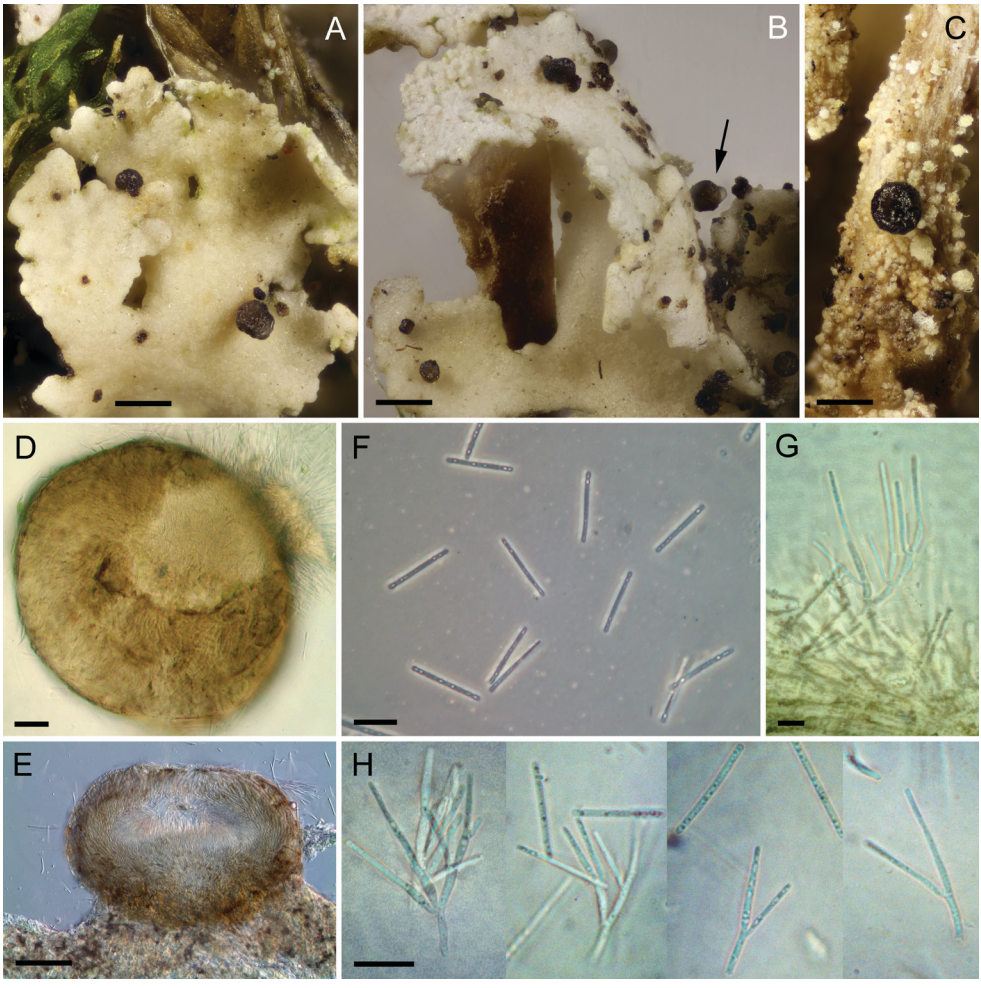


Fig. 1. *Hainesia brevicladoniae*. A-C, Conidiomata on thallus of *Cladonia*; note drop with conidia emerging from conidioma in B (arrow). D, Entire conidioma in water. E, Section through conidioma in water (DIC). F, Conidia in water (phase contrast). G-H, Conidiophores, conidiogenous cells and conidia in water. A-B, D-H: holotype; C: *van den Boom* 23782. Scale bars: A-C = 200 µm, D = 20 µm, E = 50 µm, F-H = 10 µm.

from which a pale to medium brown 'drop' filled with conidia often emerges at maturity; wall pale brown, c. 10 µm thick. *Conidiophores* hyaline, formed from the inner wall of the conidioma, composed of 1–3 elongate cells, each of them acting as a conidiogenous cell. *Conidiogenous cells* hyaline, enteroblastic, phialidic, determinate, integrated, acropleurogenous, narrowly lageniform to fusiform, smooth-walled, (5.3–) 5.7–6.7(–7.0) × (0.9–)1.0–1.5(–1.9) µm, l/b = (3.3–)4.0–6.4(–7.3) (n = 20). *Conidia* hyaline, elongate bacilliform, straight, with a truncate base and a broadly rounded apex, not tapered towards the apices, aseptate, smooth-walled, sometimes with inconspicuous small guttules, (13.5–) 15.3–17.5(–18.0) × (1.0–)1.0–1.1(–1.2) µm, l/b = (11.5–)14.0–16.9(–17.5) (n = 20).

Distribution and hosts. Known from Belgium, northern France and the Netherlands, always on the primary thallus of *Cladonia* spp., incl. *C. polydactyla*, that is bleached and killed by the parasite. Probably widespread, but overlooked.

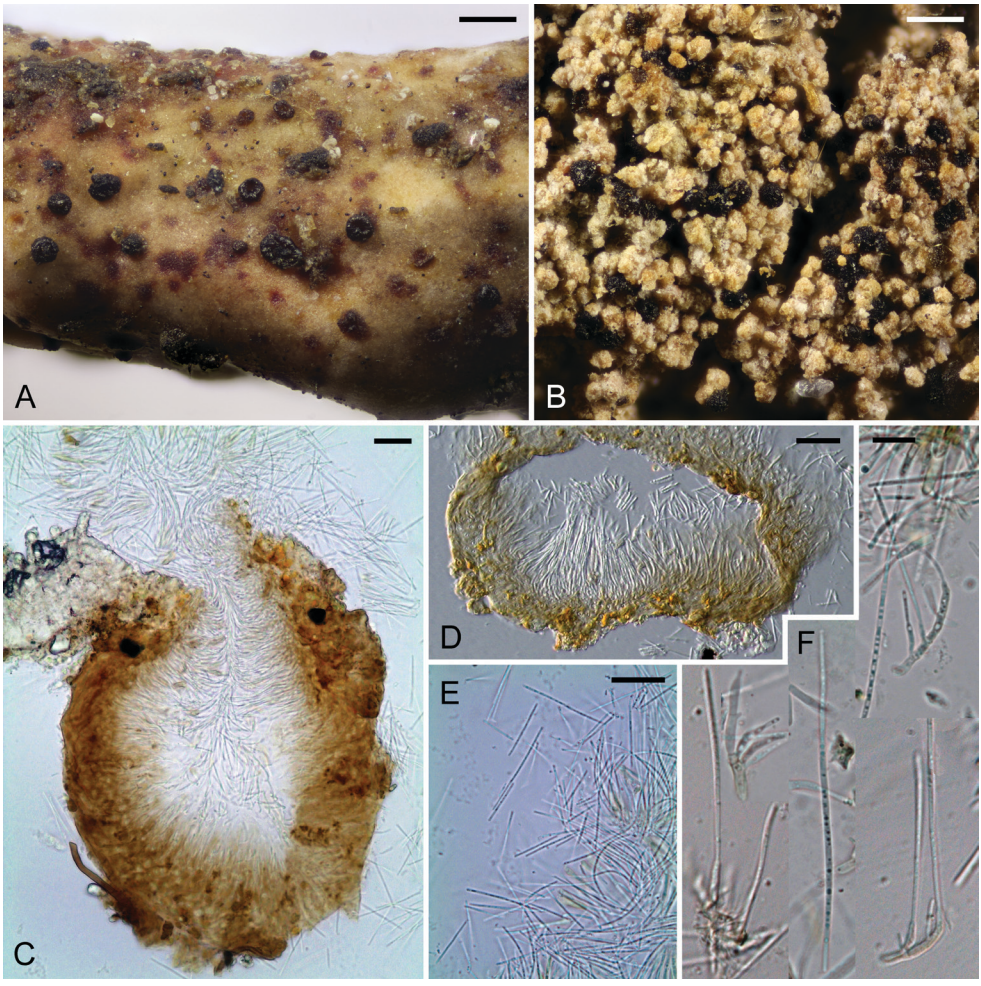


Fig. 2. *Hainesia longicladoniae*. A-B, Conidiomata on thallus of *Cladonia*. C-D, Section through conidioma in water (D: DIC). E, Conidia in water. F, Conidiophores, conidiogenous cells and conidia in water. A, C-F: holotype, B: *van den Boom* 25449. Scale bars: A-B = 200 µm, C-E = 20 µm, F = 10 µm.

Observations. The new species is similar to *Hainesia bryonorae*, *H. peltigerae* and *H. pertusariae* by the relatively short conidia. *Hainesia peltigerae* differs by the distinctly shorter, mainly 1-septate conidia [(8.3–)10.6–14.6(–16.5) × (1.0–)1.1–1.5(–1.7) µm], the other two species by the longer and broader conidia [*Hainesia bryonorae*: (12.0–)18.1–24.5(–29.1) × (1.1–)1.3–1.5(–1.6) µm; *H. pertusariae*: 14–22 × 1–1.5 µm].

Additional specimens examined. **France:** Ardennes, à 2 km au nord de Monthermé, ancienne carrière de la Chitte Collet (49.90396° N, 4.74223° E), on *Quercus*, on *Cladonia polydactyla*, 31 Aug. 2013, *P. Diederich* 17608 (herb. Diederich). **Netherlands:** Noord-Brabant, E of Best, NE of Lisseven (coord. 157.6, 390.2), on terricolous *Cladonia*, 7 Jan. 2000, *P. van den Boom* 23782 (herb. van den Boom).

Hainesia longicladoniae Diederich & van den Boom sp. nov. (Fig. 2)

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Similar to *Hainesia xanthoriae*, but conidia shorter and narrower, (28.0–)40.1–63.5(–69.0) × (1.0–)1.1–1.4(–1.6) µm vs. (53–)57–63(–70) × (1.9–)2.1–2.8(–3.2) µm, and conidiomata smaller, 60–120 µm diam. vs. 100–220 µm diam.

Type: Luxembourg, à l'ouest de Steinfort, anciennes carrières, dans la réserve naturelle (49.66753° N, 5.9053° E), terricolous on sandy soil, on *Cladonia furcata*, 15 Sept 2012, *P. Diederich* 17486 (BR–holotype; herb. Diederich–isotype).

Mycelium indistinct. *Conidiomata* dispersed over the host thallus, medium to dark reddish brown, mat to slightly glossy, initially immersed, soon erumpent and becoming superficial, more or less hemispherical, with an irregular small opening, not or rarely becoming cupulate when old, 60–120 µm diam., 40–60 µm tall; wall pale brown, c. 10 µm thick. *Conidiophores* hyaline, formed from the inner wall of the conidioma, composed of 1–3 elongate cells, each of them acting as a conidiogenous cell. *Conidiogenous cells* hyaline, enteroblastic, phialidic, determinate, integrated, acropleurogenous, narrowly lageniform to fusiform, smooth-walled, (5.7–)7.0–10.6(–12.6) × (1.4–)1.7–2.3(–2.5) µm, l/b = (3.2–)3.7–5.3(–6.3) (n = 20). *Conidia* hyaline, filiform, straight or sometimes slightly curved, base indistinctly truncate, apex rounded, aseptate, smooth-walled, guttulate, (28.0–)40.1–63.5(–69.0) × (1.0–)1.1–1.4(–1.6) µm, l/b = (23.7–)33.6–49.8(–61.8) (n = 20).

Distribution and hosts. Known from Luxembourg and the Netherlands, on the primary thallus or on podetia of *Cladonia furcata* and *C. macilenta* subsp. *bacillaris*, often in necrosed portions of the thallus.

Observations. The new species is distinguished from most known *Hainesia* species by the particularly long conidia. The only similar species, *Hainesia xanthoriae*, has longer and broader conidia, (53–)57–63(–70) × (1.9–)2.1–2.8(–3.2) µm, l/b (19–)22–28(–30), and larger conidiomata, 100–220 µm diam.

Additional specimen examined. **Netherlands:** Noord-Brabant, S of Best, Aarlesche Heide, S side of highway (coord. 154.1, 388.5), *Calluna* heathland and path along *Pinus* forest, on terricolous *Cladonia macilenta* subsp. *bacillaris*, 2 Dec. 2000, *P. van den Boom* 25449 (herb. van den Boom, herb. Diederich).

Key to the known lichenicolous species of *Hainesia*

1. Conidial length > 40 µm **2**
1. Conidial length < 25 µm **3**
2. Conidia 40–63.5 × 1.1-1.4 µm, l/b 33.5–50; conidiomata 60–120 µm diam.; on *Cladonia* ..... ***Hainesia longicladoniae***
2. Conidia 57–63 × 2.1–2.8 µm, l/b 22–28; conidiomata 100–220 µm diam.; mainly on *Xanthoria* ..... ***Hainesia xanthoriae***
3. Conidia 10.5–14.5 × 1.1–1.5 µm, l/b 7.5–11, (0–)1-septate; on *Peltigera* ..... ***Hainesia peltigerae***
3. Conidia over 14 µm long, l/b > 13, 0–1-septate **4**
4. Conidia 15.3–17.5 × 1.0–1.1 µm, aseptate; on *Cladonia* ..... ***Hainesia brevicladoniae***
4. Conidia up to 1.5 µm broad **5**
5. Conidiomata 30–100 µm; conidia 18–24.5 × 1.3–1.5 µm, 0–1-septate; on *Bryonora* ..... ***Hainesia bryonorae***
5. Conidiomata 80–150 µm; conidia 14–22 × 1–1.5 µm, 0(–1?)-septate; on *Pertusaria* ..... ***Hainesia pertusariae***

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