

Caloboletus frustosus (Snell & E.A. Dick) D. Arora & J.L. Frank, comb.nov.

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Basionym: *Boletus frustosus* Snell & E.A. Dick, *Mycologia* **33**(1): 33 (1941)

Caloboletus marshii D. Arora, C.F. Schwarz & J.L. Frank, sp.nov.

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Pileus 6–15 (–20) cm broad, convex becoming broadly convex at maturity; surface dry or very slightly viscid when wet, faintly velvety and with a fine whitish, powdery bloom when young, white to grayish-white becoming buff or tan in age; margin often projecting slightly beyond the tube layer (curblike) when young. Context pallid and readily bruising blue or gray-blue when fresh but often only weakly so in age; taste distinctly bitter in fresh specimens at least for most people, but sometimes indistinctly in old or waterlogged specimens; odor rather distinctive, somewhat sour. Hymenophore (tube layer) pale yellow becoming yellow and then olive-yellow, or in old age dingy olive-gray; pore surface concolorous, staining blue when fresh, the blue stains becoming deep grayish-blue and finally changing to brown; individual pores < 1 mm broad, the tube layer 1–3 cm deep. Stipe 5–15 cm long, 2–7 cm thick, narrowest at the apex and swollen or bulbous below with the base often narrowed and/or knobby and radiating, typically terminating in a knotted tuft of yellow rhizomorphs; surface of stalk pale yellow to yellow, sometimes with small reddish dots or splotches (especially where damaged by invertebrates), and often stained dingy brownish toward base (more so in age); yellow portions typically blueing when handled; not reticulate. Stipe context often marked with zones of contrasting colors: upper portion concolorous with the pileus context and usually blueing when cut, dull yellowish to dingy brown or even reddish-brown at, or below, the mid-point and blueing less strongly or not at all; extreme base usually covered in a thin or thick (0.5–3 mm) yellow rind of tissue. Spores dark olive-brown in mass, short-fusoid or long-ellipsoid with a weak abaxial curve, smooth, pale brown or yellowish in KOH, 11–14 × 4.5–6 µm (length/width ratio =2.5, n=30). Basidia clavate, mostly 4-spored; hymenial cystidia mostly fusoid-ventricose. Pileipellis an entangled upright layer of sinuous, cylindrical hyphae.

Holotype SFSU, Arora 11118.

This bolete was first reported in 1979 by Arora (Mushrooms Demystified, 1st edition, p. 421-22) but was not formally named at that time because of its close resemblance to the European species, *Caloboletus radicans* (Pes.) Vizzini (formerly *Boletus radicans* Pers.). That species also has a pale cap, radiating stipe, and bitter taste, but its stalk is often reticulate and ITS and LSU data show clear differences between *C. radicans* and USA material. *C. marshii* can be recognized in the field by its pale cap, yellow pore surface, blue-staining flesh and pores, non-reticulate yellow stalk, bitter taste, and occurrence with oaks. The only other western USA *Caloboletus* with a pale cap, *C. rubripes* (Thiers) Vizzini, shows red on the stalk and associates with conifers. Other large western oak-associated boletes that resemble *C. marshii* include *Boletus barrowsii* Thiers & A.H. Smith (whitish cap, sweet or nutty taste, reticulate stalk and non-blueing flesh), and *Butyriboletus persolidus* D. Arora & J.L. Frank (brown cap, mild taste, yellow reticulate stalk, and yellow flesh that blues erratically). The bitter boletes (*Caloboletus*) form a monophyletic group recently attributed generic recognition (Vizzini 2014, Index Fungorum 146). All species known to the authors have persistent fruiting bodies with pale, blue-staining flesh and a distinctly bitter taste that is detectable by most people. Hellwig et al. 2002 (European Journal of Organic Chemistry 2002(17): 2895-2904) identified the bitter principles as calopins and cyclocalopins. As far as we know this genus is endemic to the northern hemisphere. Our data also show two clades within *Caloboletus*, one embracing species with pale caps (*C. rubripes*, *C. marshii*, *C. inedulis* and *C. radicans*), and the other centered on *C. calopus* and *C. frustosus*. Specimens examined: USA, California, Santa Cruz County, UC Santa Cruz campus near Porter College under *Quercus agrifolia*, 7 Nov. 2011, Arora 11118 (Holotype: SFSU, GenBank KC812286); Santa Cruz County: Arora 11117 (SFSU, GenBank KC812285); Santa Cruz County: Arora 11119 (SFSU, GenBank KC812287-8). USA, Oregon, Jackson County: JLF 1050 (GenBank KC812289); Josephine County: JLF 2174 (GenBank KC812290-91). Occurrence: Solitary or in groups or small clusters on ground in association with oaks, especially *Quercus agrifolia* but not limited to that species. It typically fruits in the summer or early fall before the onset of the fall rainy season, but has been found as late as December. It is known at present from central coastal California north to Oregon and Washington, where it associates with *Q. garryana*, and also at low elevations near Sacramento, California and in the Sierra Nevada foothills with various oak species.

Etymology: Named after Ben Marsh, who found it near the type locality in 1972 and brought it to the attention of DA after unsuccessfully trying to make it palatable.