

Nine Species of *Lepiota sensu lato* (Basidiomycotina) New to Taiwan

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Abstract. Nine species of *Cystolepiota*, *Lepiota*, *Leucocoprinus*, and *Macrolepiota* (*Lepiota s. l.*) are described and illustrated as new to Taiwan. They are *Cystolepiota hetieri* (Boud.) Singer, *Cystolepiota pseudogranulosa* (Berk. & Broome) Pegler, *Cystolepiota seminuda* (Lasch) Bon, *Lepiota bettinae* Dörfelt, *Lepiota ventriospora* Reid, *Lepiota xanthophylla* P.D. Orton, *Leucocoprinus denudatus* (Rab.) Sing. f. *major* Hongo, *Macrolepiota alborubescens* (Hongo) Hongo, and *Macrolepiota puellaris* (Fr.) M.M. Moser.

Keywords: : Agaricaceae, Lepiotaceae, *Leucocoprinus*, *Lepiota*.

INTRODUCTION

Lepiota sensu lato (including the genera *Cystolepiota*, *Lepiota*, *Leucoagaricus*, *Leucocoprinus*, and *Macrolepiota*) was formerly placed in the Agaricaceae, but some mycologists treat it under the Lepiotaceae. It is characterized by a white to yellowish spore print, free lamellae, the stipe usually with a ring, and without a universal veil (Moser, 1983, Candusso and Lanzoni, 1990; Breitenbach and Kränzlin, 1995).

In Taiwan, 1 species of *Chlorophyllum*, 15 species of *Lepiota*, 5 species of *Leucocoprinus*, 2 species of *Leucoagaricus*, and 1 species of *Macrolepiota* were reported (Wang *et al.*, 1999; Chang *et al.*, 2001; Chou and Chang, 2005). In this paper, 3 species of *Cystolepiota*, 3 species of *Lepiota*, 1 species of *Leucocoprinus*, and 2 species of *Macrolepiota* are described and illustrated as new to Taiwan.

TAXONOMY

Cystolepiota hetieri (Boud.) Singer, Beih. Sydowia 7: 67, 1973.

= *Agaricus granulatus* var. *rufescens* Berk. & Broome, Ann. Mag. nat. Hist., Ser. 57: 124, 1881.

= *Cystoderma hetieri* (Boud.) Singer, Schweiz. Z.

Pilzk. 17: 53, 1939.

= *Cystolepiota langei* (Locq.) Bon, *Docums Mycol.* 22(no. 88): 27, 1993.

= *Lepiota hetieri* Boud., Bull. Soc. mycol. Fr. 18: 137, 1902.

= *Lepiota langei* Locq., Bull. Soc. linn. Lyon 14: 95, 1945.

= *Lepiota rufescens* (Berk. & Broome) J.E. Lange, Dansk bot. Ark. 9(no. 6): 65, 1938.

(Fig. 1)

Pileus 2-3 cm, spherical to semispherical when young, later convex to plane, surface densely covered with concentric, conical, grayish-red to grayish-brown flocci, margin smooth. Lamellae free, white, with lamellulae, edges smooth. Stipe 3-3.5 x 0.3-0.5 cm, cylindrical, hollow, white, granulate-verruculose, turning reddish-brown when bruised. Annulus white, with woolly-floccose coating which is easily wiped off. Flesh white, thin. Spores elliptical, hyaline, smooth, 3.5-4.5 x 2-2.5 µm. Basidia clavate, 13-18 x 5-6 µm, with 4 sterigmata. Cheilocystidia lageniform to fusiform, often with an apical prolongation, 40-60 x 8-12 µm. Pileipellis composed of subglobose cells, septa with clamps.

Habitat: On soils.

Specimens examined: Nantou: Aowanta, W. N. Chou, CWN 06239, July 3, 2003; Taichung: National Museum of Natural Science (NMNS),

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W. N. Chou, CWN 08831, Sept. 6, 2009; Taichung: NMNS, W. N. Chou, CWN 07063, Apr. 18, 2006.

Distribution: Europe, Japan.

Notes: This species is similar to *Cystolepiota pseudogranulosa* (Berk. & Broome) Pegler, but the latter has cystidia (Candusso and Lanzoni, 1990; Breitenbach and Kränzlin, 1995).

Cystolepiota pseudogranulosa (Berk. & Broome) Pegler, 1986.

= *Lepiota pseudogranulosa* (Berk. & Broome) Sacc., Syll. fung. (Abellini) 5: 53, 1887.

= *Agaricus pseudogranulosus* J. Linn. Soc., Bot. 11(no. 56): 501, 1871.

(Fig. 2)

Pileus 1-1.5 cm, convex when young, later plane, surface densely covered with concentric, conical, whitish to dust-brown flocci, margin smooth. Lamellae free, white, with lamellulae, edges smooth. Stipe 2-4 x 0.15-0.2 cm, cylindrical, hollow, white to dust-brown, granulose-verruculose. Annulus white, membranous or fragmentary. Flesh thin. Spores elliptical, hyaline, smooth, 4-5 x 2-2.5 µm. Basidia clavate, 16-18 x 5-6 µm, with 4 sterigmata. Cheilocystidia not observed. Pileipellis composed of subglobose cells, septa with clamps.

Habitat: On soils.

Specimens examined: Nantou: Aowanta, W. N. Chou, CWN 07192, June 22, 2006; Taichung: NMNS, W. N. Chou, CWN 07241, Sept. 12, 2006.

Distribution: Japan, North America, Sri Lanka.

Notes: This species is characterized by the pileus surface densely covered with concentric, conical, and whitish to dust-brown flocci (Imazeki and Hongo, 1987).

Cystolepiota seminuda (Lasch) Bon, Docums Mycol. 6(no. 24): 43, 1976.

= *Agaricus granulosis* var. *rufescens* Berk. & Broome, Ann. Mag. nat. Hist. Ser. 57: 124, 1881.

= *Agaricus seminudus* Lasch, Linnaea 3: 157, 1828.

= *Cystoderma seminudum* (Lasch) Singer, 1945.

= *Lepiota seminuda* (Lasch) P. Kummer, Führ. Pilzk. (Zwickau) 136, 1871.

= *Lepiota sororia* Huijsman, Persoonia 1(3): 326, 1960.

(Fig. 3)

Pileus 1-1.5 cm, conic-campanulate when young, later plane, surface white-powdered, margin smooth, sometimes with hanging veil remnants. Lamellae free, white, with lamellulae, edges smooth. Stipe 1.5-2 x 0.1-0.15 cm, cylindrical, hollow, white-powdered, dark-red when bruised. Annulus white, membranous, pendulous. Flesh white, thin. Spores broadly elliptical, hyaline, smooth, 3.5-4 x 2-2.5 µm. Basidia clavate, 12-15 x 6-7 µm, with 4 sterigmata. Cheilocystidia not observed. Pileipellis composed of subglobose cells, septa without clamps.

Habitat: On soils.

Specimens examined: Taichung: NMNS, W. N. Chou, CWN 08737, July 14, 2009; Taichung: NMNS, W. N. Chou, CWN 09009, Oct. 6, 2009.

Distribution: Asia, Europe, North America, North Africa.

Notes: This small mushroom is relatively common in Taichung. Its spores are very small. The general characteristics of *Cystolepiota* are that the spores are not dextrinoid, and the pileipellis is composed of globose cells (Imazeki and Hongo, 1987; Bi, *et al.*, 1994; Breitenbach and Kränzlin, 1995).

Lepiota bettinae Dörfelt, Z. Mykol. 48: 245, 1982.

(Fig. 5)

Pileus 0.5-1 cm, hemispherical to conical when young, later convex to plane, with reddish-brown squamules, margin smooth and fringed with veil remnants. Lamellae free, white, with lamellulae, edges smooth. Stipe 1-2 x 0.08-0.12 cm, cylindrical, hollow, dark-red, fibrillose-floccose. Annulus not observed. Flesh thin. Spores elliptical, hyaline, smooth, 4-5 x 2-2.5 µm, dextrinoid. Basidia clavate, 14-18 x 5-7 µm, with 4 sterigmata. Cheilocystidia clavate, 15-25 x 7-10 µm. Pileipellis composed of bent, branched, thick-walled hyphae, septa with clamps.

Habitat: On soils and wood-block.

Specimens examined: Taichung, W. N. Chou, CWN 06899, July 7, 2005; Taichung: NMNS, W. N. Chou, CWN 08725, July 9, 2009.

Distribution: Worldwide

Notes: This very small mushroom is found on peaty soils in greenhouses (Candusso and Lanzoni, 1990; Breitenbach and Kränzlin, 1995).

Lepiota ventriosospora D.A. Reid, Trans. Br. mycol. Soc. 41(4): 427, 1958.

= *Lepiota magnispora* Murrill, Mycologia 4(5): 237, 1912.

= *Lepiota metulispora* (Berk. & Br.) Sacc. Ss. Bres. Notices no. 1182, 1871.

(Fig. 6)

Pileus 3-3.5 cm, hemispherical to plane, pale yellowish-brown, with brown squamules, margin smooth with veil remnants. Lamellae free, white, with lamellulae, edges smooth. Stipe 6-8 x 0.4-0.5 cm, cylindrical, hollow, white, entire surface densely fibrillose-floccose. Annulus white, membranous. Flesh thin. Spores fusiform, hyaline, smooth, 15-20 x 4.5-5.5 µm, dextrinoid. Basidia clavate, 26-32 x 9-10 µm, with 4 sterigmata. Cheilocystidia clavate, 20-27 x 8-10 µm. Pileipellis composed of cylindrical to clavate hyphae, septa with clamps.

Habitat: On soils and forest litter.

Specimen examined: Nantou: Tsuifeng, W. N. Chou, CWN 05845, Oct. 9, 2002, (TNM F0016336).

Distribution: Asia, Europe, North America.

Notes: This species is similar to *Lepiota clypeolaria* (Bull.:Fr.) Kummer, but the latter has shorter spores (11-16 x 4.5-6.5 µm) and a whitish cap (Candusso and Lanzoni, 1990; Breitenbach and Kränzlin, 1995; Mao, 2000; Chou and Chang, 2005).

Lepiota xanthophylla P.D. Orton, Trans. Br. mycol. Soc. 43(2): 289, 1960.

= *Agaricus citrophyllus sensu* Cooke [Ill. Brit. Fung. 1111(639) Vol. 8, 1889]; fide Checklist of Basidiomycota of Great Britain and Ireland (2005).

= *Lepiota citrophylla sensu* Cooke, auct. eur; fide Checklist of Basidiomycota of Great Britain and Ireland (2005).

(Fig. 7)

Pileus 2.5-4 cm, convex to plane, pale yellowish-brown, with brown squamules, somewhat fibrillose toward margin, margin somewhat

swollen and grooved. Lamellae free, yellow, to lemon-yellow, with lamellulae, edges smooth. Stipe 3-5 x 0.3-0.4 cm, cylindrical, hollow, gray-whitish-red, entire surface densely brown floccose-scaly. Annulus white, membranous or fragmentary. Flesh pale-yellow, thin. Spores elliptical, hyaline, smooth, 7-8 x 4-4.5 µm, dextrinoid. Basidia clavate, 20-25 x 7-8 µm, with 4 sterigmata. Cheilocystidia not observed. Pileipellis composed of cylindrical to clavate hyphae, septa with clamps.

Habitat: On rotten wood.

Specimen examined: Taichung, NMNS, W. N. Chou, CWN 07512, May 3, 2007.

Distribution: Europe, North America.

Notes: This species is identified by the lemon-yellow lamellae. The common characteristics of *Lepiota* are that the spores are dextrinoid, without a germ pore, and the pileipellis is composed of cylindrical to clavate hyphae (Candusso and Lanzoni, 1990; Breitenbach and Kränzlin, 1995).

Leucocoprinus denudatus (Rab.) Sing. f. *major* Hongo, J. Jap. Bot. 31: 250, 1956.

(Fig. 4)

Pileus 2.5-4 cm, convex to plane, pale-yellow, powdery, margin striate. Lamellae free, pale-yellow, with lamellulae, edges smooth. Stipe 4.5-6 x 0.2-0.4 cm, cylindrical, hollow, pale-yellow, powdery. Annulus pale-yellow, membranous or fragmentary. Flesh thin. Spores ovoid, hyaline, smooth, 5-6 x 3.5-4.5 µm, dextrinoid. Basidia clavate, 12-15 x 6-7 µm, with 4 sterigmata. Cheilocystidia fusiform to ventricose, 25-35 x 7-10 µm. Pileipellis composed of subglobose cells, septa without clamps.

Habitat: On soils.

Specimens examined: Taichung, W. N. Chou, CWN 05336, Apr. 1, 2002; Taichung: NMNS, W. N. Chou, CWN 08895, Aug. 24, 2009.

Distribution: Japan.

Notes: This species is similar to *Leucocoprinus birnbaumii* (Corda) Sing. by the yellow cap and stipe. But *L. birnbaumii* has larger spores (8-11 x 5.5-8.5 µm) with a distinct germ-pore, and the pileipellis is composed of cylindrical to clavate hyphae. The general characteristics of *Leucocoprinus* include a striated cap margin, and

dextrinoid spores with a germ pore (Imazeki and Hongo, 1987).

Macrolepiota alborubescens (Hongo) Hongo, Trans. Mycol. Soc. Japan 27(1): 107, 1986.
= *Leucoagaricus nympharum* (Kalchbr.) Bon. Docums Mycol. 7(27-28): 19, 1977
= *Chlorophyllum alborubescens* (Hongo) Vellinga, Mycotaxon 83: 416, 2002.

(Fig. 8)

Pileus 4-8 cm, spherical to plane, often with an obtuse umbo, white to yellowish, coarsely squamose, center grayish-brown, margin striated. Lamellae free, white, with lamellulae, edges smooth. Stipe 4-7 x 0.4-0.61 cm, cylindrical, white to grayish-brown, hollow, turning reddish-brown when bruised. Annulus white, membranous, movable. Flesh whitish, thick. Spores broadly elliptical, hyaline, smooth, 8-11 x 6-7 µm, dextrinoid, thick-walled. Basidia clavate, 22-28 x 8-10 µm, with 2 sterigmata. Cheilocystidia clavate-cylindrical, 50-60 x 5-8 µm. Pileipellis composed of cylindrical to clavate hyphae, septa without clamps.

Habitat: On grassland.

Specimen examined: Taichung, NMNS, W. N. Chou, CWN 05896, Oct. 18, 2002.

Distribution: Japan.

Notes: This species is a comparatively large mushroom. It is characterized by the stipe turning reddish-brown when bruised, and with a movable annulus (Imazeki and Hongo, 1987).

Macrolepiota puellaris (Fr.) M.M. Moser, in Gams, Kleine Kryptogamenflora, Ed. 3 (Stuttgart) 2b/2: 184, 1967.
= *Leucoagaricus nympharum* (Kalchbr.) Bon Docums Mycol. 7(27-28): 19, 1977.
= *Agaricus rhacodes* var. *puellaris* Fr. Monogr. Hymenomyc. Suec. (Upsaliae) 2(2): 285, 1863.

(Fig. 9)

Pileus 5-8 cm, spherical to plane, white, floccus-like, with erect concentric scales, center grayish-brown, margin hung with fibrillose veil. Lamellae free, white, with lamellulae, edges smooth. Stipe 6-10 x 0.8-1 cm, cylindrical, white, clavate toward base, hollow, turning reddish-brown when bruised. Annulus white, woolly-membranous, movable. Flesh whitish,

thick. Spores elliptical, hyaline, smooth, 7.5-10 x 6-7 µm, dextrinoid, thick-walled, with a germ pore. Basidia clavate, 25-30 x 10-12 µm, with 4 sterigmata. Cheilocystidia polymorphic, lageniform, clavate, 50-70 x 10-15 µm. Pileipellis composed of cylindrical to clavate hyphae, septa without clamps.

Habitat: On rotten wood.

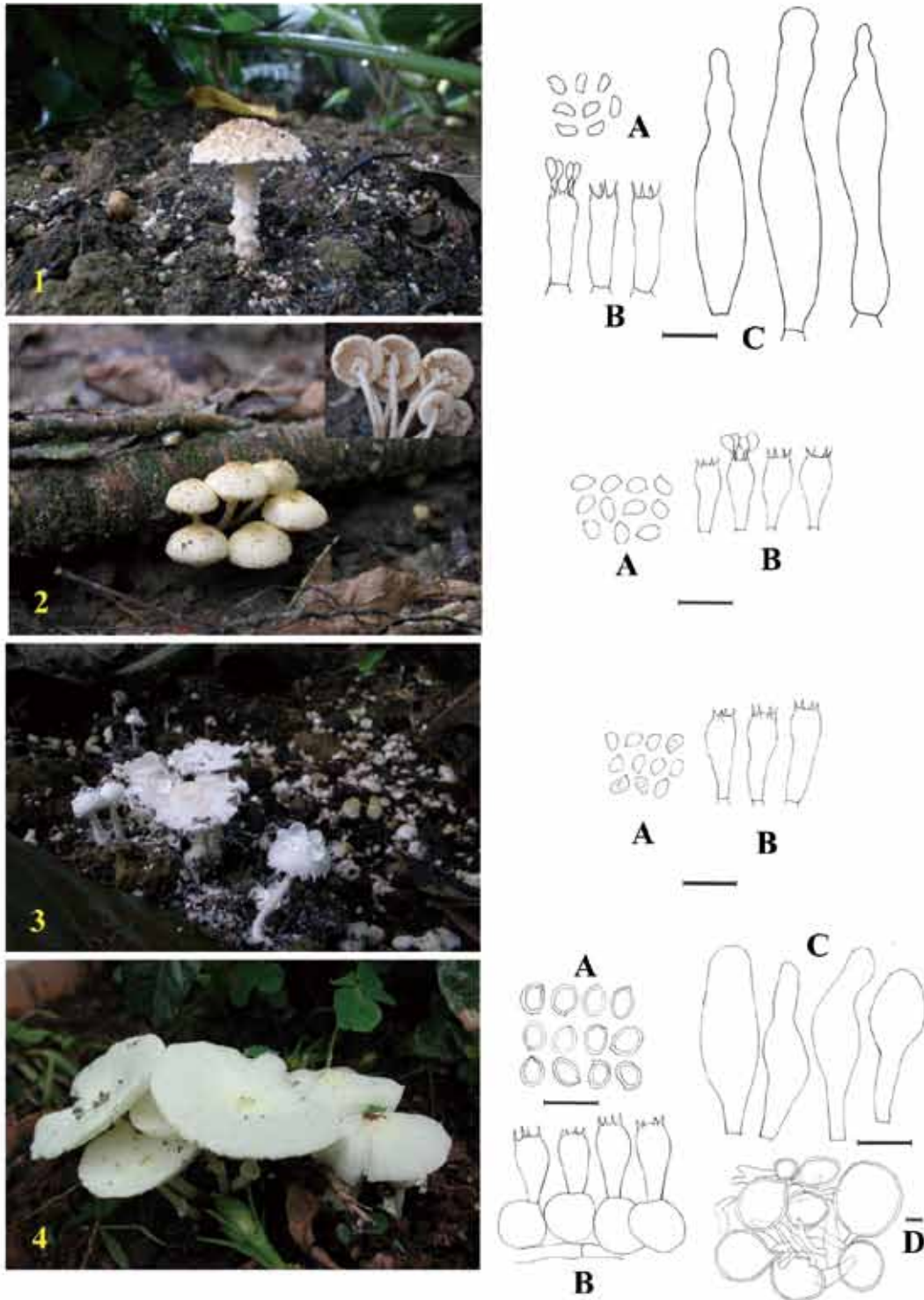
Specimen examined: Taichung, NMNS, W. N. Chou, CWN 07684, Aug. 16, 2007.

Distribution: China, Europe.

Notes: This species differs from the other whitish species of *Macrolepiota* by the shape of the cheilocystidia. *Macrolepiota* is characterized by a smooth cap margin, dextrinoid spores with a germ pore, and a pileipellis is composed of cylindrical to clavate hyphae (Candusso and Lanzoni, 1990; Breitenbach and Kränzlin, 1995; Mao, 2000).

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Fig. 1. *Cystolepiota hetieri*.Fig. 2. *Cystolepiota pseudogranulosa*.Fig. 3. *Cystolepiota seminuda*.Fig. 4. *Leucocoprinus denudatus* f. *major*.A. Basidiospores. B. Basidia. C. Cheilocystidia. D. Epidermal cells hyphae. Bars = 10 μ m

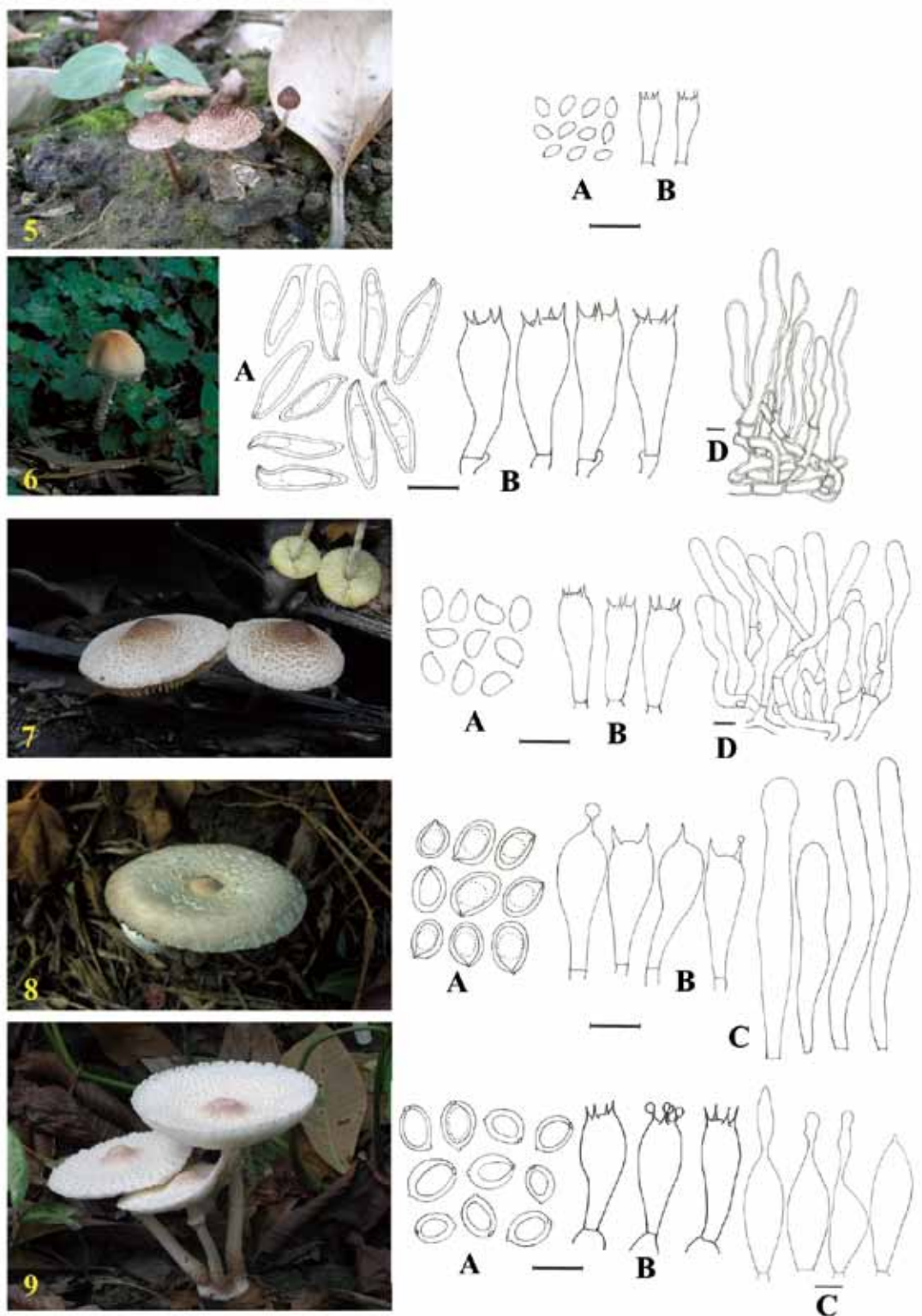


Fig. 5. *Lepiota bettinae*. Fig. 6. *Lepiota ventriosospora*.

Fig. 7. *Lepiota xanthophylla*.

Fig. 8. *Macrolepiota alborubescens*. Fig. 9. *Macrolepiota puellaris*.

A. Basidiospores. B. Basidia. C. Cheilocystidia. D. Epidermal hyphae. Bars = 10 μm

九種廣義環柄菇屬(擔子菌)的台灣新紀錄

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本文描述九種囊環柄菇屬、白鬼傘屬、環柄菇屬及大環柄菇屬（泛稱環柄菇屬）的台灣新紀錄種。它們分別屬於囊環柄菇屬3種*Cystolepiota hetieri* (Boud.) Singer, *Cystolepiota pseudogranulosa* (Berk. & Broome) Pegler, 及*Cystolepiota seminuda* (Lasch) Bon。環柄菇屬3種*Lepiota bettinae* Dörfelt, *Lepiota ventriosospora* Reid及*Lepiota xanthophylla* P.D. Orton。白鬼傘屬1種*Leucocoprinus denudatus* (Rab.) Sing. f. *major* Hongo與大環柄菇屬2種*Macrolepiota alborubescens* (Hongo) Hongo 及 *Macrolepiota puellaris* (Fr.) M.M. Moser。

關鍵詞：白鬼傘屬，環柄菇屬，環柄菇科，傘菌科。