Three Species of the Genus *Fuscoboletinus* Boletaceae Newly Recorded to Taiwan

三種褐孔小牛肝菌新紀錄種

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Abstract

This paper describes three species of newly recorded fungi belonging to the genus *Fuscoboletinus* Boletaceae of Taiwan. They are *Fuscoboletinus grisellus* (Peck) Pomerleau & Smith, *Fuscoboletinus ochraceoroseus* (Snell) Pomerleau & Smith, and *Fuscoboletinus paluster* (Peck) Pomerleau. In addition to *F. glandulosus* (Peck) Pomerleau & Smith already known in Taiwan, these three newly recorded species make the genus *Fuscoboletinus* on the island to the total of four species.

摘 要

本文描述並討論在台灣首次被發現的三種褐孔小牛肝菌新紀錄種，分別是淡褐孔小牛肝菌 (*Fuscoboletinus grisellus* (Peck) Pomerleau & Smith)、赭黃褐孔小牛肝菌 (*F. ochraceoroseus* (Snell) Pomerleau & Smith)及濕褐孔小牛肝菌 (*F. paluster* (Peck) Pomerleau)。加上已知的 *F. glandulosus* (Peck) Pomerleau & Smith ，台灣*Fuscoboletinus*屬共有四種。

Key words: *Fuscoboletinus grisellus, Fuscoboletinus ochraceoroseus, Fuscoboletinus paluster,* Boletaceae, Taiwan

關鍵詞：淡褐孔小牛肝菌、赭黃褐孔小牛肝菌、濕褐孔小牛肝菌、牛肝菌科、台灣

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Introduction

The genus *Fuscoboletinus* comprises the species that were once in the genera *Boletinus* and *Suillus* but were later excluded from the two genera. The species in *Boletinus* that have been transferred to *Fuscoboletinus* include those having hyphae of fruit body without clamp connections and those having viscid to glutinous pileus and separable hymenophore (Pomerleau and Smith 1962; Pomerleau 1964). The species in *Suillus* that have been transferred are those having purple, brown or chocolate-gray spore deposit, instead of cinnamon to olive print, such as *S. aeruginascens* (Secr.) Snell and *S. glandulosus* (Peck) Singer (Singer *et al.* 1963; Smith and Thiers 1971). They form mycorrhizal association with the species of the genera *Larix*, *Pinus*, *Abies* and *Picea* (Ying and Zang 1994).

There are a total of nine species of *Fuscoboletinus* in the world, but only the species *F. glandulosus* (Peck) Pomerleau and Smith has been reported in Taiwan (Chen and Yeh 2000). This paper describes three species of fungi belonging to the genus *Fuscoboletinus* as the new records to Taiwan. This makes a total of four known species of *Fuscoboletinus* on the island.

Specimens of fresh fruit bodies of boletes were collected and brought back to the laboratory. According to the conventional mycological methods described by Largent *et al.* (1977), the specimens were sectioned by hands, soaked in drops of the 10% NH_4OH solution, mounted in drops of 1% aqueous phloxine solution, and then examined under microscope with magnifications of 100-, 400- and 1,000-fold separately. Melzer's reagent was used in detecting amyloidity and dextrinoidity, and the ammoniac 1% Congo Red solution staining method was used for further examination (Bas 1969). After examination they were dried in warm air and deposited in the Taiwan Endemic Species Research Institute as described by Chen *et al.* (2002).

Fuscoboletinus grisellus (Peck) Pomerleau & Smith

Boletinus grisellus Peck, Mem. N. Y. State Mus. 3: 169. 1900.
Fuscoboletinus grisellus (Peck) Pomerleau & Smith, Brittonia 14: 168. 1962.

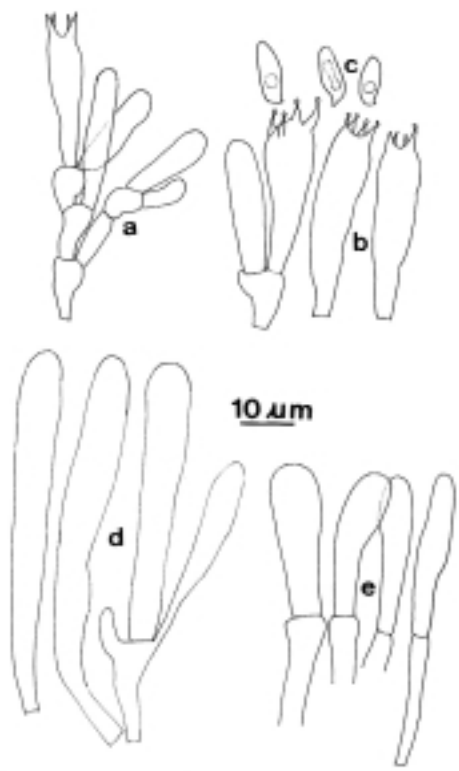

Fig. 1. *Fuscoboletinus grisellus* (a, hymenium; b, basidia; c, basidiospores; d, pleurocystidia; e, caulocystidia).

Pileus 3-6 cm broad, obtuse to broadly conic; surface glabrous to appressed-fibrillose, slightly viscid beneath fibrils when fresh; color pale dull olive, becoming pallid to grayish olivaceous or occasionally tinted with yellow, avellaneous in age, at times drying dull brown; margin inrolled when young, often decorated with remnants of submembranous grayish veil; context thick, cottony, whitish or faintly olivaceous, unchanging when cut; odor and taste not distinctive. Tubes 3-5 mm long, adnate to decurrent, scarcely separable, pallid to grayish when young, in aged yellowish, finally dull brownish; pores concolorous with tubes, round to angular, often sublamellate in radiating lines. Stipe 5-9 cm long, 0.4-0.7 cm thick, equal, straight; surface somewhat reticulate above annulus, nearly glabrous below, whitish or pallid becoming yellowish, rarely bluish when handled; context solid, whitish above annular zone, becoming yellow below; veil submemranous, well-formed annulus rare. Spore deposit gray-brown to chocolate-gray. Spores 10.5-12.5 x 4-5 μm, smooth, broadly elliptic to subovate in face view, inequilateral with shallow suprahilar depression in profile, hyaline to pale olive gray in KOH, ochre in Melzer's. Basidia 30-35 x 7-8.5 μm, mostly clavate to subcylindric, thin-walled, 4-spored, sterigmata 4.5-5.5 μm long, basidioles often subglobose in clusters on short branch hyphae, hyaline in KOH, in Melzer's mostly pale yellow. Pleurocystidia 65-85 x 7-9 μm, mostly subcylindric with rounded apices, thin-walled, sometimes with coagulated and amorphous, then brown in KOH, fasciculate, incrusted at base of fascicle with brown granular material, mostly hyaline in KOH, ochre yellow in Melzer's. Cheilocystidia 60-80 x 5-8 μm, similar to pleurocystidia. Caulocystidia 26-35 x 7-10 μm, subcylindric to clavate, apices rounded, septate, terminal cell often expanded, thin-walled, mostly hyaline in KOH, numerous, mixed with scattered caulobasidia; cuticular hyphae at base of stipe of variously inflated cells, not considered to be caulocystidia. Tube trama interwoven type, hyaline in KOH, nonamyloid. Pileal cuticle consisting of parallel, nongelationous, radial hyphae that are 7-10 μm thick, light yellowish-brown to cinnamon color in KOH. No clamp connections were observed.

Collection Locality：Taitung County, Shiang-Yang, elevation 2,300m, C. M. Chen 2929 (14. Ⅶ. 2001.).

Habitat: Cespitose on humus in rocky soil of *Pinus taiwanensis* Hayata in summer.

Distribution: Taiwan, North America, China (Sichuan, Yunnan, Tibet, Heilongjiang).

Remarks: *F. grisellus* is distinguishable from other congeneric species by having a typical conic-umbonate pileus and submemranous veil, and having a well-formed annulus. Also, it is much less viscid than *F. glandulosus*. It has no characteristic squamules on pileus like those of *F. ochraceoroseus* and *F. paluster*.

Fuscoboletinus ochraceoroseus (Snell) Pomerleau & Smith

Boletinus ochraceoroseus Snell, Mycologia 33: 35. 1941.

Fuscoboletinus ochraceoroseus (Snell) Pomerleau & Smith, Brittonia 14: 157. 1962.

Pileus 4-9 cm broad, convex to sub-umbonate, becoming plane or the margin slightly uplifted; surface dry and pitted, fibrillose to

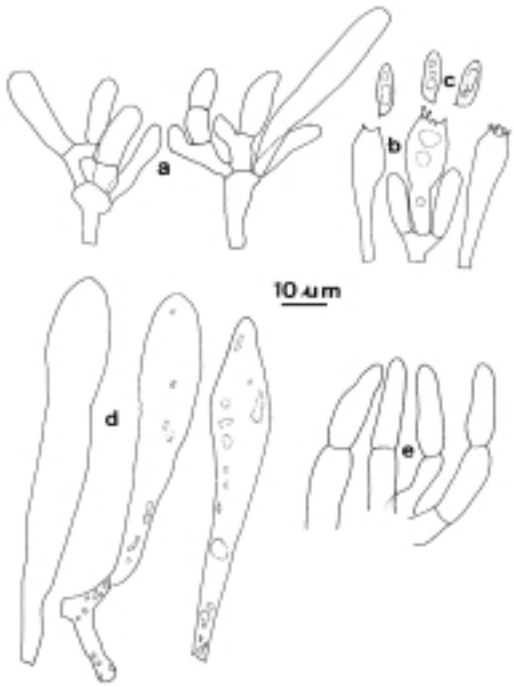

Fig. 2. *Fuscoboletinus ochraceoroseus* (a, hymenium; b, basidia; c, basidiospores; d, pleurocystidia; e, caulocystidia).

fibrillose-squamulose, the scales usually appressed toward the margin, variable in color; margin incurved and appendiculate with fragments of broken veil when young. Context thick, soft, pale bright yellow, often with a pinkish red zone under fibrils, unchanging when bruised. Hymenophore 3-5 mm thick, adnate to decurrent, boletinoid, dull olive-ocher to ding brown, pores compound, 2-4 x 1-2 mm broad, elongated to mostly angular, radiately arranged to sublamellate. Stipe 3-5 cm long, 1-1.8 cm broad, solid, subequal with subbulbous base, concolorous with tubes and reticulate at apex. Annulate, pallid to yellowish, usually adhering to margin of pileus. Spore deposit dark vinaceous-brown. Spores 9.5-12 x 4-4.5 μm, yellowish in KOH, subcylindric to slightly inequilateral, smooth, a few dextrinoids in Melzer's. Basidia 26−32 x 8−9 μm, narrowly clavate to subcylindric, 4−spored, sterigmata 2-3 μm long, subhyaline in KOH. Pleurocystidia 60−90 x 11−15 μm, scattered to abundant, subcylindric to subventricose, obtuse to abruptly acute, thin-walled, often flexuous, punctate and incrusted with brownish material when fasciculated. Cheilocystidia similar to the pleurocystidia but smaller, usually in clusters. Caulocystidia septate, terminal cell 15−25 x 5−7 μm, subcylindric to clavate, apices rounded, thin-walled, mostly hyaline in KOH, numerous, mixed with scattered caulobasidia. Tube trama parallel type, 80−90 μm thick, pallid melleous in KOH, hyphae 7−9 μm in diameter, thin-walled. No clamp connections were observed. Pileus trama of loosely interwoven hyphae 6−21 μm in diameter, hyaline in KOH, thin-walled, gelatinous. Pileus surface layer composed of compactly interwoven, cylindrical hyphae, 8−23 μm broad.

Collection Localities：Taichung County, Da-Shiu-Shan, elevation 2,350m, C. M. Chen 2884 (27. VI. 2001.); Taitung County, Shiang-Yang , elevation 2,300m, C. M. Chen 2935 (14. VII. 2001.).

Habitat: Solitary to densely gregarious under *Pinus taiwanensis* Hayata in spring to late summer.

Distribution: Taiwan, North America, China (Sichuan, Yunnan, Guizhow, Tsinghai, Tibet).

Remarks: *F. ochraceoroseus* is a common bolete in Taitung and may be found in colors ranged from dark lemon-yellow to brick-red. Its pileus is always densely tomentose to fibrillose

over the surface. The stipe is short. *F. paluster* and *Suillus spraguei* (Berk. *et* Curt.) Kuntze are the other species to have densely tomentose, but differ from *F. ochraceoroseus* in other characters. *F. paluster* has a narrow stipe, and its pileus surface is deep red from the colored floccose-tomentose covering, which breaks up into fibrillose squamules on the pileus. *S. spraguei* is fairly similar in coloration to *F. ochraceoroseus*, but the former is associated with *Pinus morrisonicola* Hay. and the latter to *P. taiwanensis* Hay. Also, the spore deposit color of *S. spraguei* is olive-brown to tawny-olive, not tinted with vinicolor like that of *F. ochraceoroseus*.

Fuscoboletinus paluster (Peck) Pomerleau

Boletus paluster Peck, Ann. Rept. N. Y. State Cab. 23: 132. 1872.

Boletinus paluster (Peck) Peck, Bull. N. Y. State Mus. 298: 78. 1889.

Boletinellus paluster (Peck) Murr., Mycologia 1: 8. 1909.

Fuscoboletinus paluster (Peck) Pomerleau, Mycologia 56: 708. 1964

Pileus 0.8-7 cm broad, irregularly umbonate when young, expanding to convex-umbonate or nearly plane when aged; surface floccose-tomentose covering which breaks up into fibrillose squamules; margin entire, thin, incurved; color wine red to deep red; context yellow, red under cutis, soft, unchanging when bruised; taste mildly acid, odor not distinctive. Tubes shallow (about 2 mm deep), decurrent, yellow and finally becoming dingy ochraceous, unchanging when bruised. Pores large, angular

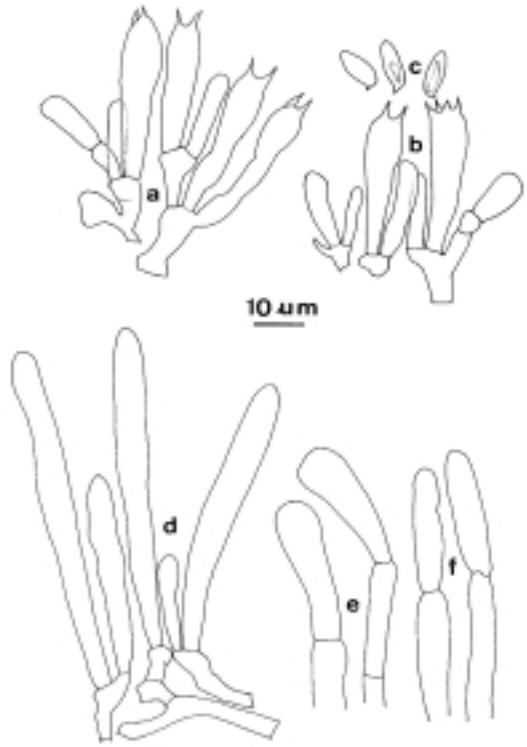

Fig. 3. *Fuscoboletinus paluster* (a, hymenium; b, basidia; c, basidiospores; d, pleurocystidia; e, caulocystidia at apex; f, caulocystidia at base).

in radial arrangement or sublamellate with crossveins. Stipe 3-5 cm long, 7-10 mm thick, equal to tapering downward, solid, surface finely pruinose; concolorous with pileus, yellow band at apex covered with decurrent reticulation, base yellow mycelioid; context yellow to pallid, soft, unchanging when bruised. Spore deposit dark purplish brown when moist, pinkish brown when air-dried. Spores 9-11.5 x 3.5-4.5 μm, inequilateral, narrow, slight suprahilar depression in profile, oblong in face view, smooth, hyaline in KOH, yellow in Melzer's. Basidia 29-35 x 7-8 μm, elongate-clavate to sub-cylindrical, thin-walled, 2 or 4–spored,

Fig. 4. Basidiomes (a and b, *Fuscoboletinus glandulosus*; c and d, *Fuscoboletinus grisellus*; e, *Fuscoboletinus ochraceoroseus*; f, *Fuscoboletinus paluster*; scale bar = 1 cm) .

sterigmata 5–7 μm long, hyaline in KOH, pale yellow in Melzer's. Pleurocystidia 55–104 x 6.5–11 μm, subcylindric, apices rounded, thin-walled, hyaline in KOH, pale yellow in Melzer's. Cheilocystidia 20–80 x 6–11 μm, cylindric, clavate to subventricose, thin-walled, hyaline in KOH, pale yellow in Melzer's. Caulocystidia at apex of stipe 25–52 x 8-10 μm, subcylindric,

clavate to clavate-mucronate, thin-walled, hyaline in KOH, at the base 25−40 x 6−9 μm, mostly clavate, septate, terminal element often obclavate, thin-walled, hyaline in KOH. Tube trama interwoven type, hyaline in KOH, nonamyloid, basal cell with clamp connections but difficult to find. Pileal cuticle a non-gelatinous trichodermium, end cells 7−12 μm thick, pale yellow in KOH, red to red-brown in Melzer's.

Collection Locality：Taitung County, Shiang-Yang, elevation 2,312m, C. M. Chen 2933 (14. Ⅶ. 2001.).

Habitat: Solitary to densely gregarious under *Pinus taiwanensis* Hayata in summer.

Distribution: Taiwan, Japan, North America, China (Sichuan).

Remarks: *F. paluster* is distinguishable from its congeneric species by having vinaceous red pileus, large and almost lamellate hymenophore, and the reaction of hyphae of its trichodermium in Melzer's. It is closely related to *Boletinus asiaticus* Sing., but the two species are distinguishable in the field. *B. asiaticus* has fistulose stipe and prominent partial veil, of which the latter covers lamellae from the stipe to the margin of pileus, whereas *F. paluster* has a solid stipe and evanescent annulus. Also, *B. asiaticus* has pileus of 4−12.5 cm in diameter, longer than 0.8−7 cm for *F. paluster*, and the former has spores of 10−12 μm in length, longer than 8−10 μm for the latter.

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