Bot. Bull. Academia Sinica (1992) **33:** 277-284

Some lignicolous Aphyllophorales (Basidiomycetes) from Taiwan

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(*Received December 3, 1991; Accepted March 3, 1992*)

Abstract. Ten Aphyllophorales all new to Taiwan are described. These are *Coriolopsis aspera* (Jungh.) Teng, *C. floccosa* (Jungh.) Ryv., *Earliella scabrosa* (Pers.) Gilbn. & Ryv., *Polyporus grammocephalus* Berk., *Rigidoporus microporus* (Fr.) Overeem., *Trichaptum abietinum* (Dicks.: Fr.) Ryv., *Bondarzewia montana* (Quél.) Sing., *Lenzites betulina* (Fr.) Fr., *Stereum ostrea* (Bl. et Nees) Fr., and *Hymenochaete rubiginosa* (Dicks.) Lev. They are found growing on decayed stems, roots or twigs of either hardwoods or conifers.

Key words: Lignicolous Aphyllophorales; Taiwan.

Introduction

The Aphyllophorales-also known as the Polyporales-are a morphologically heterogenous group of fungi. Although several families are recognized mainly by the 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 not be as 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, 1981; 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 this treatment. 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 this report, ten species in the order Aphyllophorales new to Taiwan are described and illustrated.

Materials and Methods

Specimens collected from 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 2% KOH solution. The important microscopic structures were drawn with a camera lucida attached to the microscope (Leitz, Laborlux S). Macroscopic examinations were carried out with the aid of a stereo microscope (10 -20x). Chunningham (1965), Gilbertson and Ryvarden (1986), Rattan (1977) and Ryvarden and Johansen (1980) were used as the key references in identification. All

specimens are deposited at the Laboratory of Forest Pathology, Taiwan Forestry Research Institute (TFRI).

Results

Species Descriptions and Remarks

Coriolopsis aspera (Jungh.) Teng. True Fungi of China p. 755. 1964. (Figs. 1 an 11-A)

Fruitbodies annual to perennial, solitary or imbricate making clusters of pilei from the same base, often somewhat effused on the substrate, up to 8.0 cm broad, 5.5 cm wide and 2.0 cm in total thickness, consistency hard when dry. Pileus dimidiate to flabelliform with a tapering base, flat to slightly convex, color dark fulvous to ferruginous in young specimens, more chestnut to reddish brown with darker patches when older, usually with a distinct reddish tint, concentrically sulcate and ridged, radially striate with warts, and scrupose tuft of agglutinated hairs, most erect near the base, more flattened near the margin, the hairs disappear later. Margin acute to more round, thin, often somewhat deflexed. Pore surface fulvous to rusty brown often with an ashy grey tint, usually darker than the context, pores round, entire, relatively thick-walled, 1-3 per mm, tubes concolourous, up to 7 mm long, margin often sterile. Context fulvous, rusty brown to umber, turning black in KOH, up to 10 mm thick. Hyphal system trimitic, generative hyphae, hyaline, thin-walled, up to 8 μm in diameter. Binding hyphae irregular in outline, strongly branched or with a few long tapering branches, thick-walled, yellow to light brown, up to 6 μm in diameter. Basidiospores cylindrical, hyaline, thin-walled and IKI-, 9-12 × 3-4.5 μm.

Fruitbodies were observed on dead stems of *Casuarina* sp. collected at Tai-ma-li (TFRI-28, July, 1991, <100 m).

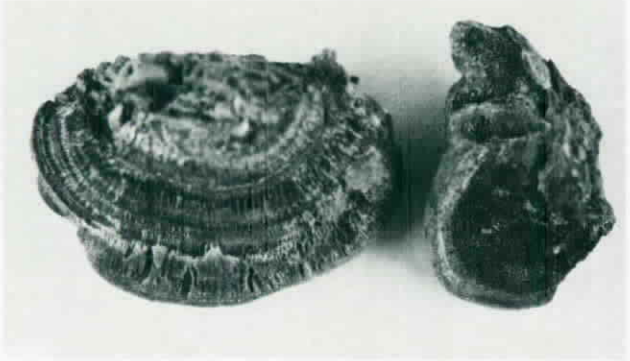

Fig. 1. Basidiocarps of *Coriolopsis aspera*.

Coriolopsis floccosa (Jungh.) Ryv. Norw. J. Bot. 19:230. 1972. (Figs. 2 and 11-B)

Fruitbodies annual, pileate, sessile to a stipelike base, single or laterally fused, up to 4 cm wide and 11 cm long in fused fruitbodies, up to 1 cm thick at the base, margin entire, crenulate, lobed or dentate, undulating and sharp. Pileus ochraceous to deep hazel brown frequently greyish brown, hirsute to tomentose, usually somewhat scrupose in old specimens, distinctly to indistinctly zonate, often in rather broad zones, 1-5 mm wide, also somewhat radially striate. Pore surface

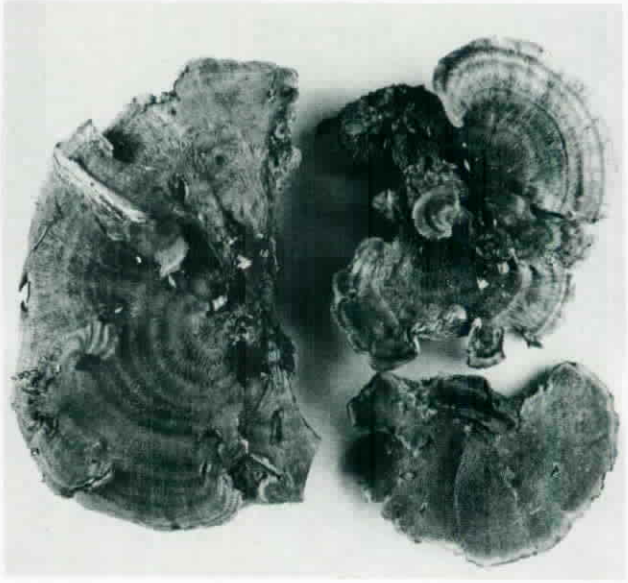

Fig. 2. Basidiocarps of *Coriolopsis floccosa*.

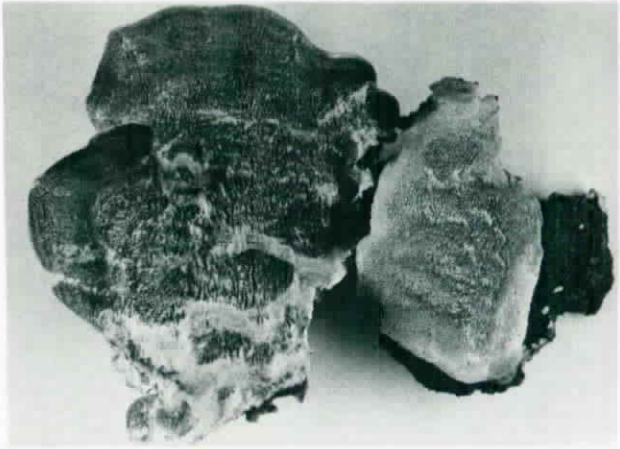

Fig. 3. Basidiocarps of *Earlilla scabrosa*.

greyish brown a distinct blue ashy grey tint which is typical for this species, in old specimens more tobacco to greyish brown, pores round to angular, entire 2-4 (5) per mm in old specimens up to 1-2 mm long, tubes concolourous with the pore surface in the tube walls, in the trama dark brown, thus the trama and the tube walls are contrasting, up to 6 mm deep in thick specimens. Context tobacco brown, shiny fibrous and floccose, trama and context black with KOH. Hyphal system trimitic, generative hyphae hyaline, thin-walled and with clamps 1.5-4 μm in diameter, skeletal hyphae abundant, yellow to almost golden, thick-walled, 3-8 μm wide, binding hyphae thin-walled to slightly thick-walled, 1.5-4 μm, hyaline to yellowish, irregular in outline. Basidiospores cylindrical, hyaline, smooth and thin-walled, IKI-, 8-12.5 × 3.5-5 μm.

Fruitbodies were found on dead stems of *Casuarina* sp. collected at Taipei (TFRI-26, June, 1991, <100 m).

Earliella scabrosa (Pers.) Gilbn. & Ryv. Mycotaxon 22: 364. 1985. (Figs. 3 and 11-C)

Fruitbodies resupinate, effused reflexed to more rarely distinctly pileate, often widely effused as shelflike, tough and coriaceous, upper surface glabrous, zoned, at first white to cream, soon covered by a reddish cuticle starting from the base, when dry the cuticle is often slightly wrinkled, individual pilei up to 1 cm thick at the base. Pore surface white to cork colored, pores angular to semidaedaleoid, especially on sloping parts of the basidiocarp, 2-3 per mm, but individual elongated pores up to 6 mm long, tubes concolorous, up to 5 mm deep, context white, tough up to 3 mm thick, in section with a distinct dark line where covered with the reddish to bay colored cuticle. Hyphal system trimitic, generative hyphae with clamps, thin-walled, 1.5-4 μm wide, skeletal hyphae dominate, thick-walled to solid, hyaline, 3-6 μm wide, binding hyphae as skeletal hyphae but branched with tapering side branches. Basidiospores cylindrical to oblong ellipsoid, thin-walled and hyaline, IKI-, 8-12.5 × 3.5 - 5 μm.

Fruitbodies were found on decayed stems of *Ficus microcarpa* var. *microcarpa* collected at Taipei. (TFRI-29, July, 1991, <100 m).

Polyporus grammocephalus Berk. Hook. Lond. J. Bot. 1:148, 1842. (Figs. 4 and 11-D)

Fruitbodies annual, solitary, pileate, dimidiate, flabelliform or spathulate and laterally attached with a stipelike contracted base, up to 5 cm wide and long, 3 mm thick at the base. Pileus glabrous, ochraceous to tan or pale brown with numerous fine radial lines becoming more tufted towards the base. Margin thin and deflexed in dried specimens. Stipe usually absent, but in a few specimens there is a short stipe present. Pore surface straw colored, tan to pale brown in old specimens, pores thin-walled and angular, sometimes slightly split, 2-4 per mm, tubes up to 3 mm thick. Context 1-2 mm thick, cream to ochraceous, homogeneous.

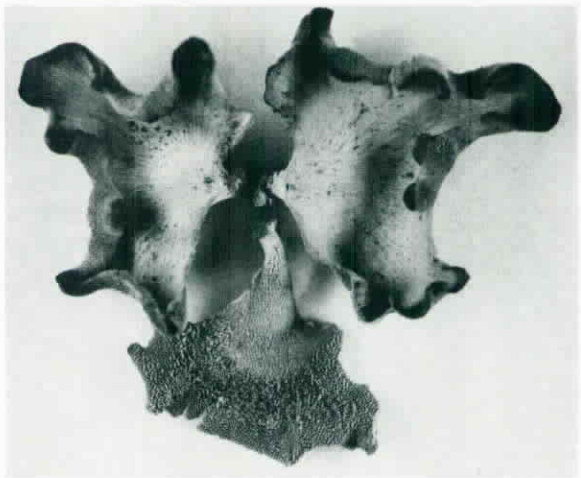

Fig. 4. Basidiocarps of *Polyporus grammocephalus*.

Fig. 5. Basidiocarps of *Rigidoporus microporus*.

Hyphal system dimitic, generative hyphae with clamps, 2–4 μm wide, binding hyphae of the Bovista type abundantly present, thick-walled to solid, up to 10 μm thick at the main trunk. Basidiospores oblong ellipsoid thin-walled, hyaline and smooth, IKI–, 6.0–8.0 × 2.5–3.5 μm.

Fruitbodies were observed on dead hardwoods collected at Fu-shan (TFRI-21, May, 1991, 700 m)

Rigidoporus microporus (Fr.) Overeem. Icon. Fung. Malayensum 5:1. 1924. (Figs. 5 and 11-E)

Fruitbodies annual, occasionally resupinate but mostly pileate, sessile or broadly attached, often imbricate or growing together in clusters. Pileus dimidiate to flabelliform, up to 10 cm long and 5 cm from margin to attachment and 0.2–1.5 cm thick, upper surface first orange reddish brown and slightly velutinate, later glabrous and fading to wood-color, concentrically zonate-sulcate, dull to slightly shining, margin thin and often decurrent. Pore surface first bright orange to reddish brown, fading to ochraceous, pale brown or grey, pores round to angular, 6–9 per mm, dissepiments very thin, tubes single-layered up to 0.6 cm long, reddish brown near the pore mouth. Context white, cream to wood colored, radially fibrous, up to 0.6 cm thick. Hyphal system dimitic, generative hyphae with simple septa, thin to thick-walled, 3–5 μm wide, skeletal hyphae up to 8 μm wide. Cystidia not present, but smooth, pointed, thin-walled cystidioles present among the basidia, 20–25 × 10–12 μm. Basidiospores subglobose, hyaline, thin-walled, IKI–, 3.5–5 × 3.5–4 μm.

Fruitbodies were found on decayed hardwoods collected at Wu-lai, Pingtung and Ta-pu. (TFRI-20, March, 1991, Pingtung, <100 m; TFRI-107 and 108, September, 1991, Wu-lai, 300 m; TFRI-113, September, 1991, Ta-pu, 400 m).

Trichaptum abietinum (Dicks.: Fr.) Ryv. Norw. J. Bot. 19:237. 1972. (Figs. 6 and 12-A)

Fruitbodies annual, usually effused-reflexed, sometimes sessile or resupinate, pilei solitary or imbricate, often laterally fused, up to 1.5 × 5 × 0.2 cm; upper surface gray, hirsute, azonate, smooth, margin concolorous. Pore surface bright purplish, fading to ochraceous, rough, the pores angular, 4–6 per mm, entire dissepiments that become thin and deeply lacerate with age. Context usually less than 1 cm thick, duplex, the upper layer whitish, floccose, soft, the lower layer white, firm, tough-fibrous. Tube layer concolorous and continuous with the lower layer of the context, up to 1.5 mm thick. Hyphal system dimitic, contextually skeletal hyphae thick-walled, hyaline, with rare branching, nonseptate, 2.5–5 μm in diameter, contextual generative hyphae thin-walled, hyaline, rarely branched, with clamps, 2–4 μm in diameter, tramal hyphae similar. Cystidia abundant, usually capitately encrusted, embedded or projecting to 15 μm 4–7 μm in diameter, arising from embedded tramal

Fig. 6. Basidiocarps of *Trichaptum abietinum*.

Fig. 7. Basidiocarps of *Bondarzewia montana*.

skeletal hyphae that curve out into the hymenium, hyphal pegs also present. Basidiospores cylindric, slighty curved, hyaline, smooth, IKI-, 6-7.5 × 2.5-3 μm.

Fruitbodies were observed on decayed conifers collected at Hsiao-Ko-Tou and Wu-ling. (TFRI-18, May, 1991, Hsiao-Ko-Tou, 300 m; TFRI-49, Auguest, 1991, Wu-ling, 2000 m).

Bondarzewia montana (Quél.) Sing. Rev. Mycol. 5:4. 1940. (Figs. 7 and 12-B)

Fruitabodies annual, centrally to laterally stipitate, pilei solitary or several on a branched stipe, flabelliform, up to 8 cm wide and 1 cm thick, upper surface purplish brown, azonate, scurfy to finely tomentose, drying rugose, margin concolorous. Pore surface cream colored, the pores angular, 1-3 per mm, with thin dissepiments that become lacerate. Context cream colored, azonate, firm, fissile when dry, up to 1 cm thick. Tube layer continuous and concolorous with context, up to 2 mm thick, often decurrent on stipe almost to ground level, odor very pleasant, nutlike. Hyphal system dimitic, generative hyphae thin-walled, simple-septate, with rare branching, 4-8 μm in diameter, skeletal hyphae thick-walled, aseptate, with infrequent branching, 3-8 μm in diameter. Basidiospores globose to subglobose, hyaline in KOH, ornamented with irregularly arranged, short, strongly amyloid ridges 6-8 × 5-7μm.

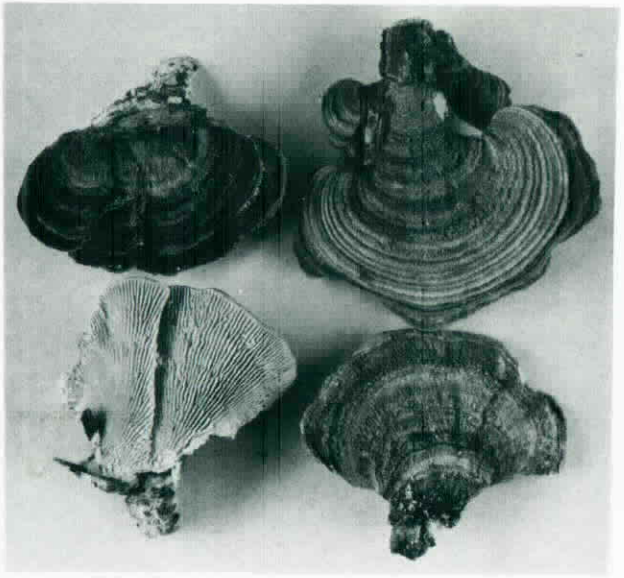

Fig. 8. Basidiocarps of *Lenzites betulina*.

Fruitbodies were observed on decayed conifers collected at Neng-Kao. (TFRI-82, September, 1991, 2750 m).

Lenzites betulina (Fr.) Fr. Epicr. p. 405. 1838. (Figs. 8 and 12-C)

Fruitbodies annual, single to a few together, pileate, dimidiate to semicircular or broadly attached with a partly resupinate, effused part, 1-5 × 2-8 × 0.3-1.0 cm, margin even to lobed or incised, corky and coriaceous. Upper surface tomentose to hispid in concentric, partly sulcate zones, first white, later grayish to cream, old specimens often with a greenish tint. Hymenophore lenzitoid with thin radial lamellae, about 100-200 μm thick, in older parts and when dry, mostly undulating or flexuous, thus, the distance between individual lamellae may vary considerably, first white, later cream to ochraceous. Context thin, 1-2 mm thick, fibrous and white, distinctly lighter than the lamellae. Hyphal system trimitic, generative hyphae hyaline and with clamps, thick-walled to thin-walled and up to 5 μm wide, skeletal hyphae solid to thick-walled, 3-7 μm wide, binding hyphae, hyaline, thick-walled to solid, tortuous and much branched, up to 10 μm wide. Basidiospores cylindrical, often slightly bent, hyaline, thin-walled and IKI-, 5-6 × 2-3 μm.

Fruitbodies were found on decayed conifers collected at Tun-yuang. (TFRI-66 and 99, September, 1991, 2000 m).

Stereum ostrea (Bl. et Nees) Fr. Epicr. P. 547. 1838. (Figs. 9 and 13-A)

Fruitbodies annual, effused-reflexed to dimidiate or laterally sessile, coriaceous to leathery. Pileus generally up to 5 cm long and broad up to 1 mm thick in section at the base flablliform to petalliform, often

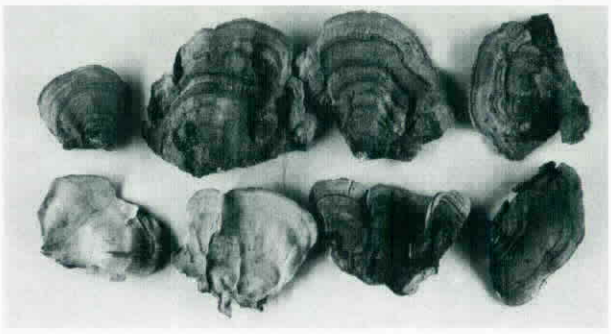

Fig. 9. Basidiocarps of *Stereum ostrea*.

attached laterally by a narrow base. Upper surface tomentose, concentrically zonate, zones of erect and appressed tomentum, multicolored, showing a variety of color shades of yellow and grey in concentric bands, young margin in always some shade of yellow which is followed by deeper shades of brown and grey towards the base. Hymenial surface cream yellow to yellow ochraceous, smooth. Margin acute, paler concolorous. Context subhyaline in section, composed of compactly arranged hyphae, with a thick brown cuticle on the abhymenial side. Hyphal system dimitic, skeletal hyphae 5–8 μm wide, sparsely branched, aseptate, thick, generative hyphae 2–4 μm wide, clamps absent, the walls subhyaline, thin to moderately thick. Tomentose hyphae 3–6 μm wide, unbranched to rarely branched, distantly septate, usually with retraction septa, clamps absent, the walls subhyaline to tinted brown, thick and leaving a narrow lumen. Cystidiate hyphae 6–10 μm broad, cylindrical to hyphoid with curve into the hymenium, immersed or projecting slightly out of it, unbranched, aseptate, the walls subhyaline, thick, leaving a capillary lumen except at the top where it broadens gradually. Basidiospores ellipsoid, minutely apiculate, the walls hyaline, smooth, thin and IKI–, 5.5–7.5 × 2–3 μm.

Fruitbodies were found on decayed hardwoods collected at Wu-lai. (TFRI-110, September, 1991, 300 m).

Hymenochaete rubiginosa (Dicks.) Lev. Ann. Sci. Nat. Bot. 5:151. 1846. (Figs. 10 and 13-B)

Fruitbodies perennial, effused-reflexed to pileate, cartilaginous-tough when fresh but become hard and woody on drying. Pileus up to 5 cm and 2 mm thick, sessile or attached by a narrow base or umbo, occasionally imbricate. Hymenial surface chocolate brown to snuff brown, smooth to sparsely tuberculate or uneven or faintly concentrically sulcate, sulcations or zonations corresponding to those of upper surface. Ab-

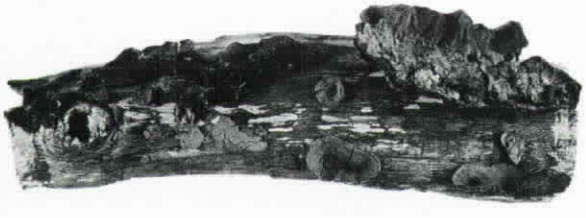

Fig. 10. Basidiocarps of *Hymenochaete rubiginosa*.

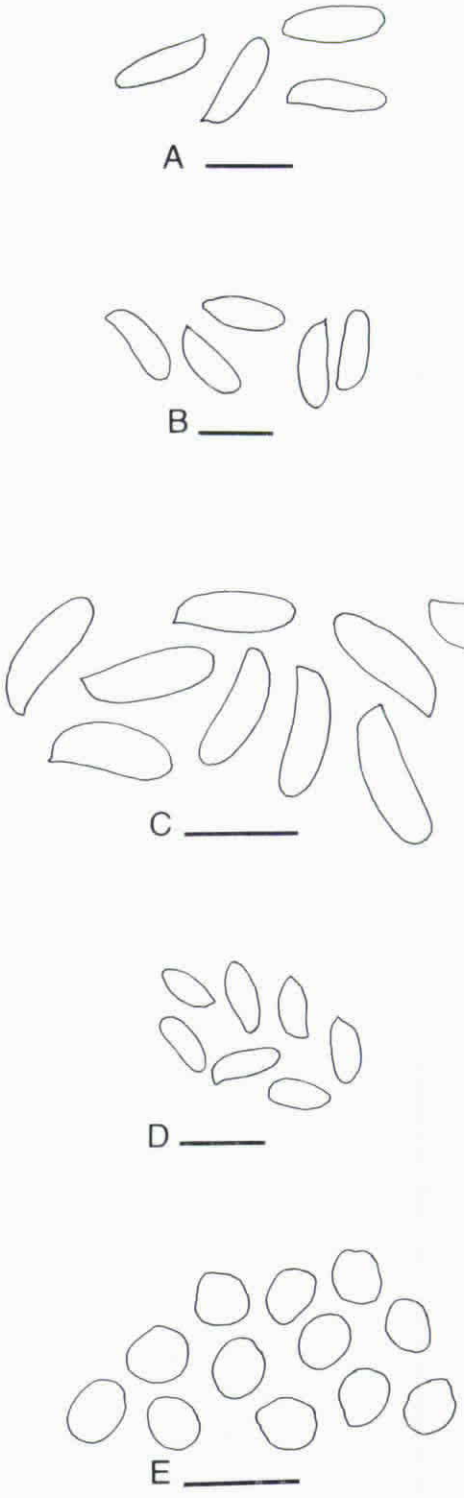

Fig. 11. Basidiospores. A, *Coriolopsis aspera*; B, *C. floccosa*; C, *Earlilla scabrosa*; D, *Polyporus grammocephalus*; E, *Rigidoporus microporus*. Bar=10 μm.

hymenial surface dark brown to greyish brown, concentrically zonate, with zones of erect and appressed tomentum, radially sulcate, with maturity the tomentum becomes compact and somewhat agglutinated and appears hard and barklike. Margin acute, entire or rarely cleft, paler concolorous. Context light brown in cross section, composed of compactly arranged somewhat agglutinated hyphae, with a well-developed cuticle on the abhymenial surface. Hyphal system dimitic, skeletal hyphae 1.5-2.5 μm wide, unbranched, aseptate, the walls thick to almost solid, light brown, generative hyphae 1.5-2 μm wide, branched, septate, clamps absent, the walls thin, subhyaline. Setae 30-70 μm, subulate to subcylindrical, light brown, thick-walled, arising from the upper layers of the context or subhymenium, immersed or projecting up to 25 μm out

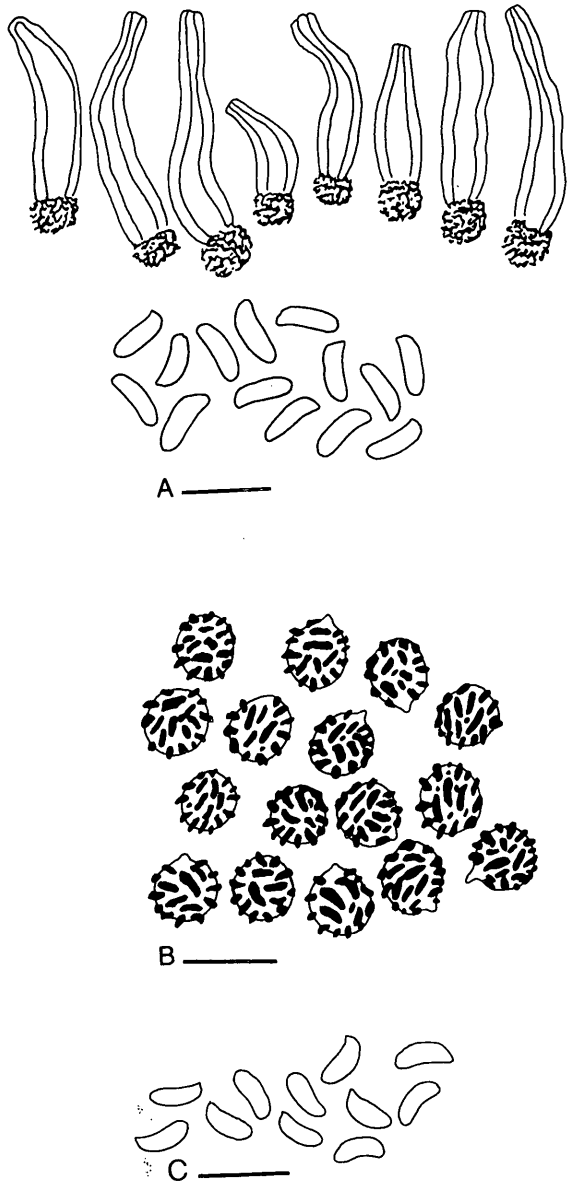

Fig. 12. Basidiospores (A, B, C) and cystidia (A). A, *Trichaptum abietinum*; B, *Bondarzewia montana*; C, *Lenzites betulina*. Bar=10 μm.

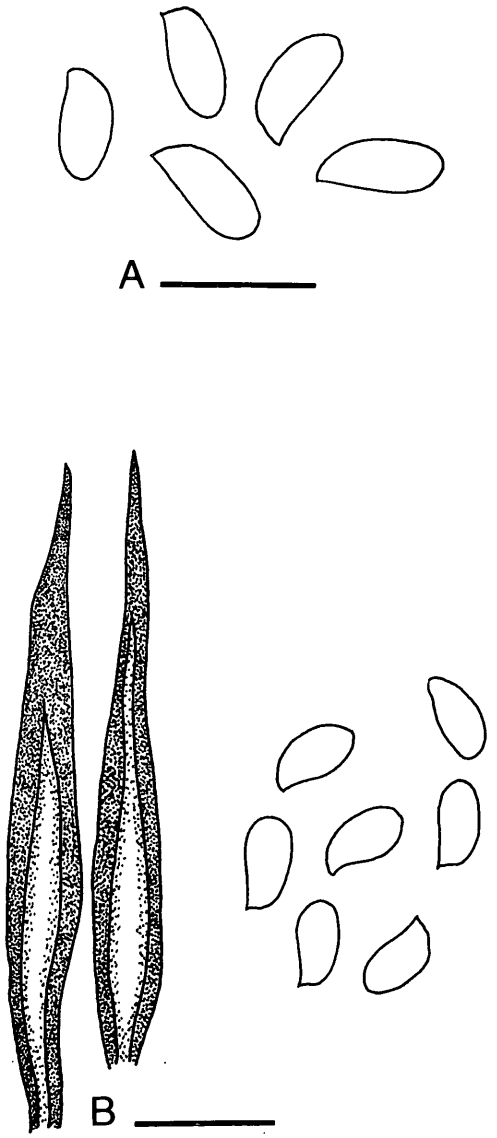

Fig. 13. Basidiospores (A,B) and setae (B). A, *Stereum ostrea*; B, *Hymenochaete rubiginosa*. Bar=10 μm.

of the hymenium. Basidiospores ellipsoid, minutely apiculate, the walls thin, subhyaline, smooth, IKI-, 4.5 -6 × 2.5-3.5 μm.

Fruitbodies were found on decayed twigs of *Casuarina* sp. collected at Chin-shan (TFRI-02, Auguest, 1991, <100 m).

Acknowledgments. I wish to thank Dr. L. Ryvarden, Department of Biology, University of Oslo for confirming specimens of *Coriolopsis aspera, C. floccosa*, and *Earliella scabrosa* and to Dr. Z. C. Chen, Department of Botany, National Taiwan University for critical review of the manuscript. This study was in part supported by a grant from the Taiwan Provincial Government.

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數種臺灣新記錄之木生性無褶菌

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本文報導十種臺灣新記錄之木材腐朽性無褶菌：*Coriolopsis aspera*, *C. floccosa*, *Earliella scabrosa*, *Polyporus grammocephalus*, *Rigidoporus microporus*, *Trichaptum abietinum*, *Bondarzewia montana*, *Lenzites betulina*, *Stereum ostrea* 和 *Hymenochaete rubiginosa*。上述十種無褶菌採自腐朽闊葉樹或針葉樹之莖，根或枝條。