Taiwania, **43**(2): 132-139, 1998

The Boletes of Taiwan (IX)

Chien-Ming Chen[1,3], Jen-Jye Peng[1]and Kai-Wun Yeh[2]

(Manuscript received 15 April 1998; accepted 30 May 1998)

ABSTRACT: Four boletes newly recorded from Taiwan are described and illustrated. They are *Boletus speciosus* Frost, *Porphyrellus atrofuscus* Dick & Snell, *Pulveroboletus ravenelii* (Berk. *et* Curt.) Murrill, and *Xanthoconium affine* (Pk.) Sing. For each species a note is given and briefly discussed.

KEY WORDS: Boletes, Taiwan.

INTRODUCTION

The bolete flora of Taiwan is of particular interest because Taiwan is an isolated island in which the climate is strongly modified by the surrounding seas. Historically, the first record of the bolete flora of Taiwan come from the Japanese researchers (Sawada, 1933, 1959; Kida, 1937) who described seven species of the boletes genera representing *Boletus, Suillus* and *Xerocomus*. The study of boletes was continued by Yeh and Chen (1980, 1981, 1982, 1983, 1985) who described forty-five species. The literatures constitute a wealth of resources for study the bolete of Taiwan. The abundance of boletes perhaps correlated with the diversified forests, and probably many more remain to be identified. Thorough foray investigation of bolete in Taiwan is compulsory, thereby field in central Taiwan has been carrying out since 1992 and parts of the result of the survey have been published by Chen and the other (1997). In this paper, four boletes species newly recorded from Taiwan are reported. Among them, the ocuurence of the genus *Pulveroboletus* Murrill and *Xanthoconium* Singer are firstly rewarded in the regions.

MATERIALS AND METHODS

Fresh fruit bodies were collected and examined in fresh condition. Spore prints were made from segments of fruit bodies placed on white paper. Subsequently the fruit bodies were dried under circulating air at 40 ℃, the dried specimen were deposited in the mycological lab. of the Taiwan Endemic Species Research Institute (TESRI). Conventional

1. Taiwan Endemic Species Research Institute, Taiwan, Republic of China.
2. Department of Botany, National Taiwan University, Taipei 106, Taiwan, Republic of China.
3. Corresponding author.

mycological techniques for examination of specimens were used throughout this study (Largent, 1977). Fruiting bodies were sectioned by free hands and mounted in a mixture of 1% aqueous phloxine and 3% KOH solution for microscopic examination.

RESULTS AND DISCUSSION

1. Boletus speciosus Frost, Bull. Buff. Soc. Nat. Sci. **2**: 101, 1874. Figs. 1 & 5

Pileus 7-12 cm broad, hemispheric to broadly convex, margin incurved and even, surface dry, inherently felted, rose-pink to vinaceous russet with some yellowish areas at maturity, context 10-16 mm thick, moderately firm, pale yellow, quickly turning blue when cut. Tubes 6-10 mm deep, adnate but varying to slightly depressed, with decurrent reticulations on the stipe, bright yellow, immediately turning blue, then darker blue-brown when bruised. Pores 0.3-0.5 mm broad, lightly stuffed when young, often dull reddish at maturity. Stipe 4-10 cm long, 1.5-3 cm thick, equal to clavate, some pinched at very base, solid, bright yellow toward the base, becoming paler toward the apex, reddish at base and in damaged area, surface finely reticulated over upper half or overall, context quickly turning blue but in the base often chrome-yellow when cut. Spore print olive-brown. Spores 11-15 x 3-4 μm, smooth, narrowly oblong to subfusoid with subacute ends in face view, narrowly inequilateral to subcylindric in profile view, pale ochraceous in KOH solution, yellow to pale tawny in Melzer's reagent. Basidia 24 -27 x 8-9 μm, clavate, sterigmata two or four, 7-9 μm long, yellow in KOH solution or Melzer's reagent. Pleurocystidia 33-45 x 8-12 μm, narrowly ventricose to fusoid with subacute apex, walls sometimes flexuous, hyaline to yellowish in KOH solution or Melzer's reagent. Tube trama divergent and gelatinous, the hyphae hyaline, thin-walled and smooth with some dextrinoid debris along the hymenium. Pileus cuticle matted down into a layer of interwoven hyphae, hyphae 3-5 μm wide, the hyphae cells tubular, the end-cells tubular and obtuse.

This species is apparently most closely related to *B. regius* Krombholz, but the spores of the former are wider, and has a more elongated stipe, and the flesh immediately turns blue when pruised. In our collections the characters of the species agree with the lectotype designated by Smith and Thiers, in having identical narrow, cylindrical spores, a pileus cutis of appressed hyphae 3-5 μm wide, in staining blue when injured, and in having rose tints lower down on the stipe.

Habitat: Scattered under broad-leaved forest.

Distribution: Taiwan, China, Japan, North America, Europe.

Nantow, Shanlinhsi, alt. 1750m, Nov. 5, 1997. Chen Chien-Ming (1980).

2. Porphyrellus atrofuscus Dick & Snell, Mycologia **52**: 449, 1960. Figs. 2, 6 & 9

Pileus 3-7 cm broad, convex, margin decurved, surface dry and velutinous, dark olivaceous-brown, context white, becoming bluing-gray when cut. Tubes 3-6 mm deep, depressed to more or less free, whitish, becoming honey yellow at first, then grayish upon exposure. Pores whitish at first, becoming ochraceous to a reddish-fawn color. Stipes 3.5-7 cm long, 4-7 mm thick, equal or tapering upward, solid, yellowish in the cortex in the apical

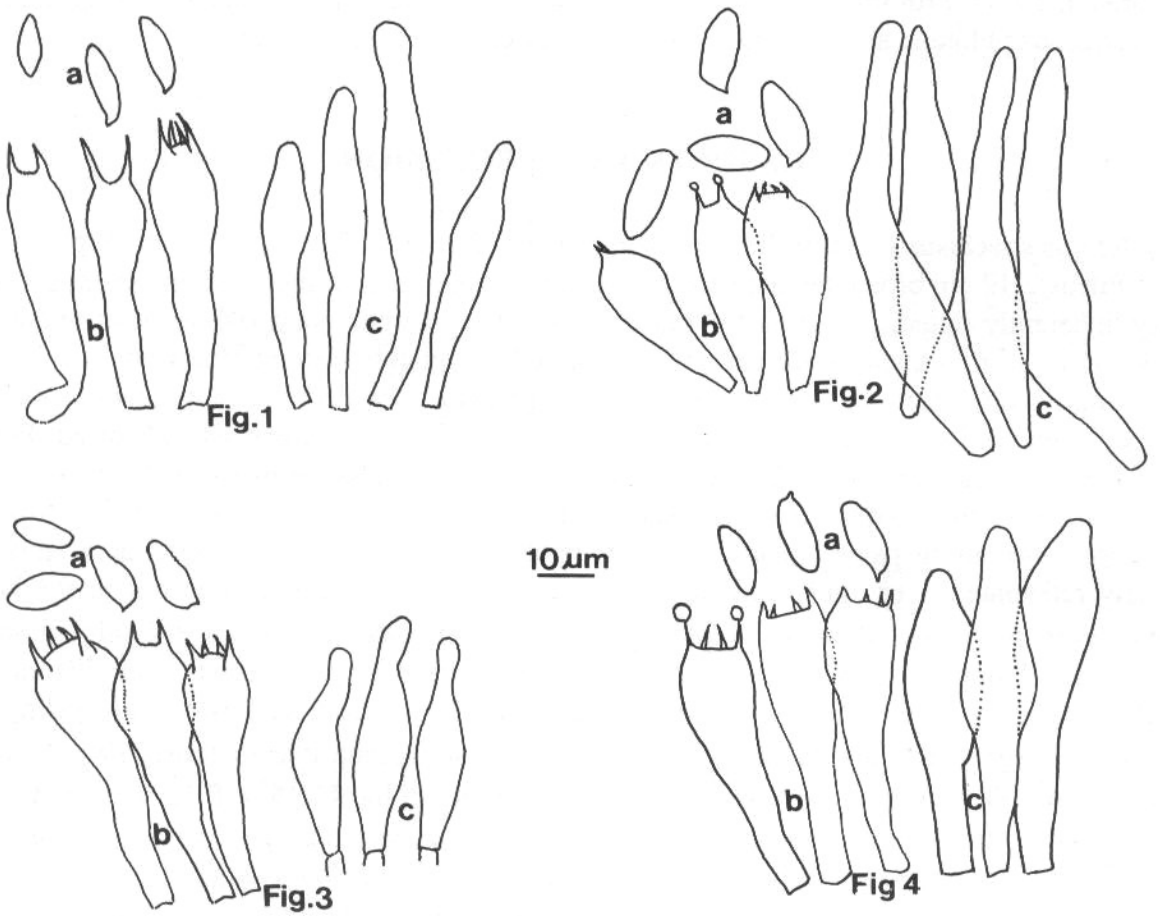


Fig. 1. *Boletus speciosus*; Fig. 2. *Porphyrellus atrofuscus*; Fig. 3. *Pulveroboletus ravenelii*; Fig. 4. *Xanthoconium affine*. a: basidiospores; b: basidia; c: pleurocystidia.

and middle region but reddish in base when cut, slowly changing to grayish except the base; surface nearly concolorous with pileus or lighter, minutely and closely furfuraceous at first, becoming brownish striae or furfurescence when elongated. Spore print chestnut brown. Spores 12.5-16.5 x 5.5-6 μm, subellipsoid or oblong- ellipsoid. Basidia 30-35 x 13-15 μm, clavate, sterigmata four, 4-5 μm long. Pleurocystidia 65-85 x 10-15 μm, stalked, somewhat ampullaceous with a elongated and poited tip. Tube trama of hyphae divergent from a central strand, 6-7 μm wide, hyaline, thin-walled and smooth.

The distinctive features of the species are by the sooty-olivaceous, velutinous pileus with whitish flesh blackening to grayish when bruised. Scanning electron microscopy revealed that the spore surface is relatively smooth (Fig. 9), in contrast to the punctuate spores of *P. gracilis* (Pk.) Sing. (Fig. 10).

Habitat: Scattered under broad-leaved forest.

Distribution: Taiwan, North America.

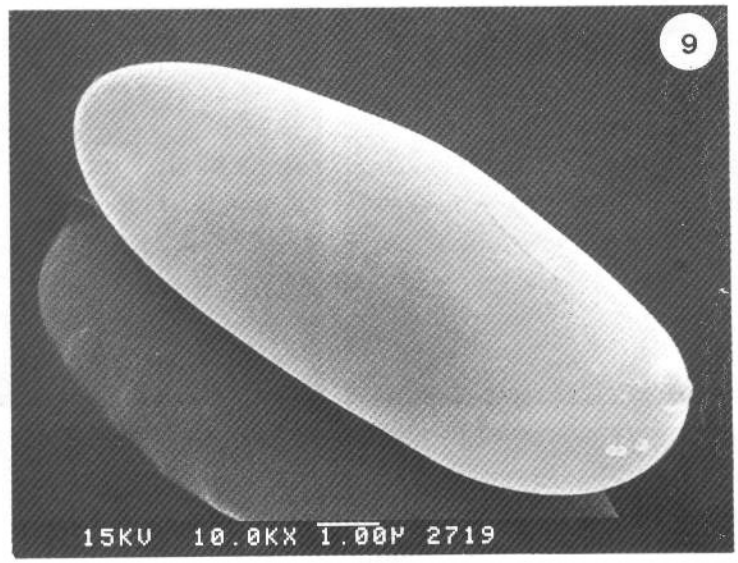
Nantou : Shanlinhsi, alt. 1750m, Sept. 18, 1996. Chen Chien-Ming (1415).

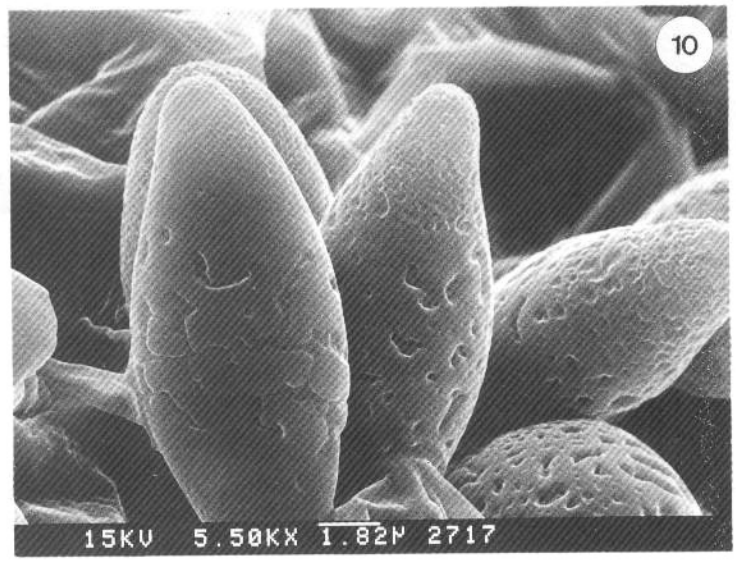
Fig. 5. *Boletus speciosus*; Fig. 6. *Porphyrellus atrofuscus*; Fig. 7. *Pulveroboletus ravenelii*; Fig. 8. *Xanthoconium affine.*

3. Pulveroboletus ravenelii (Berk. et Curt.) Murill, Mycologia **1**: 9, 1909. Figs. 3 & 7

Boletus ravenelii Berk. *et* Curt., Ann. Mag. Nat. Hist. II . 12: 429, 1853.

Pileus 3-8 cm broad, convex, becoming nearly plane, surface glabrous, dry, dull, areolate in age, margin entire, incurved, often with remnants of veil, color bright yellow when young, becoming ochre to yellow brown in age, sometimes brownish red, context pale yellow, becoming grayish upon cutting or exposure. Tubes 4-10 mm deep, adnate, depressed around the stipe, color at first yellow then light brownish olive, sometimes olive yellow. Pores 0.5-1 mm broad, concolorous with tube, round or subangular, blue when bruised, then brown, finally dark brown. Stipe 6-8.5 cm long, 7-12 mm thick, mostly equal, annulate, pulverulence from universal veil over lower half. Spore print olive-brown. Spores 11-14 x 4.5-5.5 μm, shape narrowly boat-shaped in face view, narrowly inequilateral in profile view, thin-walled, smooth, pallid-ochraceous in KOH solution, ochre brown in Melzer's reagent. Basidia 40-50 x 11-14 μm, clavate, thin-walled, sterigmata two or four, 5-6 μm long, hyaline in KOH, pale yellowish in Melzer's reagent. Pleurocystidia 30-45 x 7-12 μm, fusoid-ventricose, neck often curved. Pileal cuticle an undifferentiated pellicle of tangled interwoven hyphae, 3-6 μm wide. Clamp connections absent. Tube trama gelatinous and of divergent hyphae.





Figs. 9-10. Scanning eletron micrographs of basidiospores. Fig. 9: *Porphyrellus atrofuscus*, 10000x; Fig. 10: *P. gracilis*, 5500x

P. ravenelii is charaterized by the bright yellow sporocarp with powdery membranous veil, and at maturity leaves an annulus on the stipe. The hyphal components of veil are interwoven, smooth-walled, yellow, and branched. The hyphae fade quickly in KOH, but bunches of greenish crystals and amorphous debris often precipitate in KOH solution. Its surface is not a true pulverulence due to the composition of loose sphaerocysts.

Habitat: Scattered under *Myrsine sequinii* Levl.

Distribution: Taiwan, China, Japan, Malaysia, North America.

Nantou, Sun Moon Lake, alt. 800m, Aug. 23, 1994. Chen Chien-Ming (713).

4. Xanthoconium affine (Peck) Singer, Amer. Midl. Nat. **37**: 88. 1947. Figs. 4 & 8

Boletus affine Peck, Ann. Rept. N. Y. State Mus. **25**: 81. 1873.

Pileus 3-7 cm broad, convex to plane, sometimes centrally depressed, surface subtomentose and rugulose, dry, subviscid when wet, margin entire, becoming rimose in age, color of various shades of dull yellow brown to light cinnamon brown, context white, unchanging when cut. Tubes 5-9mm long, depressed at stipe, color ochraceous. Pores 1-3 mm broad, circular or angular, concolorous with tube, staining yellowish slightly when injured. Stipe 3.5- 6.5 cm long, 0.6-1.1 cm thick, slightly enlarged downward, but pointed at base, solid, surface with low longitudinal ridges, color pallid and pruinose at apex, base white, context white and unchanging when cut.Spore print ochraceous buff. Spores 13-15 x 5.5-6 μm, oblong in face view, narrowly inequilateral in profile, smooth, pale dingy yellow in KOH solution. Basidia 45-52 x 13-15 μm, subclavate, hyaline in KOH solution, sterigmata four, 5-6 μm long. Pleurocystidia 53-75 x 12-15 μm, fusoid-ventricose or sometimes lageniform, thin-walled, hyaline in KOH solution. Tube trama parallel to obscurely divergent, subgelatinous. Pileal cuticle an epithelium, the end cells cystidioid and clavate to ventricose, 30-70 x 15-20 μm, brown in KOH solution. Clamp connections absent.

This bolete is distinguished by the stipe with longitudinal ridges and spores with pale golden yellow tints in KOH solution. Microscopically, the specimen has larger basidia and pleurocystidia than the collection made in Michigan; however, it does degree with the Peck type as reported by Smith & Thiers (1971). This species is common in the south province of China, but rare in the central area of Taiwan in spite of the presence of preferred hardwood photosymbionts.

Habitat: Solitary under broad-leaved forest.

Distribution: Taiwan,China, Japan, North America.

Nantou : Shanlinhsi, alt. 1750m, Jun. 8, 1994. Chen Chien-Ming (410).

LITERATURE CITED

Chen, C.-M., H.-W. Huang, and K.-W. Yeh. 1997. The Boletes of Taiwan (VI) Taiwania **42**: 154-160.

Chen, C.-M., H.-W. Huang, and K.-W. Yeh. 1997. The Boletes of Taiwan (VII) Taiwania **42**: 174-179.

Chen, C.-M., J.-J. Peng, and K.-W. Yeh. 1997. The Boletes of Taiwan (VIII) Taiwania **42**: in press.

Kida, T. 1937. A Glimpse of Mushrooms in Mt. Niitaka and Its Vicinity. Trans. Taihoku Agr. & Forestry J. Coll. 2: 360-366.

Largent, D. L. 1977. How to Identify Mushrooms to Genus I: Macroscopic Features. 2nd. ed. pp. 86. Mad River Press Inc, Eureka, Ca., U.S.

Sawada, K. 1933. Descriptive Catalogue of Taiwan (Formosan) Fungi. VI. pp. 56.

Sawada, K. 1959. Descriptive Catalogue of Taiwan (Formosan) Fungi. Pt. XI. pp. 116. Special Publ. Coll. Agric. Natl. Taiwan Univ.

Singer, R. 1945. Note and Brief Articles. Mycologia **45**: 799.

Smith, A. H. and H. D. Thiers. 1971. The Boletes of Michigan. Univ. of Michigan Press, Ann Arbor. pp. 428.

Yeh, K.-W. and Z.-C.Chen. 1980. The Boletes of Taiwan (I). Taiwania **25**: 166-184.

Yeh, K.-W. and Z.-C. Chen. 1981. The Boletes of Taiwan (II). Taiwania **26**: 100-115.

Yen, K.-W. and Z.-C. Chen. 1982. The Boletes of Taiwan (III). Taiwania **27**: 52-63.

Yen, K.-W. and Z.-C. Chen. 1983. The Boletes of Taiwan (IV). Taiwania **28**: 122-127.

Yen, K.-W. and Z.-C. Chen. 1985. The Boletes of Taiwan (V). Trans. Mycol. Soc. R.O.C. **1**: 71-76.

臺灣之網孔蕈類(九)

陳建名[1,3]、彭仁傑[1]、葉開溫[2]

(收稿日期：1998 年 4 月 15 日；接受日期：1998 年 5 月 30 日)

摘　　要

本文描述並討論在台灣首次被發現的四種牛肝菌新紀錄種，分別是華美牛肝菌 (*Boletus speciosus* Frost)、黑棕紅牛肝菌 (*Porphyrellus atrofuscus* Dick & Snell)、粉末牛肝菌 (*Pulveroboletus ravenelii* (Berk. *et* Curt.) Murr.及褐金孢牛肝菌 (*Xanthoconium affine* (Pk.) Sing.)。

關鍵詞：牛肝菌，台灣。

1. 台灣省特有生物研究保育中心，南投縣集集鎮民生東路 1 號，臺灣，中華民國。
2. 國立台灣大學植物系，臺北市 106，臺灣，中華民國。
3. 通信連絡員。