Taiwania, **49**(2): 109-117, 2004

Four *Tylopilus* Species (Boletaceae) New to Taiwan

Chien-Ming Chen[1, 3], Yuan-San Ho[1], Wen-Neng Chou[2] and Tzy-Chau Lin[1]

(Manuscript received 21 April, 2004; accepted 18 May, 2004)

ABSTRACT: Four species of *Tylopilus* (Boletaceae) are reported as new records in Taiwan. They are *Tylopilus albofarinaceus* (Chiu) Tai, *Tylopilus gracilis* (Peck) Henn., *Tylopilus neofelleus* Hongo, and *Tylopilus vinosobrunneus* Hongo.

KEY WORDS: ***Tylopilus albofarinaceus, Tylopilus gracilis, Tylopilus neofelleus, Tylopilus vinosobrunneus*, Taiwan.**

INTRODUCTION

Hymenophores of fungi in the genus *Tylopilus* (Boletaceae) are white or pale grayish white in color when young, and become vinaceous or reddish brown when old. Their spore deposits are vinaceous, vinaceous-brown, purplish brown or rusty ferruginous, but rarely olivaceous tint. There are two distribution centers of *Tylopilus* in the world: the tropical Asia and Central America (Singer *et al.*, 1991).

According to the specimens collected by Chen *et al.* (1999), the taxa of *Tylopilus* in Taiwan are similar to those in the northeast Asia and those from the southwest China. However, there are eight species of this genus previously reported from Taiwan (Chen and Peng, 1998) far less than known from the northeast Asia and the southwest China which have 31 taxa (Imazeki and Hongo, 1989; Ying and Zang, 1994). In this paper we describe four other species which are all new records to Taiwan. Up to the present, a total of 12 species of *Tylopilus* have been found in Taiwan.

MATERIALS AND METHODS

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 3% KOH solution, mounted in drops of 1% aqueous phloxine solution, and examined under microscope with magnifications of 100-, 400- and 1,000-fold. 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 the examination they were dried in warm air and deposited in the Taiwan Endemic Species Research Institute (Chen *et al.*, 2002).

1. Endemic Species Research Institute, Chichi, Nantou 540, Taiwan.
2. National Museum of National Science, 1, Kuan-Chien Road, Taichung 400, Taiwan.
3. Corresponding author. Tel: 886-49-2761331 ext. 331; Email: super@tesri.gov.tw

RESULTS

Tylopilus albofarinaceus (Chiu) Tai, Sylloge Fungorum Sinicorum, p. 757. 1979.

Boletus albofarinaceus Chiu, Mycologia 40: 209. 1948.

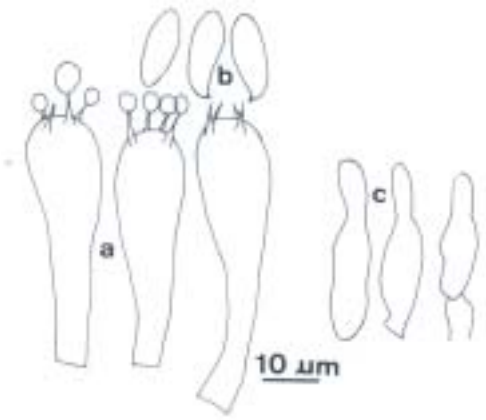

Fig. 1. *Tylopilus albofarinaceus*. a: Basidia. b: Basidiospores. c: Pleurocystidia.

Pileus 3-5 cm broad, convex to broadly convex; margin incurved slightly and without hymenium for about 1-1.5 mm; surface dry, glabrous, somewhat shiny and tacky to the touch when moist; color white-pulverulent when young, and cinnamon-brown on the disc center when old; context pallid, spongy, unchanging when cut, taste acidulous, odor none. Tubes 7-11 mm long, ventricose and depressed around the stipe, pallid vinicolor to pallid purple-brown. Pores 0.8-1 mm broad, angular, concolorous to tubes or dark vinaceous, unchanging when bruised. Stipe 6-7 cm long, 7-8 mm thick, expanding toward base, surface of young specimens with pruinose ornamentation except its yellowish base, and becoming glabrous with brown fibrils slightly striated toward the base in old specimens. Flesh whitish, fibrous, yellowish to ochraceous yellow at the basal part of the stipe. Spore deposit vinaceous to vinaceous-brown. Spores 11-14 × 5-7 μm, ellipsoid, smooth, thin-walled (Fig. 1b), ochraceous yellow in KOH, golden yellow in Melzer's reagent. Basidia 35-42 × 14-15.5 μm, clavate, thin-walled, with four spores (Fig. 1a), hyaline in KOH, pale yellow in Melzer's reagent. Pleurocystidia absent or if present only as ventricose-rostrate pseudocystidia imbedded in the hymenium, which is 21-32 μm long, 6-7 μm broad at the bottom (Fig. 1c). Tube trama bilateral. Mediostratum 20-30 μm thick with a color on comparatively compact mediostratum and exterior to its hyphae diverging to subhymenium. Epicutis of pileus like a loosely interwoven pellicle, hyphae gelatinous and 3-4 μm in diameter, yellowish to hyaline. Clamp connections absent.

Collection Locality: Chiayi Co., Da-Tung-Shan, elevation 1,500 m, *C. M. Chen 3240* (14 June, 2002).

Habitat: Solitary under broad-leaved forest.

Distribution: Taiwan, China (Yunnan, Guizhow).

Remarks: The distinguishing features of *T. albofarinaceus* are the white-pulverulent caps when young and enlarged downward stipes with yellowish area at base. This species is closely related to *Tylopilus javanicus* P. Henn. which also has glabrous cap, but its stipes are equal in length and flesh of its caps has a mild sweet taste.

Tylopilus gracilis (Peck) Henn., in Engler & Prantl, Nat. Pflanzenfamilien 1: 190. 1897.

Boletus gracilis Peck, Ann. Rept. N. Y. State Mus. 24: 78. 1872.
Porphyrellus gracilis (Peck) Singer, Farlowia 2: 121. 1945.

Pileus 3-5 cm broad, hemispheric to convex; surface dry and granulose when young and areolate in age, chestnut-brown or paler but often in cinnamon color except for the pale flesh

showing in areolate pileus; margin with a very narrow sterile band; context up to 0.8 cm thick, white to pallid or tinged incarnate near the cuticle, unchanging when bruised or cut, floccose but soft to the touch, taste mild, odor not distinctive. Tubes up to 10 mm deep, deeper than flesh of pileus, deeply depressed around the stipe, color white to pallid, becoming flesh colored to vinaceous. Pores each 1 mm, brownish color when bruised. Stipe 6-12 cm long, 4-7 mm thick at apex, 0.8-1.5 cm at base, much longer than width of pileus, often curved, surface finely granular to pruinose, often with longitudinally striates; color white at apex, white mycelioid at base, the remaining areas nearly similar to the color of pileus in well-developed basidiocarps but often with a paler cinnamon-tan, solid; context white, unchanging when bruised. Spore deposits dark purplish or vinaceous brown; spores (10)14-15(15.5) × 5-6(7) μm, narrowly ovoid to subelliptic in face view and inequilateral in profile view (Fig. 2b), smooth, thick-walled, greenish in KOH, yellow ochre in Melzer's reagent with about 20% dextrinoid. Basidia with 2- or 4-spores, each 36-42 × 10-15 μm (Fig. 2a), hyaline in KOH, yellowish in Melzer's reagent. Pleurocystidia scattered, 35-50 × 6-9 μm in length, narrowly fusoid-ventricose with gradually tapered neck and subacute or obtuse apex, thin-walled, hyaline in KOH and Melzer's reagent (Fig. 2c). Tube trama gelatinous and divergent, hyphae nonamyloid. Pileus cuticle with a trichodermium of hyphae 8-10 μm in diameter, the terminal cells nonamyloid but often more or less cystidioid, hyaline or yellowish in KOH; hyphae in subcutis 5-8 μm thick. Surface of stipe a layer of interwoven hyphae or suberect hyphae; tip cells contorted to cystidioid (Fig. 2d). Clamp connections absent.

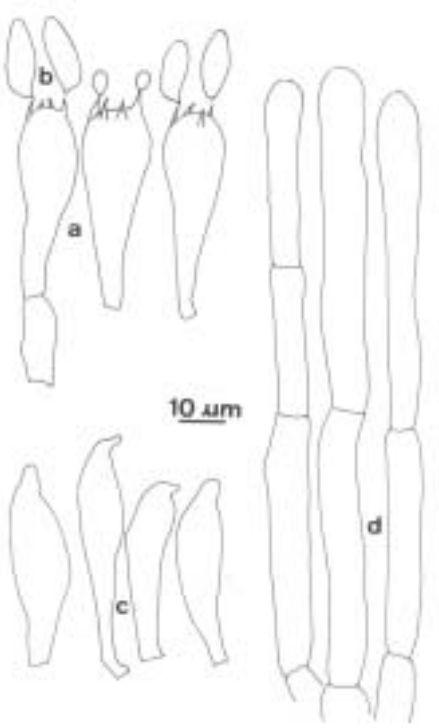

Fig. 2. *Tyropilus gracilis.* a: Basidia. b: Basidiospores. c: Pleurocystidia. d: End cells of suberect hyphae from stipe.

Collection Locality: Chiayi Co., Da-Tung-Shan, elevation 1,500 m, *C. M. Chen 3243* (14 June, 2002).

Habitat: Scattered under broad-leaved forest.

Distribution: Taiwan, North America.

Remarks: *Tylopilus gracilis* (Peck) Henn. is easily confused with *Austroboletus gracilis* (Peck) Wolfe. Both species share the same character of a long slender stipe, and once were considered to be synonymous to *Boletus gracilis* Peck. Smith and Thiers (1971) described the spores of *Tylopilus gracilis* as "punctate (under oil-immersion lens) in many spores", while Grund and Harrison (1976) found that the spores are smooth, but "the peculiar punctate spores, seen in some collections under high magnification, are unusual in *Tylopilus"*. Thereafter, Wolfe (1979) proposed the genus *Austroboletus*, based on the result of EM scanning observation, to include those of *T. gracilis* that have the spores "with an inconspicuous hyaline sheath, inner colored wall with minute canals ending in the pits at the surface" described by Smith and Thiers (1971). In addition, they are distinguishable by their shape of

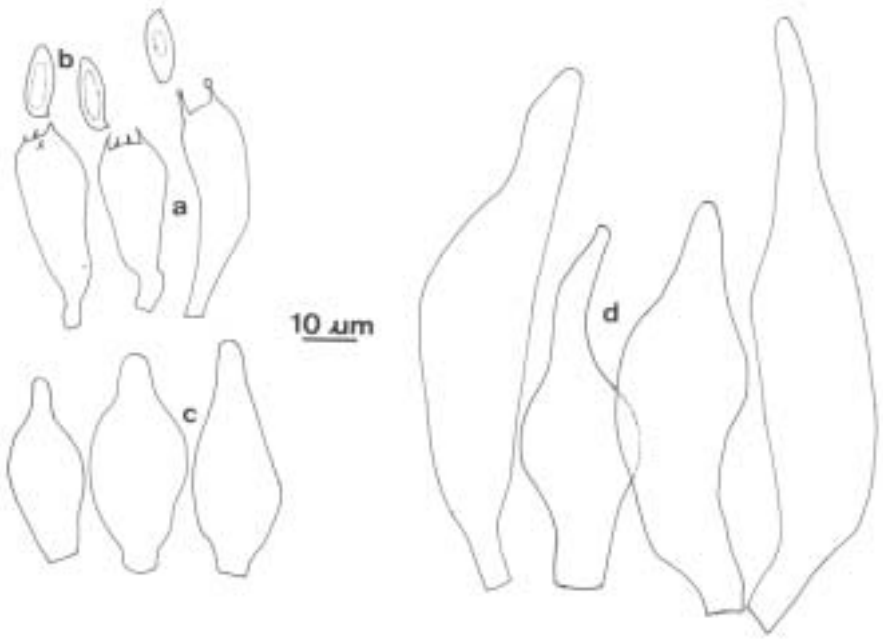

Fig. 3. *Tylopilus neofelleus*. a: Basidia. b: Basidiospores. c: Cheilocystidia. d: Pleurocystidia.

pleurocystidia: narrowly fusoid-ventricose with gradually tapered neck for *T. gracillis* and clavate for *A. gracilis*. Also, the spores of *T. gracilis* are distinctively longer (14-15 μm) than those of *A. gracilis* (7-9.5 μm).

Tylopilus neofelleus Hongo, Journ. of Jap. Bot. 42 (5): 154. 1967.

Pileus 3-6 cm broad, pulvinate to broadly convex; surface distinctly tomentose, dry, subviscid when wet, smooth to occasionally rimose toward the margin when old; vinaceous-brown in color; context thick, white, but pinkish brown when exposed, often vinaceous-red around the larval tunnel, no odor but with a very bitter taste. Tube 0.6-1.2 cm deep, adnate, white in color, vinaceous-brown to yellow-brown when old. Pores 1-1.5 mm broad, circular to angular, usually elongate near the stipe. Stipe 3-6 cm long, 0.7-1.1 cm thick, equal or flared either above or below, or both, solid, surface dry, glabrous to subvelutinous, typically distinctly reticulate at apex; color pinkish brown to vinaceous, often with ochre red streaks, staining ding pinkish brown when handled; context firm, white, pinkish brown when cut. Spore deposit maroon, spores 11-14 × 4-5 μm, ellipsoid to narrowly subfusoid in face view, obscurely inequilateral in profile, smooth, thin-walled, with a slight suprahilar depression (Fig. 3b), pale melleous in KOH, hyaline in Melzer's reagent. Basidia 30-39 × 10-13 μm, clavate, thin-walled, with two or four spores (Fig. 3a), hyaline or pale gray in KOH, pale yellow in Melzer's reagent. Pleurocystidia 49-107 × 14-24 μm, scattering and numerous, fusoid-ventricose, often with an elongated neck and obtuse apex, with umbrinous contents (Fig. 3d). Cheilocystidia 33-43 × 13-17 μm, ventricose but obtuse at top (Fig. 3c), numerous, shorter and smaller than pleurocystidia under microscope, thin-walled, with dark fawn contents, pallid brown in KOH, dark fawn in Melzer's reagent. Pileus cutis of appressed hyphae (Fig. 4), end cells ventricose and concentrating at the subacute apex, each 38-46 μm in length, 12-14 μm in diameter, with granular yellowish contents in KOH; lower cells mostly cylindrical and 12-14 μm broad with constricted septa. Hyphae in subcutis, 7-9 μm thick. Trama bilateral type. No clamps observed.

Collection Locality: Chiayi Co., Da-Tung-Shan, elevation 1,500 m, *C. M. Chen 3246* (14 June, 2002).

Habitat: Scattered under broad-leaved forest.

Distribution: Taiwan, China (Sichuan, Yunnan), Japan, New Guinea.

Remarks: *T. neofelleus* is closely related to *T. felleus* (Bull.: Fr.) Karst. and *T. plumbeoviolaceus* (Snell) Snell et Dick. The three species are distinguishable in the field by their morphological characters. *T. felleus* has a yellowish brown pileus with olive-gray color and distinct reticulation on its yellowish stipe, while *T. plumbeoviolaceus* has an olive-brown to avellaneous carpophore, and *T. neofelleus* has smaller spores and longer pleurocystidia, as compared to those of *T. felleus*. Also, spores of *T. neofelleus* are evidently longer (11-14 μm) than those of *T. plumbeoviolaceus* (7.5-9.5 μm) under microscopic examination.

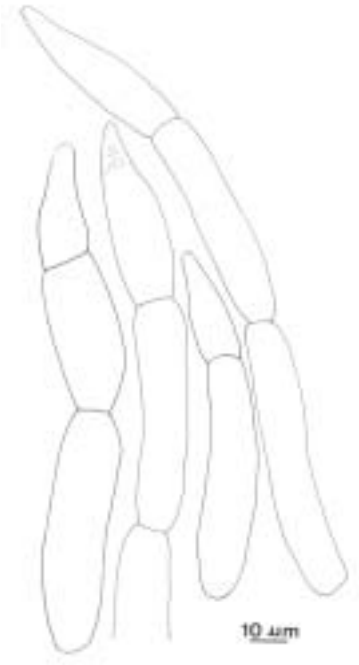

Fig. 4. Trichodermial hyphae of *T. neofelleus*.

Tylopilus vinosobrunneus Hongo, Beihefte zur Sydowia 8: 198. 1979.

Pileus 2-8 cm broad, convex to broadly convex, nearly plane when old; surface matted-fibrillose, slightly viscid but dry when old; color purple-brown to vinaceous-brown when young, orange-brown to black when old, brown when bruised; context whitish, unchanging when cut, odor slight, taste bitter. Tubes 0.3-0.7 cm deep, pallid, wood-brown or darker at the pallid stage, staining wood-brown when bruised, adnate or depressed around the stipe; pores very small (2-3 per mm), pallid when young, yellow-brown when old, staining pallid brown when injured. Stipes 7-14 cm long, 1-1.6 cm thick at apex, solid, clavate and enlarged downward; surface with vinaceous-brown to purple-brown fibrils, evenly furfuraceous or granulate except the pallid; apex reticulate; base with whitish mycelium; context whitish within, unchanging when cut, but staining ochraceous yellow around larval tunnels. Spore deposit vinaceous-fawn. Spores 9-12 × 4-5 μm, smooth, thin-walled, subfusoid in face view, subequilateral with shallow suprahilar depression in profile (Fig. 5c), hyaline to pale yellow in KOH, pale yellow in Melzer's reagent. Basidia 34-40 × 9.5-12 μm, clavate, thin-walled (Fig. 5b), with two or four spores, hyaline in KOH and Melzer's reagent; subhymenium inflated-ramose (Fig. 5a). Pleurocystidia 58-94 × 7.5-11.5 μm, scattered, smooth, thin-walled, narrowly fusoid with an elongated neck and tapered to a obtuse apex (Fig. 5d), hyaline in KOH, hyaline to pale yellow in Melzer's reagent. Epicutis of pileus a trichodermial palisade (Fig. 5e); terminal cells cylindrical or cystidioid, versiform, utriform, subampullaceous, or clavate by maturity; apex short and attenuate; content brownish in KOH. Clamp connections absent.

Collection Locality: Taichung Co., Da-Shiu-Shan, elevation 2,350 m, *C. M. Chen 2856* (27 June, 2002).

Habitat: Solitary to scattered under *Tsuga chinensis* Pritz.

Distribution: Taiwan, China (Guizhow), Japan.

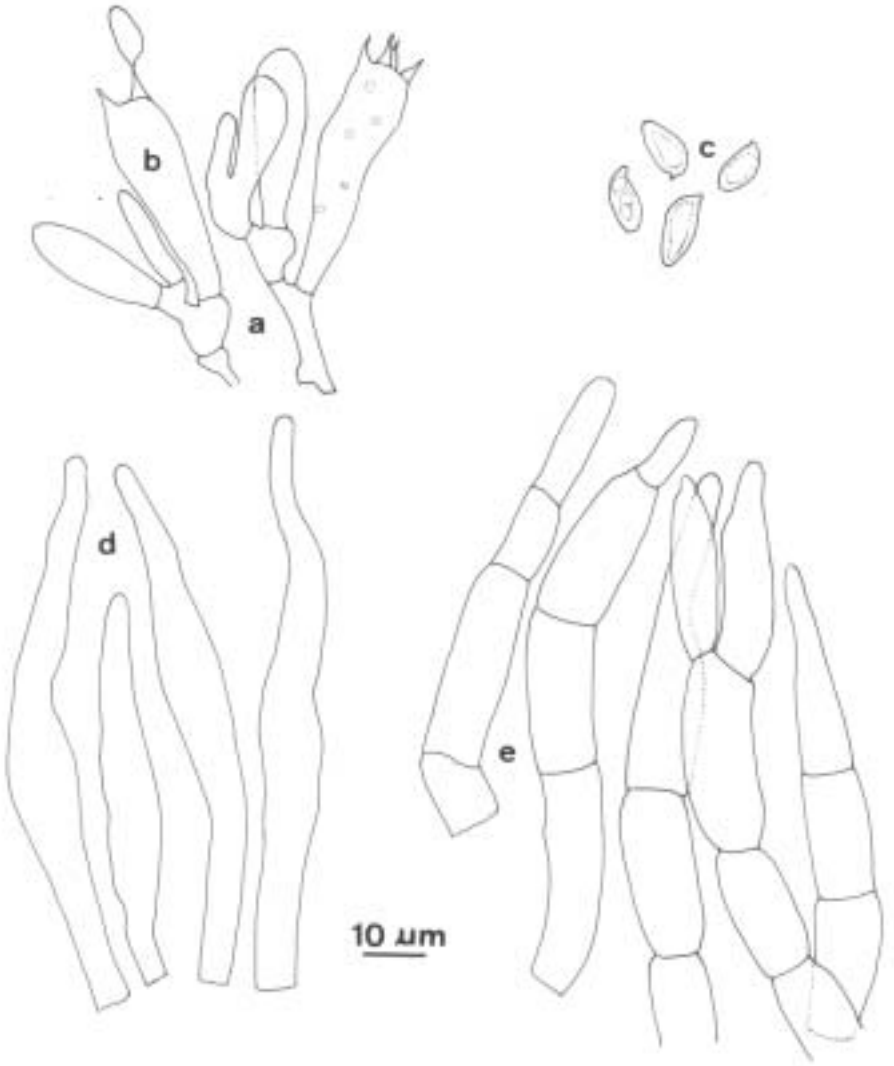

Fig. 5. *Tylopilus vinosobrunneus*. a: Subhymenium. b: Basidia. c: Basidiospores. d: Pleurocystidia. e: Fascicle of trichodermial hyphae.

Remarks: *T. vinosobrunneus* is one of the most unusual species of boletes. It looks like *T. neofellus* described by Hongo (1967). The most obvious differences between *T. vinosobrunneus* and *T. neofellus* are the shape and size of pleurocystidia. *T. vinosobrunneus* has narrowly subfusiform pleurocystidia with a neck of 20-26 μm, while *T. neofellus* is ventricose and its pleurocystidia is much broader than that of the former. In addition, suprapellis of *T. vinosobrunneus* is a distinctly erect palisade-like trichoderm as viewed in a tangential section, while suprapellis of *T. neofellus* is parallel to underlying layers.

ACKNOWLEDGEMENTS

We are grateful to professor M. Zang of Kunming Institute of Botany, Academia Sinica, China, for his constructive comments. We also thank Dr. C.-F. Tsai for reviewing this paper and the Council of Agriculture, Taiwan (ROC) for financial supports under the project 93AS-2.2.1-EI-W2.

Fig. 6. Basidiomes. a, b: *Tylopilus albofarinaceus.* c: *Tyropilus gracilis.* d: *Tylopilus neofelleus.* e: *Tylopilus vinosobrunneus*. Scale bar = 1 cm.

LITERATURE CITED

Bas, C. 1969. Morphology and subdivision of *Amanita* and a monograph of its section Lepidella. Persoonia **5**: 285-579.

Chen, C.-M. and J.-J. Peng. 1998. Four *Tylopilus* new to Taiwan. Fungal Science **13**: 11-16.

Chen, C.-M., S.-Y. Hwang, H.-W. Hwang and K.-W. Yeh. 1999. An inventory of Boletale resources in the central region of Taiwan. Endemic Species Research **1**: 79-87.

Chen, C.-M., Y.-S. Ho, J.-J. Peng and T.-C. Lin. 2002. Four species of boletes newly recorded to Taiwan. Endemic Species Research **4**: 51-58.

Grund, D. W. and K. A. Harrison. 1976. Nova Scotian Boletes. Bibliotheca Mycologica **47**: 196.

Hongo. T. 1967. Notes on Japanese larger fungi (19). Journal of Japanese Botany **42**: 154.

Imazeki, R. and T. Hongo. 1989. Colored Illustrations of Mushrooms of Japan, Vol. II. Hoikusha, Osaka, Japan. pp. 32-40.

Largent, D. L., D. Johnson, and R. Watling. 1977. How to Identify Mushrooms to Genus Ⅲ: Microscopic Features, 2nd ed. Mad River Press Inc., Eureka, Ca., U. S. A. 148 pp.

Singer, R., J. Garcia and L. D. Gomez 1991. The Boletineae of Mexico and central America Ⅲ. Nova Hedwigia **102**: 8.

Smith, A. H. and H. D. Thiers. 1971. The Boletes of Michigan. University of Michigan Press, Ann Arbor, Michigan, U. S. A. pp. 94-95.

Wolfe, C. B. 1979. *Austroboletus* and *Tylopilus* subg. *Porphyrellus* with emphasis on north American taxa. Bibliotheca Mycologica **69**: 92.

Ying, J.-Z. and M. Zang. 1994. Economic Macrofungi from Southwestern China. Science Press, Beijing, China. pp. 275-280.

四種粉孢牛肝菌新紀錄種

陳建名[1,3]、何源三[1]、周文能[2]、林子超[1]

(收稿日期：2004 年 4 月 21 日；接受日期：2004 年 5 月 18 日)

摘　　要

本文描述並討論在台灣首次被發現的 4 種粉孢牛肝菌屬新紀錄種，分別是白粉孢牛肝菌 (*Tylopilus albofarinaceus* (Chiu) Tai)，細網粉孢牛肝菌 (*Tylopilus gracilis* (Peck) Henn.)，新苦粉孢牛肝菌 (*Tylopilus neofelleus* Hongo) 及紫褐粉孢牛肝菌 (*Tylopilus vinosobrunneus* Hongo)。台灣產粉孢牛肝菌屬種類累計已有 12 種。

關鍵詞：白粉孢牛肝菌、細網粉孢牛肝菌、新苦粉孢牛肝菌、紫褐粉孢牛肝菌、台灣。

1. 行政院農業委員會特有生物研究保育中心，南投縣 540 集集鎮民生東路 1 號，台灣。
2. 國立自然科學博物館，台中市 400 館前路 1 號，台灣。
3. 通信作者。Tel: 886-49-2761331 ext. 331; Email: super@tesri.gov.tw