



One terrestrial and some lignicolous Aphyllophorales (Basidiomycotina) from Taiwan

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Abstract. One terrestrial and eight lignicolous Aphyllophorales all new to Taiwan are described. These are *Coltricia cinnamomea* (Pers.) Murr., which is a terrestrial fungus, *Corioloopsis telfarii* (KL) Ryv., *Ganoderma boninense* Pat., *Ganoderma limushanense* Zhao et Zhang, *Gloeophyllum abietinum* (Fr.) Karst., *Gloeophyllum sepiarum* (Fr.) Karst., *Perenniporia fraxinea* (Bull. : Fr.) Ryv., *Stereum ochraceo-flavum* (Schw.) Ell. and *Trametes pubescens* (Schum. : Fr.) Pilat. The lignicolous fungi are found growing on decayed stems, roots or twigs of either hardwoods or conifers.

Key words: Aphyllophorales; Taiwan.

Introduction

The Aphyllophorales—also known as the Polyporales—are a morphologically heterogeneous group of fungi. Recently, although several families recognized are mainly based on hymenophore configuration, others like Corticiaceae and Polyporaceae are still highly heterogeneous. They mostly produce various types of gymnocarpous sporophores on wood, litter, and soil. The hymenophore is unilateral or amphigenous which may be smooth, warted, dentate, porous or lamellate. If pores or lamellae are present, the texture of the basidiocarp may be not soft and fleshy as in the order Agaricales. They all produce single-celled, club-shaped basidia in well-defined hymenia which are often associated with sterile hyphidia, cystidia, gloeocystia, setae or gloeovessels (Jülich, 1982; Alexopoulos and Mims, 1979; Talbot, 1973).

The first recording of the order Aphyllophorales in Taiwan was by Sawada (1919–1959). More than 100 species were included in these treatments, Imazeki (1943) and Ito (1955) also described some species in the order Aphyllophorales from Taiwan. More recently, Chen (1975, 1976) reported 12 species new to Taiwan.

Lin (1976) and Lin (1983) treated 32 and 33 species, respectively, some of them undescribed or new to Taiwan. Unfortunately, their studies have not been published. Additional reports on the order in Taiwan include: *Ganoderma formosanum* Chang et Chen (Chang and Chen, 1984) and *G. microsporum* Hseu (Hseu *et al.*, 1989), two new species of *Ganoderma*, and a new genus, *Pseudolagarobasidium* Jang et Chen (Jang and Chen, 1985). Also, in a study of three subfamilies of Corticiaceae, Wu (1990) described sixty-two species, most new to Taiwan. In the most recent, the author reported ten species in the order Aphyllophorales new to Taiwan (Chang, 1992). In the report, nine species in the order Aphyllophorales new to Taiwan are described and illustrated.

Materials and Methods

Specimens collected from soil and decayed tree-stems, roots or twigs were air dried to prevent contamination. All specimens were examined for both microscopic and macroscopic characteristics of the basidiocarp. Material for light microscope (200–400x) observations was prepared from freehand sections, mounted in H₂O or 2% KOH solution. The important

microscopic structures were taken photographs with a microscope (Leitz, Laborlux) or drawn with the aid of a camera lucida. Macroscopic examinations were carried out with the aid of a stereo microscope (10–20 \times). Breithenbach and Kranzlin (1986), Chamuris (1985), Corner (1983), Gilbertson and Ryvarden (1986), Ryvarden and Johansen (1980) and Zhao (1989) were used as the key references in identification. All specimens are deposited at the Laboratory of Forest Pathology, Taiwan Forestry Research Institute.

Results

Species Descriptions and Remarks

Coltricia cinnamomea (Pers.) Murr. Bull. Torr. Bot. Cl. 31: 343, 1904. (Figs. 1 and 2)

Fruitbodies more or less stipitate, pileus circular, flat to infundibuliform, up to 8 cm in diameter, up to 5 mm thick in center, margin sharp and mostly deflexed when dry. Pileus finely velutinate as covered with velvet, shiny to glossy with numerous distinct to indistinct concentric zones, brown to deep reddish brown. Stipe cylindrical to flattened, mostly expanded towards the base, finely velutinate, ochraceous rusty to deep reddish brown, up to 4 cm long, 2 cm in diameter. Pore surface reddish brown, pores round to angular, 1–2 mm wide. Tubes up to 3 mm deep, more or less concolorous with the pore surface. Context narrow, up to 1 mm thick, fibrous and rusty to reddish brown. Hyphal system monomitic, generative hyphae with simple septa, first thin-walled and hyaline, later more thick-walled and golden to light rusty brown, up to 8 μm in diameter. Basidia clavate to irregular, 20–50 \times 5.5–8.5 μm , 2 to 4-sterigmate. Basidiospores oblong to broadly ellipsoid, smooth, thin to distinctly thick-walled, hyaline to golden yellow, IKI weakly dextrinoid, 8.5–12.5 \times 5–7.5 μm .

Fruitbodies were found on the ground in deciduous forests collected at Neng-kao, Nantou (TFRI-89, September, 1991, alt. 2600 m) and at Piluchi, Nantou (TFRI-392, July, 1992, alt. 2000 m).

Corioloopsis telfarii (KL). Ryv. Norw. J. Bot. 19(3–4): 230, 1972. (Figs. 3 and 4)

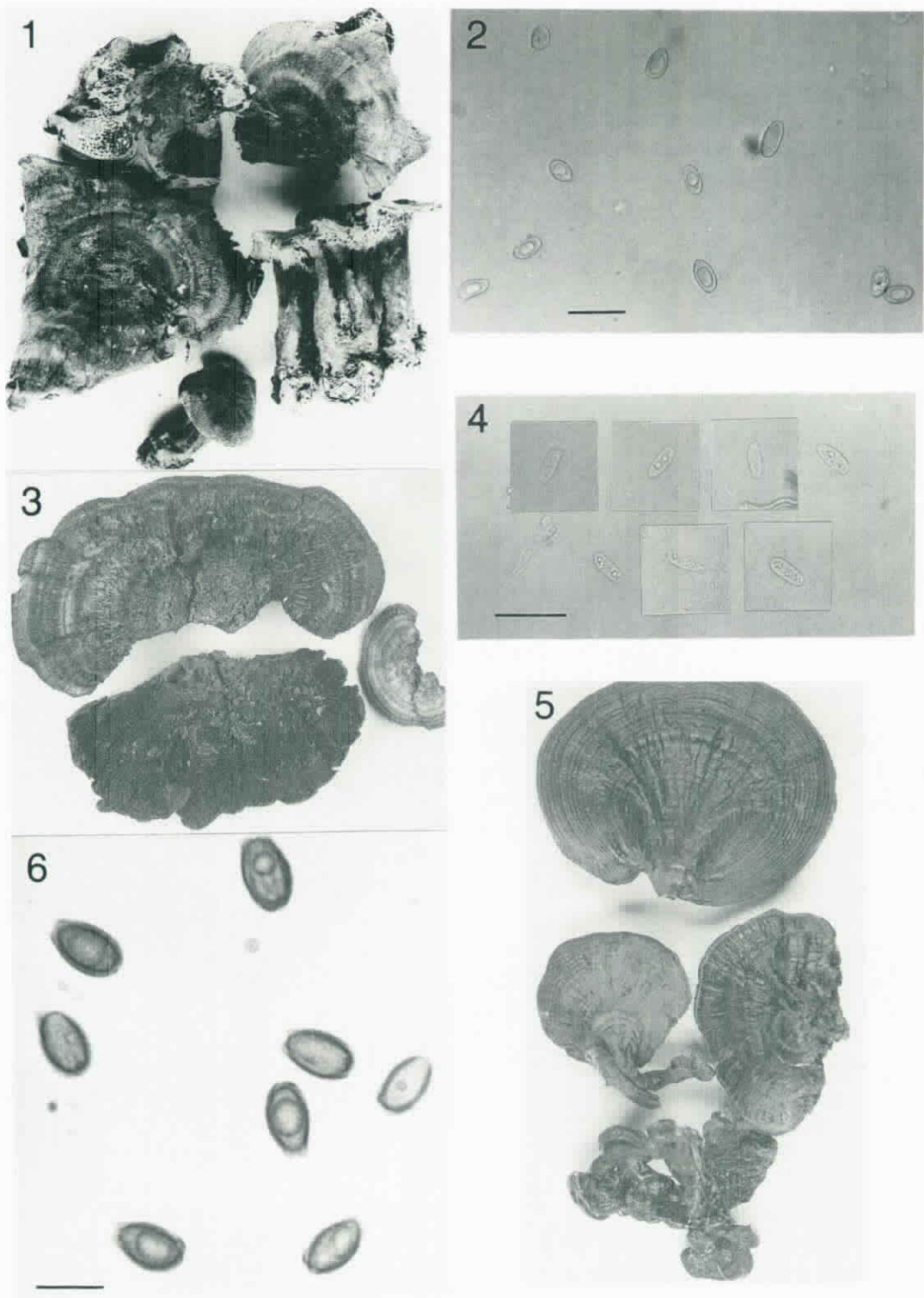
Fruitbodies annual, solitary or imbricate, in some cases fused laterally to elongated lobed or incised fruitbodies, broadly attached to dimidiate, flabelliform to reniform or semicircular, applanate, up to 12 cm wide,

8 cm long, 2–10 mm thick, thin and flexible when dry. Pileus variably covered with antlerlike, forked hairs, 1–5 mm long, in some specimens very dense, in others more scattered, surface ochraceous to fulvous in old specimens, slightly concentric zonate, mostly strongly radially striate, most easily seen in specimens with few hairs or when the hairs agglutinate or wear away with age, margin thin, sharp and deflexed. Pore surface woodcoloured to ochraceous, pale fulvous in old specimens, pores angular, thin-walled 1–2 per mm, in older specimens becoming lacerate and dentate to almost irpicoid in part as some pores grow stronger than others, in such cases from 1–3 mm wide. Tubes up to 7 mm deep, ochraceous to pale fulvous. Context fibrous, ochraceous to fulvous. Hyphal system trimitic, generative hyaline and thin-walled, with clamps, 2–4 μm in diameter, skeletal hyphae thick-walled, hyaline, yellow to almost golden, 3–7 μm wide, binding hyphae irregular, hyaline to slightly yellowish, 1.5–4 μm wide, tapering towards the ends. Basidiospores cylindrical, hyaline, smooth and thin-walled, 8–11.5 \times 3–4.5 μm , IKI–.

Fruitbodies were observed on dead stems and roots of *Casuarina* sp. collected at Kin-men county (TFRI-130, October, 1991, alt. <100 m).

Ganoderma boninense Pat. Bull. Soc. Mycol. Fr. 5: 72, 1889. (Figs. 5 and 6)

Fruitbodies annual, sessile or with short and thick stipe, corky to woody. Pileus suborbicular, up to 14 \times 9 \times 1.2 cm, upper surface dark purple, with densely situated distinct concentric zones, radially rugose, laccate, margin obtuse. Context brown above, deep brown near the tube, about 0.3 cm thick. Tubes brown, about 0.8 cm long. Pore surface brown, pores suborbicular, about 5 per mm. Stipe, if present, only with a short dorsal base in the center of pileus, up to 4 cm long, 2 cm thick. Pilear crust an irregular hymenoderm, yellowish brown, hyphal elements clavate or at apex lobate or fusiform, usually 20–40 μm long, 3–7 μm wide. Hyphal system trimitic, generative hyphae hyaline, thin-walled, 3–4 μm in diameter, skeletal hyphae nearly colorless to light brown, thick-walled to solid, arboriform or aciculiform, skeletal stalks 2.5–5 μm diameter, with branches ending flagelliform binding processes, binding hyphae colorless thick-walled, 1–2 μm in diameter. Basidiospores 8.5–12 \times 5.5–8 μm , narrowly ovoid or slightly truncate at apex, bitunicate,



Figs. 1-6. Basidiocarps and basidiospores: 1, Basidiocarps of *Coltricia cinnamomea*. 0.77 ×; 2, Basidiospores of *Coltricia cinnamomea*. Bar = 20 μm; 3, Basidiocarps of *Corioloopsis telfarii*. 0.53 ×; 4, Basidiospores of *Corioloopsis telfarii*. Bar = 20 μm; 5, Basidiocarps of *Ganoderma boninense*. 0.44 ×; 6, Basidiospores of *Ganoderma boninense*. Bar = 10 μm.

exospore hyaline, smooth, endospore indistinctly echinulate, yellowish brown.

Fruitbodies were found on dead stems of Fagaceae and *Casuarina* sp. collected at I-lan county (TFRI-54, August, 1991. alt. 700 m) and Kin-men county (TFRI-129, October, 1991. alt. <100 m).

Ganoderma limushanese Zhao et Zhang. Acta Mycol. Sin. 5(4): 119-122, 1986. (Figs. 7 and 8)

Fruitbodies annual, stipitate or sessile, corky to woody. Pileus suborbicular or dimidiate, sometimes irregular, up to 15 × 12 × 1 cm. Upper surface yellowish brown when fresh and becoming brown or slightly black when dry, non-laccate or slightly laccate, concentrically sulcate, sometimes covered with a ferruginous layer of spores. Margin sharp to obtuse, entire. Context brown or dark brown, with black crustaceous layer, 4-8 mm thick. Tubes brown, stuffed with white mycelium, 4-8 mm long. Pore surface brown to sordid brown, pores suborbicular, 4-6 per mm. Stipe dorsal-lateral or lateral, up to 3 cm. Pilear crust similar to subanamixoderm. Hyphal system trimitic, generative hyphal hyaline, 2.5-5 μm in diameter, skeletal hyphal yellowish brown, thick walled to solid, arboriform, skeletal stalks 2-5 μm in diameter, with branches ending in flagelliform binding processes, binding hyphal, colorless, thick walled to solid, branched, 2-3 μm in diameter. Basidiospores 7-9 × 5-6.5 μm, ovoid, ellipsoid, rarely truncate at apex, bitunicate, exospore hyaline, smooth, endospore brownish, echinulate or indistinct.

Fruitbodies were observed on dead stems of Fagaceae collected at I-lan county (TFRI-58, August, TFRI-112, August, TFRI-183, October, 1991, alt. 700 m).

Gloeophyllum abietinum (Fr.) Karst. Finl. Hattsv. 2: 79, 1879. (Figs. 9 and 16-A)

Fruitbodies perennial, pileate, sessile and broadly attached, mostly elongated along the substratum, up to 3 cm wide, 2-8 cm long, up to 5 mm thick at the base. Upper surface deep umber brown, first finely velutinate to tomentose, zonate and often more scrupose to warted or even smooth in old specimens, usually narrowly zonate and slightly sulcate, margin wavy and sharp. Hymenophore lamellate with anastomosing, wavy lamellate, 8-12 per cm, individual lamellate up to 1 mm thick, deep brown to pale brown,

at the base up to 10 mm deep. Context dark brown and fibrous, up to 2 mm thick. Hyphal system trimitic, generative hyphae with clamps, thin to slightly thick-walled, 2-4 μm wide, skeletal hyphae yellowish to pale rusty brown thick-walled, 2.5-6 μm wide, binding hyphae rare, tortuous, twisted and yellowish brown, 2-4 μm wide. Cystidia abundant in the hymenium, subulate to rounded, thick-walled, smooth or with a small apical crown of crystals, 22-45 × 4-8 μm, not or only slightly projecting. Basidia clavate, 4-sterigmate, 23-40 × 5-8 μm with a basal clamp. Basidiospores cylindrical, 8.5-11.5 × 3-4 μm, hyaline, smooth, IKI-.

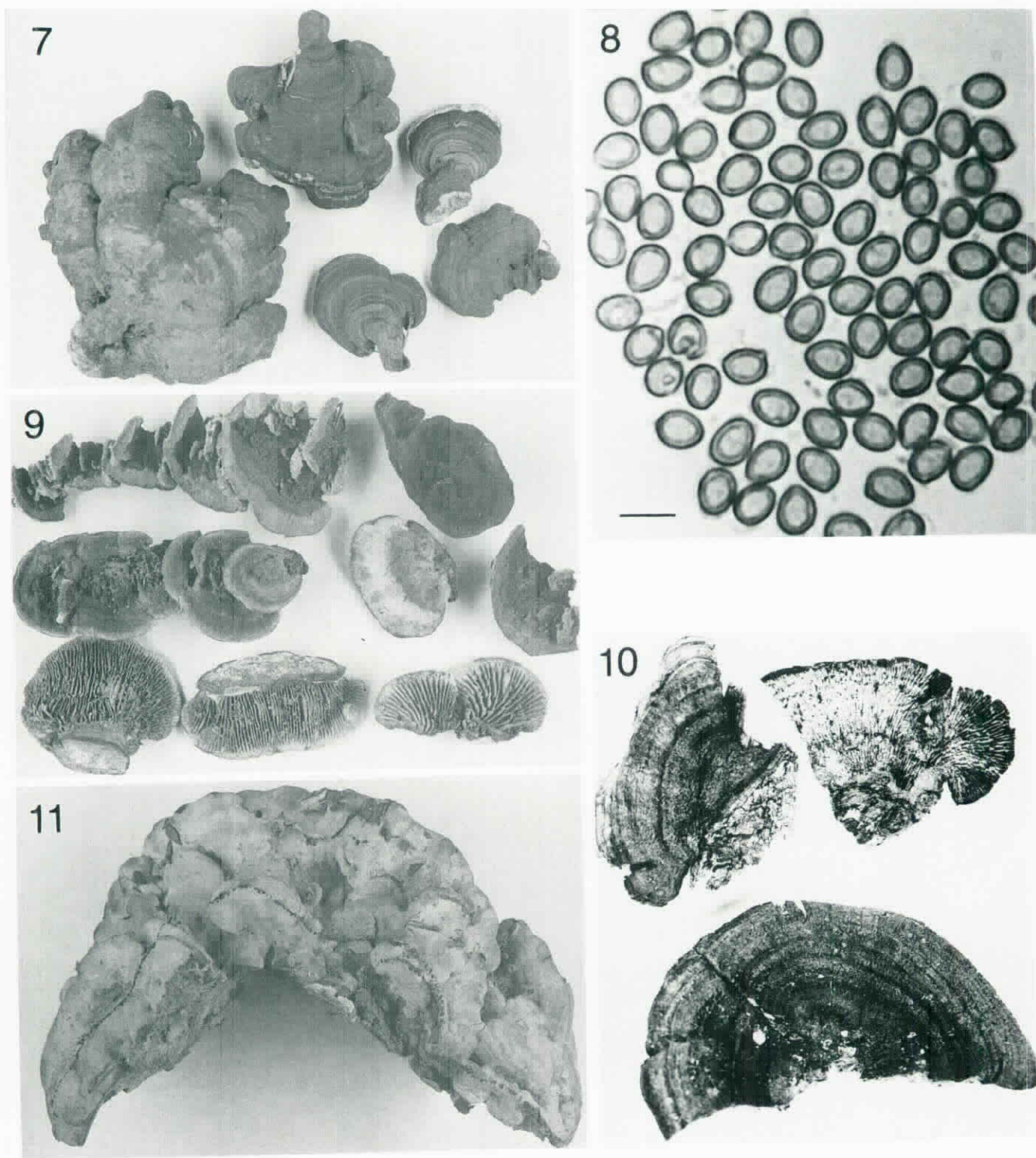
Fruitbodies were found on dead stems of *Tsuga* sp. collected at Tun-yuang, Nantou (TFRI-63, 68 and 91, September, 1991. alt. 2300 m).

Gloeophyllum sepiarum (Fr.) Karst. Finl. Hattsv. 2: 80, 1879. (Figs. 10 and 16-B)

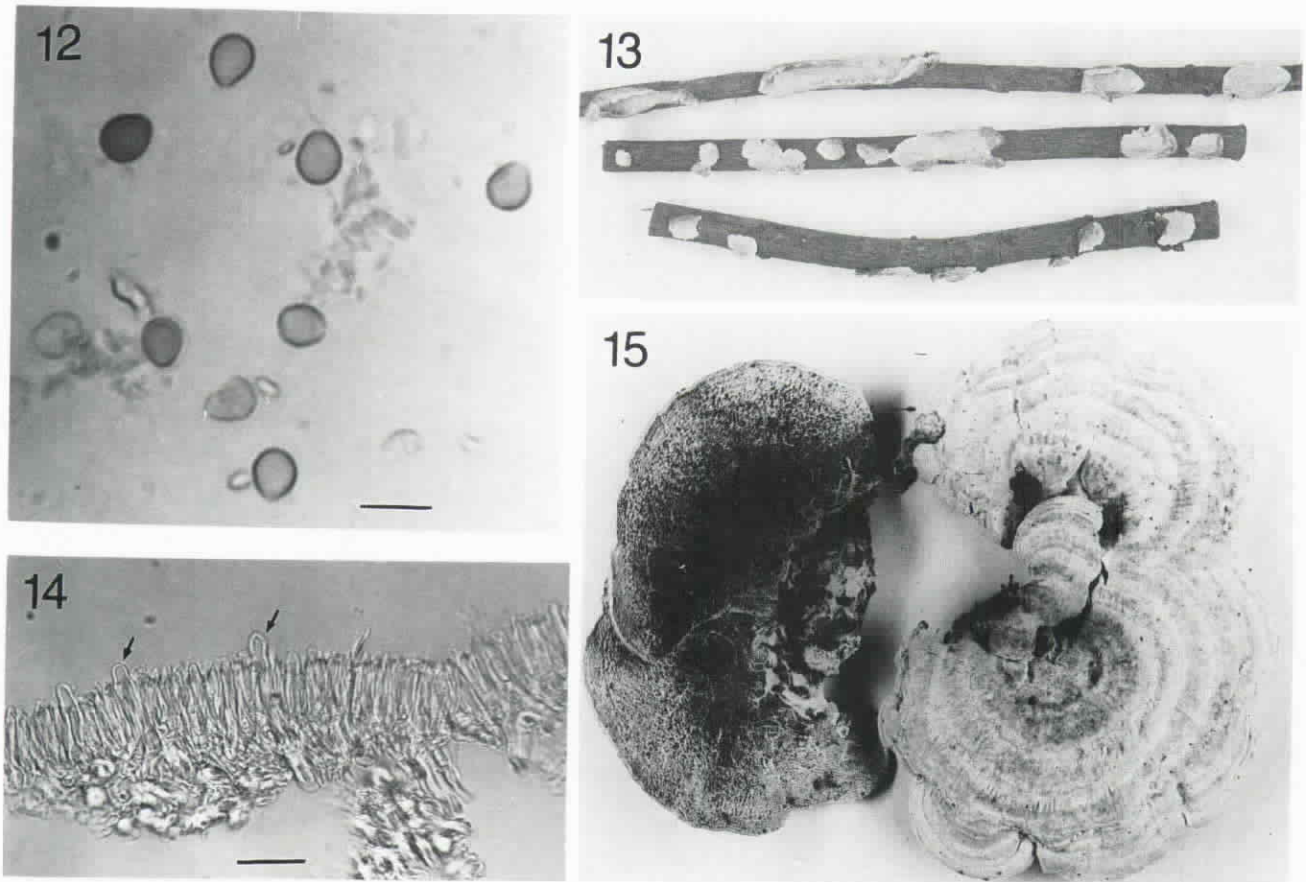
Fruitbodies annual, pileate, broadly sessile, dimidiate or rosette shaped, often imbricate in clusters from a common base, or fused laterally to compound fruitbodies, up to 8 cm wide, 14 cm long and 6-8 mm thick at the base of the pileus, tough and flexible, margin sharp and slightly wavy. Upper surface first finely bright yellowish brown, then darker reddish brown and finally grayish to black. Hymenophore lamellate with anastomosing, dense lamellae, 15-20 per cm behind the margin, more rarely mixed with poroid areas with rounded to irregular, sinuous, radially elongated pores, about 1-2 per mm. Context dark brown, up to 5 mm thick, black in KOH. Hyphal system trimitic, generative hyphae thin to thick walled and with clamps, 2.5-4 μm in diameter, skeletal hyphae golden brown, straight, thick-walled, up to 7 μm in diameter, binding hyphae few, tortuous and with relatively short branches, light golden brown, up to 4.5 μm in diameter. Cystidia abundant in the hymenium, subulate to obtuse, thin to thick-walled by age, 25-95 × 3-7 μm, usually smooth, more rarely with a small crown of crystals. Basidia narrowly clavate, 15-35 × 4.5-8 μm, with a basal clamp. Basidiospores cylindrical, 9-13 × 3-5 μm, hyaline, smooth, IKI-.

Fruitbodies were observed on dead stems of *Tsuga* sp. Collected at Li-leng, Nantou (TFRI-73, August, 1991, alt. 2300 m).

Perenniporia fraxinea (Bull.: Fr.) Ryv. Polyp. N. Europe, 307, 1978. (Figs. 11 and 12)



Figs. 7-11. Basidiocarps and basidiospores. 7, Basidiocarps of *Ganoderma limushanense*, 0.43×; 8, Basidiospores of *Ganoderma limushanense*. Bar = 10 µm; 9, Basidiocarps of *Gloeophyllum abietinum*, 0.70×; 10, Basidiocarps of *Gloeophyllum sepiarium*, 0.58×; 11, Basidiocarps of *Perenniporia fraxinea*, 0.375×.



Figs. 12-15. Basidiocarps, basidiospores and hymenium. 12, Basidiospores of *Perenniporia fraxinea*. Bar=10 μm ; 13, Basidiocarps of *Stereum ochraceo-flavum*. 0.44 \times ; 14, Hymenium of *Stereum ochraceo-flavum*. Arrow indicating pseudocystidium without contents. Bar=20 μm ; 15, Basidiocarps of *Trametes pubescens*. 0.80 \times .

Fruitbodies pileate, perennial, broadly attached, imbricate in clusters, often large, up to 12 cm wide, 25 cm long and up to 10 cm thick at the base, often triquetrous in section, woody when dry. Pileus surface glabrous, slightly zonate, often with small warts or thin ridges, first ochraceous, becoming unevenly dirty brown to grey, margin rounded. Pore surface cork or woodcolored, pores 4-6 per mm. Tubes stratified, pinkish-ochraceous to corkcolored. Context cottony to punky, isabelline to pale cork colored, up to 4 cm thick at the base. Hyphal system dimitic, generative hyphae hyaline, thin-walled, rather variable in width, mostly 2-6 μm wide, with small clamps, skeletal hyphae dextrinoid, straight to flexuous, 3-7 μm wide. Basidia clavate, 4-sterigmate, 15-22 \times 5-7 μm . Basidiospores subglobose to dropshaped, thick-walled, variably dextrinoid, 6-8 \times 5-6.5 μm .

Fruitbodies were found on living stems and roots of *Citrus* sp. collected at Chia-I county. (TFRI-182, November, 1991. alt. <100 m).

***Stereum ochraceo-flavum* (Schw.) Ell. (Figs. 13 and 14)**

Fruitbodies semipileate, pileoli up to 12 mm across and extending up to 6 mm from the substratum, 0.2-0.4 mm thick, young pileoli often cyphelloid, upper surface finely hirsute-tomentose, indistinctly zoned, hairs gray- to ocher-whitish, sometimes colored greenish by algae, margin sharp-edged, fringed, underside with the hymenophore smooth, undulating-tuberculate and commonly somewhat umbonate at the place of attachment, brown- to gray-ocher, consistency somewhat tough, elastic, usually conerescent to form rows and resupinate on the underside of the substratum. Hyphal system dimitic, generative hyphae thin- to thick

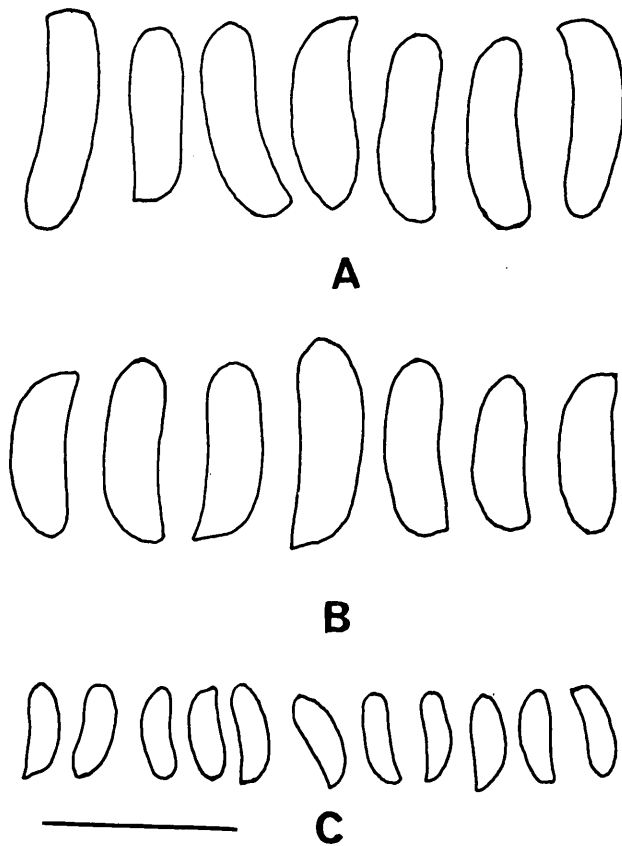


Fig. 16. Basidiospores. A, *Gloeophyllum abietinum*; B, *Gloeophyllum sepiarium*; C, *Trametes pubescens*. Bar=10 μ m.

-walled, 2–4.5 μ m in diameter, septa without clamps, skeletal hyphae thick-walled, 5–7 μ m in diameter. Pseudocystidia without contents, thick-walled, 80–110 \times 5–7 μ m. Cystidioles 30–35 \times 3–4.5 μ m. Basidia slenderly clavate, 30–37 \times 6–7 μ m, with 4-sterigmate, without basal clamp. Basidiospores cylindric to elliptic, smooth, hyaline, 7–9 \times 2–3 μ m, IKI+.

Fruitbodies were observed on dead twigs of *Malotus* sp. collected at Shih-ding, Taipei county. (TFRI-151, November, 1991, alt. 200 m).

Trametes pubescens (Schum. : Fr.) Pilat. Atl. Champ. Europ. 3: 268, 1939. (Figs. 15 and 16-C)

Fruitbodies annual, sessile or effused-reflexed, up to 8 cm wide, dimidiate, often in imbricate clusters, thin, coriaceous. Upper surface tomentose to finely pubescent or almost glabrous, cream color to warm buff, azonate or faintly zonate. Pore surface cream color to light ochraceous buff, the pores angular, 3–5

per mm. Context white to cream, tough-fibrous, up to 5 mm thick. Tube layer cream colored to pale buff, up to 4 mm thick. Hyphal system trimitic, generative hyphae thin-walled, rarely branched, with clamps, 2–3 μ m in diameter, skeletal hyphae thick-walled, with occasional branching, 5–10 μ m in diameter, binding hyphae thick-walled, nonseptate, much branched, 1.5–3 μ m in diameter, hyphal pegs usually present. Basidiospores cylindric, slightly curved, hyaline, smooth, IKI-, 5–7 \times 1.5–2 μ m.

Fruitbodies were found on decayed twigs of hardwoods collected at Chi-lai, Hualien county. (TFRI-87, 88 and 92, September, 1991, alt. 800 m).

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數種台灣新紀錄之土生性與木生性無褶菌

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本文報導一種土生性與八種木生性台灣新紀錄之無褶菌：*Coltricia cinnamomea*, *Corioloopsis telfarii*, *Ganoderma boninense*, *Ganoderma limushanense*, *Gloeophyllum abietinum*, *Gloeophyllum sepiarium*, *Perenniporia fraxinea*, *Stereum ochraceoflavum* 和 *Tremetes pubessens*。除 *C. cinnamomea* 為土生性外，其餘八種無褶菌採自腐朽闊葉樹或針葉樹之莖、根或枝條。