

Pulchroboletus sclerotiorum



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***Pulchroboletus sclerotiorum* M.E. Sm., Bessette & A.R. Bessette, sp. nov.**

Etymology. The epithet *sclerotiorum* is in reference to the subterranean orange sclerotia formed by this species.

Classification — *Boletaceae*, *Boletales*, *Agaricomycetes*, *Agaricomycotina*.

Basidiomata epigeous, pileate, pileus 4–10 cm wide, hemispheric at first, becoming convex to broadly convex at maturity, surface dry, dull or somewhat shiny, matted-subtomentose, pinkish red to rose-red or purplish red, sometimes with olive tints, becoming dull rose-pink to brownish pink in age, slowly staining blackish blue when bruised, margin bright yellow, often persistent, incurved at first, with a narrow band of sterile tissue; pileipellis tastes slightly acidic, immediately staining grey then fading to orange with red areas bleached with KOH, slowly staining weakly orange with NH₄OH, and olive-grey with FeSO₄. *Context* pale yellow, sometimes with a pinkish tinge under the pileipellis, staining blue when exposed, sometimes weakly and erratically, staining pale orange with KOH, negative with NH₄OH on yellow areas, and bleaching blue areas, FeSO₄ staining context faintly bluish grey, *odour* not distinctive, *taste* acidic. *Hymenophore* bright yellow at first, becoming dull yellow then brownish yellow at maturity, staining blue when bruised, slightly depressed near the stipe in age, pores angular to irregular, 2–3 per mm, tubes 6–15 mm deep, yellow, staining blue then brown when bruised. *Stipe* 4.5–9 cm long, 1–2 cm thick, enlarged downward or nearly equal, solid, surface dry, longitudinally striate, yellow at apex, red on lower portion, with conspicuous red to reddish brown punctae over a yellow ground colour, staining blue when handled or bruised, sometimes slowly, lacking reticulation or sometimes reticulate on upper portion, reticulation yellow at the apex and reddish below, often with white basal mycelium and yellow rhizomorphs sometimes with orange sclerotia, context brighter and deeper yellow than in the pileus, reddish brown around larval tunnels, staining bluish green, sometimes slowly and erratically. *Spores* olive-brown in fresh deposit, (12–)14–16(–18) × 4–6 μm, n = 20, av. = 15.15 × 4.99 μm, Q = 3.05, subfusoid to fusiform, hyaline to pale brownish yellow, smooth, thin-walled. *Basidia* 24–28 × 6.5–11 μm, clavate, 4-sterigmate, hyaline, lacking dextrinoid contents in Melzer's. Hymenial cystidia not observed. *Hymenophoral trama* boletoid, with lateral elements 4.5–10 μm, moderately divergent, hyaline to pale greyish yellow in KOH, pale greyish yellow in Melzer's. *Pileus* trama hyphae loosely interwoven, hyaline in KOH, pale ochraceous in Melzer's, inamyloid, 5–17.5 μm wide, thin-walled, smooth. *Pileipellis* a suberect trichodermium that becomes a cutis of tangled and interwoven cylindrical hyphae, with red contents in water, hyaline in KOH, with dingy ochraceous contents in Melzer's, inamyloid, 5–9 μm wide, immediately staining orange with KOH, staining slowly and weakly orange with NH₄OH, and staining pale olive-grey or negative with FeSO₄. *Stipitipellis* hymeniform with clavate elements 5–13 μm wide, subparallel to interwoven, pinkish

Colour illustrations. *Quercus*-dominated forest at the Ordway-Swisher Biological Reserve where *Pulchroboletus sclerotiorum* is found during wet periods in summer and fall. Basidiomata of specimen FLAS-F-60908; orange sclerotia of *P. sclerotiorum* (MES-260) from oak woodland; pale brownish basidiospores in KOH. Scale bars = 1 cm (basidiomata), 3 mm (sclerotia), 5 μm (basidiospores).

red to red in water, ochre in KOH, and yellow-brown to reddish brown in Melzer's, with scattered clavate caulocystidia. *Stipe* trama parallel, vertically oriented, cylindrical, hyaline, inamyloid, with scattered oleiferous elements. *Clamp connections* absent.

Habitat & Distribution — Scattered or in groups, often on sandy soil, with species of *Quercus*, summer to fall (July–November), eastern USA from Massachusetts to Florida.

Typus. USA, Florida, Putnam County, Ordway-Swisher Biological Station, c. 50 m asl, in oak-dominated forest, 14 June 2017, L. Kaminsky (holotype FLAS-F-60908, ITS sequence GenBank MH016883, MycoBank MB830772).

Paratypus. USA, Tennessee, Anderson County, Oak Ridge, beneath *Quercus*, 21 Aug. 2015, H. Hitchcock, ARB1260 (FLAS-F-60333, ITS, LSU, *rpb1*, *rpb2* and *tef1* sequences GenBank MF098659, MF614166, MF614168, MF614169 and MF614165).

Notes — *Pulchroboletus sclerotiorum* is characterised by the red pileus with a distinctive yellow margin, yellow hymenophore that stains blue when bruised, yellow and red stipe with conspicuous red to reddish brown punctae over a yellow ground colour, often with white basal mycelium and yellow rhizomorphs and an association with oaks. Among similar species *Boletus rubissimus* also has a pinkish red to rose-red pileus with a bright yellow margin and a similarly coloured stipe, but it has different macrochemical reactions and smaller spores, 9–11 × 3–4.5 μm. *Hortiboletus rubellus* has reddish orange context in the lower stipe, tubes that split lengthwise when torn, and smaller spores, 10–13 × 4–5 μm. *Pulchroboletus rubricitrinus* has a similarly coloured pileus that lacks a bright yellow margin, has a more yellow, longitudinally striate stipe streaked with red, and has different macrochemical reactions. *Aureoboletus mirabilis* is found in the Western USA with conifers, has a dark purplish red to reddish brown pileus, a yellow pore surface and context that does not stain blue. *Xerocomus morrisii* has a brown pileus, yellow context that does not stain blue, a yellow pore surface that becomes brownish orange to brick-red in age, and a punctate stipe. *Hemileccinum subglabripes* has an ochre to reddish brown pileus, a yellow pore surface that does not stain blue, and red to reddish brown punctae on its stipe. *Pulchroboletus sclerotiorum* is also distinct based on molecular characters. BLAST searches based on ITS rDNA did not match closely with any known boletes. The most closely related named taxa in GenBank are *P. roseoalbidus*, *P. rubricitrinus*, *Boletus smithii* and *Gasteroboletus vividus*. However, sequences of these taxa were < 91 % similar across the ITS. ITS sequences provide important insight into the ecology of this new species because they match a sequence from orange sclerotia collected beneath oaks in Massachusetts (Smith & Pfister 2009). Sclerotia of ectomycorrhizal fungi are rarely reported in the literature (Smith et al. 2015) but several other species of ectomycorrhizal *Boletales* have been shown to form sclerotia, including *B. rubropunctus* (Smith & Pfister 2009) and *Leccinum holopus* (Müller & Agerer 1990).

Supplementary material

FP1029-1 Additional specimens examined.

FP1029-2 Phylogenetic tree based on Maximum Likelihood analysis of ITS rDNA in RAxML v. 8 shows the placement of *Pulchroboletus sclerotiorum* among *Pulchroboletus* and *Alessioporus* species (*Boletaceae*, *Boletales*). *Hemileccinum impolitum* served as the outgroup.

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