



Fungal Planet 1178 – 19 December 2020

***Veloboletus limbatus* Fechner & Halling, gen. & sp. nov.**

Etymology. *Velo-* (veil) + *boletus* (genus of *Boletaceae*); *limbus-* (edge, rim, margin referring to the obvious veil remnant edge at the base of stipe).

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

Pileus (3–)6.5–9 cm broad, convex to plano-convex, dry, finely appressed squamulose, with squamules brown to deep reddish brown or reddish brown, overlying a dull red disc, dull yellow to bright yellow or dirty yellowish at margin, staining blue, with even or rarely a sterile projecting margin attached at stipe when young to form limbate rim on stipe base. *Flesh* pale yellow to pale lemon yellow, 1–2 cm thick, staining blue when exposed, with mild *odour* and slowly unpleasant to nearly bitter *taste*. *Hymenophore* adnexed to depressed around stipe, with tubes bright yellow to bright greenish yellow (2A–B7,6; Kornerup & Wanscher 1983), sometimes hardly bluing when young or staining blue-green when bruised at first, with pores olive yellow (3C8) to olive brown, then pores becoming brown. *Stipe* (4.5–)6.5–9.5 cm long, (1.5–)2–2.7(–5) cm broad, dry, terete or slightly flattened, equal to subclavate to clavate, sometimes with a pinched base, with a clearly defined limbate rim and tapering to base below that; surface bright lemon yellow above and heavily pruinose to subfloccose or fibrillose streaked, matted toward base, fading to whitish with age, pale pinkish red with fine appressed to suberect deep red to brown squamules below limbate rim (as in pileus), staining blue; interior solid, yellow, staining blue, with yellow (4B8) basal mycelium.

Basidiospores 9.6–15.2 × 3.5–4.9 μm, $x = 12.43 \times 4.30$ μm, $Q = 2.89$, $n = 100$, $p = 5$, smooth, subfusoid to ellipsoid, hyaline to pale yellow in KOH, hyaline to rarely weakly dextrinoid in Melzer's. *Basidia* 18–40 × 8–12 μm, 4-sterigmate, clavate, hyaline, inamyloid. *Pileus trama* interwoven with hyaline, thin-walled hyphae, 4–15.6(–20) μm broad. *Tube trama* boletoid and divergent, becoming gelatinised with age, with hyphae 4–15.6(–20) μm broad, hyaline in KOH and Melzer's. *Pleurocystidia* 32–41.6 × 8.8–12 μm clavate, thin walled, inamyloid. *Cheilocystidia* 8–34.4 × 6.4–10.4 μm obclavate to clavate, inamyloid, thin-walled. *Pileipellis* a trichodermium, composed of erect to suberect cylindrical elements, 3.2–9.6 μm broad, smooth, thin-walled, hyaline to occasionally very slightly dextrinoid. *Stipitipellis* a fragile and indistinct layer of cylindrical to clavate elements, 3.2–12 μm long, smooth, thin-walled, inamyloid, hyaline. *Clamp connections* absent.

Habitat & Distribution — Solitary to gregarious on soil or sand under *Allocasuarina* sp., *Eucalyptus* sp., and *Eucalyptus grandis*. At present, known in Queensland from the Tablelands west of Cairns southward to Fraser Island and the southern border of the state in the mountains west of the Gold Coast. In the months February to March, June.

Colour illustrations. Sclerophyll vegetation with *Eucalyptus* and *Allocasuarina* at Camp Milo of the Cooloola Sandmass near Fraser Island. Stipitipellis; basidiospores; pileipellis; holotype (REH9228); solitary basidiome (REH8746); sectioned basidiome (REH8917) showing universal veil attachment (arrows). Scale bars = 1 cm (entire basidiomes), 0.5 cm (sectioned basidiome); 10 μm (spores and stipitipellis), 40 μm (pileipellis).

Typus. AUSTRALIA, Queensland, Wide Bay District, Great Sandy National Park, Fraser Island, Kingfisher Bay, S25°23'35.7" E153°1'50.7", 8 m, 10 June 2009, R.E. Halling 9228 (holotype BRI AQ0794331, isotype NY 1393645; *rpb2*, *atp6*, *tef1* and LSU sequences GenBank MT747397, MT747398, MN413636 and MN393700, MycoBank MB832369 (genus), MB832370 (species)).

Notes — BLAST searches were conducted against the NCBI's GenBank nucleotide database for each of the six novel sequences using megablast in the blastn suite (Johnson et al. 2008). The results based on percent identity indicated consistent placement of *Veloboletus limbatus* in the subfamily *Xerocomoideae* (family *Boletaceae*). This was corroborated by a series of phylogenetic analyses of individual genes with selections of exemplars from across the *Boletaceae* (especially *Xerocomoideae*), *Paxillaceae*, and *Suillaceae*. A concatenated analysis of *tef1* and LSU was also done in this manner (see Supplement material FP1178). These analyses were conducted with MrBayes v. 3.2.7A (Ronquist et al. 2012) on the CIPRES REST API (Miller et al. 2015). In all cases, *Veloboletus limbatus* was consistently placed within a highly-supported *Xerocomoideae* (Bayesian posterior probability (bpp) = 1). With *tef1* and LSU, where more than one specimen of *V. limbatus* was available, the genus was fully supported (bpp = 1) in the individual and concatenated analyses. Though we were able to infer that *Veloboletus* belongs within subfamily *Xerocomoideae*, no clear sister group to *Veloboletus* was apparent.

As far as we know, there are no other members of the *Boletaceae* with a distinctive and conspicuous squamulose, universal veil rupturing to form an obvious limbate rim. That and the conspicuous cyanescence are diagnostic. *Xerocomoideae* is globally diverse and contains a number of iconic mushroom groups, including for example, *Boletellus*, *Aureoboletus*, *Phylloporus*, *Pulchroboletus*, *Heimioporus*, and *Xerocomus* s.str. It is notable that *Veloboletus limbatus* has a universal veil. According to the terminology of Cléménçon (2012), *V. limbatus* exhibits a cleistometablema. Several other epigeous stipitate-pileate *Xerocomoideae* exhibit veils that could be interpreted as universal (*Boletellus ananas*, *B. ananiceps*, *B. emodensis*, *B. deceptivus*, *B. singeri*, *Aureoboletus longicollis*), but in those species, the portion of the veil nearest the stipe is not physically connected to the stipe tissue. In *B. singeri* and *A. longicollis*, the veil can separate from the pileus margin and form an annular appendage. *Alessioporus ichnusanus*, a *Xerocomoideae* from southern Europe, is described as leaving a velar remnant on the stipe of mature fruiting bodies due to mixangiocarpic development (Gelardi et al. 2014a). Based on the combination of morphological features alone, we hypothesize the uniqueness of the taxon merits generic recognition. Clearly, the need for further exploration and collection of *Boletales* in Australasia, which harbours a diverse and unique mycota, is required. Future fieldwork or herbarium-based studies may uncover a sister group to *Veloboletus* or reveal additional species in the genus.

Supplementary material

FP1178-1 Additional materials examined.

FP1178-2 Bayesian phylogram of selected *Boletales*, especially subfam. *Xerocomoideae*.