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Asterophora salvaterrensis (*Basidiomycota, Agaricales*), a new species from Galicia (Spain)

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Abstract—*Asterophora salvaterrensis*, collected in *Pinus pinaster* forests in Galicia (northwest Iberian Peninsula), is described as new and compared with other known *Asterophora* species. The new species is distinguished by its zonate greenish brown to brownish ochre pileus with whitish margin that blackens, decurrent obtuse furfuraceous grey lamellae, furfuraceous brown to blackish stipe, black context, nondistinctive odor and taste, and small basidiospores. A key to all known *Asterophora* species is provided.

Key words—*Lyophyllaceae,* parasitic fungi, taxonomy

Introduction

Mycological studies conducted during the last decades in the forests of maritime pine (*Pinus pinaster* Aiton) in the Miño river basin of Galicia (northwestern Spain) have produced interesting discoveries, such as the new species, *Sparassis miniensis* Blanco-Dios & Zheng Wang (Blanco-Dios et al. 2006). In this territory, several samples of a remarkable species of *Asterophora* Ditmar were recently collected on a russulaceous host (*Russula* sp.).

Species of *Asterophora* (*Lyophyllaceae)* are among the few agarics that grow on basidiomata of other fungi (the most common hosts are russulaceous species, mainly in *Lactarius* Pers. and *Russula* Pers.). The genus is further distinguished by the production of chlamydospores. *Asterophora* is phylogenetically placed in *Lyophyllaceae* (Matheny et al. 2006).

Today, only three well documented species of *Asterophora* are accepted: *A. lycoperdoides* (Bull.) Ditmar, *A. parasitica* (Pers.) Singer, and *A. mirabilis* (T.W. May) Redhead & Seifert (May & Fuhrer 1995; Redhead & Seifert 2001a,b; Vizzini 2009). Our collections, which do not fit the morphological concept of any of these taxa, are described here as a new species.

A key to the known species of *Asterophora* is provided.

Materials & methods

Macro- and micromorphological descriptions are based on observations of both fresh and dried specimens. L = number of lamellae; Q = quotient of length /width of an individual spore and avQ is the average Q. All the micromorphological structures were measured in Melzer's or 3% KOH, except for the pileipellis and stipitipellis hyphae, which were measured in 10% ammonia. Spore measurements do not include the hilar appendage. The length of intercalary chlamydospores was measured from the septum of one subtending hypha to the septum of the other; the length of terminal chlamydospores was measured from basal septum to apex. All specimens, including the holotype, are kept in LOU-Fungi herbarium (Centro de Investigación Forestal de Lourizán, Pontevedra, Spain).

Taxonomy

Asterophora salvaterrensis Blanco-Dios, **sp. nov.** Plate 1, Fig. 1

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Pileus 0.5–4 mm latus, planus leviter depressus, non hygrophanus, haud traslucenter striatus, zonatus, ab brunneo-viridulus ad brunneo-ochraceus, ad medium brunneus, aliunde albidus, nigrescens. Lamellae decurrentes, dispersae, obtusatae, furfuraceae, griseae. Stipes 1.5–10 mm longus, 0.5–1.5 mm latus, plenus, furfuraceus, brunneus vel brunneo-nigrescens. Caro nigrescens, parce conspicua. Odor et sapor haud notabiles. Sporae 2.5–3.2(–4.5) × (1.2–)1.8–2.5 µm, Q = 1.29–2, ellipsoidaeae vel oblongae, laeves. Basidia tetrasporigera, fibulata. Acies lamellarum fertilis. Chlamydosporae (12–)13–17.5(–20.5) × (7.3–)8.5–10.5(–11.5) µm Q=1.26–2, ellipsoidaeae vel oblongae, laeves. Fibulae praesentes. Ad basidiomata corruptas Russulae nigricantis.

Type: Spain: Pontevedra, Salvaterra de Miño, Leirado. Collected by J.B.Blanco-Dios, 1-XII-2009 (**Holotype:** LOU-Fungi 19491).

Etymology: *salvaterrensis*, from the municipality of Salvaterra de Miño (Galicia, Spain).

Pileus 0.5–4 mm diam., plano-convex to flattened with depressed centre, margin first involute, then broadly wavy, not hygrophanous or translucently striate, zonate, brown at the disc, greenish brown to brownish ochre elsewhere with the margin whitish, blackening with age or handling. Lamellae ≤ 1 mm broad, decurrent, scattered (L = 8–10), thick, not forked, entirely furfuraceous over a grey pale or grey colour, edge concolourous, even, obtuse, lamellulae absent. Stipe 1.5–10 × 0.5–1.5 mm, central, even or a bit expanded above or attenuate, filled, entirely furfuraceous over a brown or blackish brown surface. Context very thin, black when exposed, finally brown to ochre. Odor and taste nondistinctive. Spore print whitish.

Basidiospores 2.5–3.2(–4.5) × (1.2–)1.8–2.5 µm, Q = 1.29–2, avQ = 1.47, (n = 30), sparse, ellipsoid to oblong, smooth, thin-walled, not amyloid. Basidia (10–)13–19 × 4–7 µm, sparse, broadly clavate, 4-spored, sterigmata up to 2.5 µm long, siderophilous. Chlamydospores (12–)13–17.5(–20.5)× (7.3–) 8.5–10.5(–11.5) µm, Q = 1.26–2, avQ = 1.56, numerous in the lamellar trama,

Plate. 1. *Asterophora salvaterrensis* (holotype). Habit.
Photos by Amancio Castro.

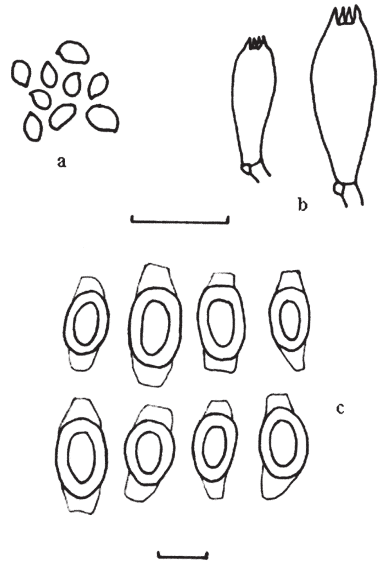

Fig. 1. *Asterophora salvaterrensis* (holotype).
a. basidiospores; b.basidia; c. chlamydospores. Scale bars = 10 µm.

in the pileal trama above the lamellae, and on the pileus surface, numerous also in the host tissue, intercalary or terminal, smooth, ellipsoid to oblong, hyaline then pale yellow, at length with an inner wall up to 0.5 µm thick which excludes a segment adjacent to each subtending hypha (the basal portion of terminal chlamydospores is similarly excluded), enclosing contents which are granular and with small and large, refractive droplets. Cystidia not seen. Pileipellis a cutis, consisting of parallel, cylindrical hyphae, 1.5–10 µm diam., thin walled, radially arranged, with ochre intracellular pigment. Stipitipellis a cutis, composed of parallel, cylindrical hyphae, 1.5–9 µm diam., thin walled. Clamp connections present in all tissues.

Ecology & distribution— On blackened and rotten *Russula nigricans* basidiomata, growing together with *Asterophora lycoperdoides* and *A. parasitica* in a *Pinus pinaster* forest. Known only from a single locality in Spain. November–December.

Collections examined: **SPAIN**: **Pontevedra**: Salvaterra de Miño, Leirado, 29TNG4565, 110 m, forest of *Pinus pinaster*, on basidiomata of *Russula nigricans*, 1.XII.2009, leg. J.B.Blanco-Dios, LOU-Fungi 19491 (holotypus); 24.XI.2009, leg. J.B.Blanco-Dios, LOU-Fungi 19490.

Other collections examined: ***Asterophora lycoperdoides*** – **SPAIN**: **A Coruña**: Brión, Adoufe, 29TNH2645, 70 m., on basidiomata of *Russula nigricans*, 19.XII.1977, leg. L. Cabo Rey, LOU-Fungi 0114; Santiago, bosque de la Condesa, 29TNH3747,

250 m., on basidiomata of *Russula nigricans*, 23.X.1975, leg. L. Freire, LOU-Fungi 0112. **Pontevedra**: A Estrada, Arnois, 29TNH4834, 60 m., on basidiomata of *Russula nigricans*, 23.X.1975, leg. L. Freire, LOU-Fungi 0116; Vilagarcía de Arousa, 29TNH1916, 20 m., on basidiomata of *Russula* sp, 18.XI.1987, leg.: E.Valdés-Bermejo, LOU-Fungi 0113.

Asterophora parasitica – **SPAIN**: **A Coruña**: Brión, Adoufe, 29TNH2645, 70 m., on basidiomata of *Russula nigricans*, 12.XI.1981, leg. L. Cabo Rey, LOU-Fungi 0117; Cambre, Cecebre, Fraga de Cecebre, 29TNH5794, 100 m., on basidiomata of *Russula* sp., 17.XI.1990, leg. L. Freire, LOU-Fungi 4557; Puebla do Caramiñal, Cabío, 29TNH0514, 10 m., on basidiomata of *Russula densifolia* Secr. ex Gillet, 25.XI.1989, leg. M. Martínez Campos, LOU-Fungi 6930; on basidiomata of *Russula nigricans*, 08.XII.1984, leg. L. Freire & M. L. Castro, LOU-Fungi 0121. **Lugo**: Mondoñedo, Couboeira, 29TPJ3215, 100 m., on basidiomata of *Russula* sp., 3.X.1992, leg. S. Cabanela, LOU-Fungi 5844.

Comments. *Asterophora salvaterrensis* is unique with respect to the other known *Asterophora* species —*A. lycoperdoides, A. parasitica, A. mirabilis*— by the following combination of features: (i) the zonate pileus which is brown at the disc, greenish brown to brownish ochre towards margin and whitish at the margin, (ii) the pileus-surface turning blackish with age or handling, (iii) the decurrent lamellae, which are furfuraceous and grey-tinged, (iv) the furfuraceous stipe-surface over a brown or blackish-brown cortical layer, (v) the context blackening when exposed and lacking a distinct smell and taste. From the micromorphological point of view the small, ellipsoid to oblong basidiospores associated with large, smooth, ellipsoid to oblong chlamydospores are typical and diagnostic. Some stellate chlamydospores (from basidiomata of *Asterophora lycoperdoides*),13–16.5 × 12–15 μm, were seen in the pileipellis, lamellae, and stipitipellis surface.

Asterophora lycoperdoides differs by having stellate chlamydospores, formed in the upper pileal trama. Additionally, this species frequently does not produce basidiospores, has a globose to pulvinate pileus with a powdery surface, and shows often only rudimentary lamellae. *Asterophora parasitica* also frequently does not produce basidiospores, has a convex to umbonate pileus with a typically silky surface and obtuse but comparatively well-formed lamellae. Both of these species cover a similar geographic range spanning through North America, Europe, North Africa, East Asia, and Papua New Guinea (Corner 1966, Horak 1980, Singer 1986). *Asterophora mirabilis,* known from Australia (Victoria and Tasmania), is similar to *A. parasitica*, but differs in producing stellate chlamydospores that are numerous in the lamellar trama and pileal trama above the lamellae and sparse to absent in the upper pileal trama and on the pileus surface (May & Fuhrer 1995).

From the taxonomic point of view, owing to the fact that it produces only smooth chlamydospores, *Asterophora salvaterrensis* seems to be close to *Asterophora parasitica* from which it is easily distinguished by greenish-brown to greenish-ochre zonate pileus and much smaller basidiospores.

Key to the known species of *Asterophora*

1a. Chlamydospores stellate 2
1b. Chlamydospores smooth 3

2a. Pileus surface powdery; chlamydospores formed in the upper pileal trama . . . . . ***A. lycoperdoides***
2b. Pileus smooth; chlamydospores formed in the lamellar trama and pileal trama above the lamellae. . . . . ***A. mirabilis***

3a. Pileus white or grey with a silky surface, not zonate; basidiospores 5–6 × 3–4 µm . . . . . ***A. parasitica***
3b. Pileus brown-greenish-ochre, zonate; basidiospores 2.5–3.2 × 1.8–2.5 µm. . . . . ***A. salvaterrensis***

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