A new species of Ophiostoma with a Leptographium anamorph from Larch in Japan

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Recent surveys of felled Larix logs infected with Ips cembrae in the Mount Fuji area of Japan have yielded numerous ophiostomatoid fungi. One of these Ophiostoma species superficially resembles Ophiostoma penicillatum in having allantoid ascospores with sheaths. However, the conidia of the Leptographium anamorph are small obovoid, and distinct from those of O. penicillatum, which are characteristically large, and cylindrical to allantoid. On the basis of the morphologically distinct anamorph, we conclude that this collection from Larix represents a new Ophiostoma holomorph. It is consequently described as Ophiostoma laricis anamorph. Leptographium larici.
Figs 1–6. Teleomorph and aramorph characteristics of *Ophiostroma laricis*. Fig. 1. Peritheciun (bar, 100 μm). Fig. 2. Allantoid ascospores with sheaths (bar, 10 μm). Fig. 3. *Leptographium* conidiophore (bar, 10 μm). Fig. 4. Conidiogenous cells showing percurrent proliferation (bar, 10 μm). Fig. 5. Small obovoid conidia with rounded apex and subtruncate base (bar, 10 μm). Fig. 6. *Hydrolecanidulid* syranamorph (bar, 10 μm).
concentrations of cycloheximide (0, 0.03, 0.1, 0.5, 1, 2.5, 5%). The growth rates of the colonies were measured on the second, third and fifth day after growth in the dark at 25°C.

Material for SEM was cut from agar plates and fixed in 3% glutaraldehyde and 1% osmium tetroxide in 0.1 M phosphate buffer. It was subsequently dehydrated in a graded acetone series, critical-point dried and coated with gold palladium. Specimens were examined using a JSM 6400 SEM.

RESULTS

After study of the Ophiostoma sp. in question and comparison with various other similar species, it was concluded that this represented a previously undescribed taxon. The fungus is thus described as follows:

**Ophiostoma larici** K. Van der Westh., Yamaoka & M. I. Wingf. sp. nov.

Perithecia genita in hospitis textu vel textu hospitis praeente et in fragmentis vapore sterilis. *Pinus pinaster* in 2% MEA patulis. Perithecia caulinae singulatim vel utque aggregata, superficialia vel basalis semi-immersae, bases alae, globoseae, glabrato-pubescentae, inaequales vel sparsa ornamento hyphali, 210–310 μm diametro, collum issum, cylindrico et exiguus, albis ad aequum, glabrum, 400–1320 μm longum, 50–70 μm latum super basim globosem, 20–50 μm latum ad apicem. Hyphae ostiolares absunt (Figs 1, 10). Asci prototunicati, hyalini, evanescentes. Ascospores asceptatae, hyalinae, gutulatae, curvatae, invasitae in vagina, 5–9 × 3–4 μm (sine vagina), 6–11 × 4–5 μm (vagina comprehensae) (Figs 2, 10).

Perithecia produced on host tissue or in the presence of host tissue and on autoclaved pieces of *Pinus pinaster* on 2% MEA plates. Perithecia occurring singly, or in groups of up to six, superficial or with semi-immersed bases, black, globose, smooth walled unornamented, or with sparse hyphal oramentation, 210–310 μm diam., rech. dark brown, cylindrical with slight apical taper, smooth, 400–1320 μm long, 50–70 μm wide above globose base, 20–50 μm wide at the apex. Ostiolar hyphae absent (Figs 1, 10). Asci prototunicati, hyalini, evanescentes. Ascospores asceptatae, hyalini, gutulatae, curvatae, invasitae in a sheath, 5–9 × 3–4 μm (without sheaths), 6–11 × 4–5 μm (sheaths included) (Figs 2, 10).

Specimen examined: Cultures on 2% malt extract agar, isolated from *Larix laricina* infected with *Leptographium*, Mt Fuji, Japan, August 1990. Y. Yamaoka and M. J. Wingfield, PREM 51810, holotype. Paratypes: from *Larix laricina* Mt Fuji, Japan, August 1990. Y. Yamaoka and M. J. Wingfield (PREM 51811, PREM 51812, PREM 51813).

**Leptographium larici** K. Van der Westh., Yamaoka & M. J. Wingf. sp. nov.

Figs 10–11. Teleomorph and anamorph characteristics of Ophiostoma lanatis. Fig. 10. A. Peritheciun (bar, 100 μm); B. ascospores surrounded with sheaths (bar, 10 μm); C. cells of the perithecial wall (bar, 10 μm). C. Hyalorhizocollela synanamorph (bar, 10 μm). Fig. 11. A. D. Leptographium anamorph (bar, 10 μm); B. obvoid conidia.

primaris; cellae apicales et basilares non tumidae. Apparatus conidiogenus 50–60 μm longus, massa conidica exquisita, tribus vel quinque seriebus tenuorum cylindricorum; metulae primariae duae vel tres, olivaceae, leves, 0–1 septatae, 20–60 μm longae et 3–8 μm latae, rami secundarii hyalini vel olivacei, 0–1 septati, 10–30 μm longi; 2–6 μm lati; rami tertiani, hyalini, 0–1 septati, 10–25 μm longi, 2.5–5 μm lati; rami quartiani, 0–1 septati, 10–15 μm longi, 2.5–4 μm lati. Celle conidiogenae discreteae, 1–3 in quoque rami, parum attenuatae at basi ad apicem, cylindraceae, rectae, 10–30 μm longae et 1.5–3 μm latae (Figs 3, 7, 11). Conidiola auctus eventi mortis ad restituentur strepitis cum ortogenese holoblastica et proliferatione percurrenti secretione retardata, si quod false videtur proliferatio sympodialis. Conidia hyalina, aseptata, gutilula obovovoidae vel oblongo-ellipsoidae, apice rotundato et base subtruncata, 2–14 × 2–5 μm (Figs 5, 11). Conidia accumulat in apparato conidiogeno in massa sub-flava albo-rubescenia cum sicca sunt. Hyphae nonnullae hyalinae sub-2 μm diametro, quid pait synanamorpham Hyalorhizocollelae. Conidiophora hyalina, simplicia, erecta, 2–4 septata, 90–130 μm longa, 3–4 μm lata ad basim. Cellae conidiogenae terminalia latere ascendentis, cylindraceae, rectae vel geniculato-inclusae, 6–20 × 2–3 μm; conidia formantia enteroblastica et percurrenter in cellis conidiogenis (Figs 6, 9).

Colors grew optimally at 25°C on MEA, reaching 44 mm colony diam. in 5 d. No growth occurred below 5°C or above 35°C. Colors were hyaline at first becoming light brown from the centre with age on MEA. The fungus could withstand high concentrations of cycloheximide with a 50% reduction in growth on 2.5% cycloheximide after 5 d at 25°C in the dark. Hyphae immersed in medium with little or no aero mycelia, hyaline to pale brown, smooth, 2–5 μm diam. Conidicophores single, or in groups of up to four, arising directly from mycelium, erect, macroconidial, mononconidial, smooth, olivaceous to light brown, frequently constricted at septa, 100–350 μm long, rhizoids absent. Stipe olivaceous to light brown, smooth, cylindrical, simple, 2–5 septate, 50–170 μm long (from first basal septum to below primary branches), 5–10 μm wide below primary branches; apical and basal cells unsheaved. Conidiogenous apparatus 50–60 μm long, excluding the conidial mass, with three to five series of cylindrical branches; two to three primary metulae, olivaceous, smooth, 0–1 septate, 20–80 μm long and 3–8 μm wide secondary branches hyaline to olivaceous, 0–1 septeate, 10–30 μm long, 3–6 μm wide; tertiary branches hyaline, 0–1 septeate, 10–25 μm long, 2–5 μm wide; quaternary branches 0–1 septeate, 10–15 μm long, 2–5 μm wide (Figs 3, 7, 11). Conidiogenous cells discrete, 1–3 per branch, tapering slightly from base to apex, cylindrical, straight, 10–30 μm long and 1.5–3 μm wide (Figs 4, 8). Conidiogenesis development occurs through replacement wall building with holoblastic ontogeny and percurrent proliferation with delayed secession, giving the false impression of sympodial proliferation (Minter et al.,
REFERENCES


Solheim, H. (1980). *Ophiostoma* species superficially resembling *O. pini* (Groseman) Moreau and *O. eurycyphus* E. P. Wright & Cain but can be distinguished from the latter species based on various anamorph and teleomorph characteristics. The ascospores of *O. laricis* are curved and surrounded by a uniform sheath. In this feature they are similar to those of *O. pini* (Solheim, 1986). However, conidia of this fungus are fimbriate and thus different from the typical large cylindrical, slightly curved conidia of *O. pini* (Kendrick, 1961; Davidson, Franche-Grossman & Käärk, 1967; Upadhyay, 1981). Conidia of *O. laricis* resemble those of *O. eurycyphus*. The latter fungus, however, has ascospores that are distinctly hat-shaped and thus very different from those of *O. laricis* (Wright & Cain, 1961; Upadhyay, 1981).

*Ophiostoma pini* and *O. eurycyphus* commonly occur together in Europe associated with the bark beetle *Ips typographus*. Conidia of *O. pini* are found on spruce (Solheim, 1986; Solheim, 1992). The fact that they occur in close proximity with each other has evidently given rise to considerable confusion in the taxonomy of *O. pini*. This fungus has, in the past, been described as having ascospores with uniform sheaths or hat-shaped sheaths. Solheim (1986) has recently clarified this confusion showing that uniform sheaths are typical of *O. pini* and he has also provided an appropriate nomenclature for the fungus. Clarification of this confusion thus made it possible for us to define the identity of *O. laricis*.

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