

# Changbai wood-rotting fungi 9. Three new species and other species in *Rigidoporus*, *Skeletocutis* and *Wolfiporia* (Basidiomycota, Aphyllophorales)

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Three new polypore species, *Rigidoporus eminens* Y. C. Dai, *Skeletocutis subvulgaris* Y. C. Dai, and *Wolfiporia curvispora* Y. C. Dai, are described and illustrated based on recent collections from Northeast China. *Rigidoporus eminens* is closely related to *R. undatus* (Pers.: Fr.) Donk, but differs by its soft corky to fragile basidiocarps, lacerate tube dissepiments, thin-walled tramal hyphae, and thicker cystidia, strongly penetrating the hymenium. *Skeletocutis subvulgaris* is similar to *S. vulgaris* (Fr.) Niemelä & Y. C. Dai in its ecology, morphology and shape of basidiospores, but it has no stellate crystal clusters on the hyphae, and its generative hyphae are covered with fine, sharp-pointed encrustations (the typical characters of *Skeletocutis* Kotl. & Pouzar). *Wolfiporia curvispora* is distinguished from the other species of the genus by its biennial habit, small pores, curved cylindric spores, and uninflated subicular hyphae. All the Chinese species in the genera of *Leucophellinus* Singer, *Oxyporus* Donk, *Rigidoporus* Murrill, *Physisporinus* P. Karst., *Skeletocutis* and *Wolfiporia* Ryvar den & Gilb. were studied, and keys for these species are given. Statistical variation of spore dimensions are included in the keys. The combination of *Physisporinus xylostomatoides* (Berk.) Y. C. Dai is proposed. *Oxyporus bucholtzii* (Bondartsev & Ljub.) Y. C. Dai & Niemelä is new to China.

Key words: basidiomycota, Changbai Mts., China, polypores, *Rigidoporus eminens*, *Skeletocutis subvulgaris*, taxonomy, *Wolfiporia curvispora*

## INTRODUCTION

This paper belongs to a series of studies devoted to the wood-rotting fungi of Northeast China. Three new species, belonging to *Rigidoporus* Murrill, *Skeletocutis* Kotl. & Pouzar and *Wolfiporia* Ryvar den & Gilb., are described from recent collections of the author. The differences between the new species and their related look-alike spe-

cies are discussed by comparative specimen examination. Specimens of Chinese species belonging to the genera *Leucophellinus* Singer, *Oxyporus* Donk, *Rigidoporus*, *Physisporinus* P. Karst., *Skeletocutis* and *Wolfiporia* were studied. In order to make these species available to a forthcoming book on East Asian polypores by Prof. Leif Ryvar den (Oslo) and his coworkers, the keys for all the Chinese species in the above genera are given,

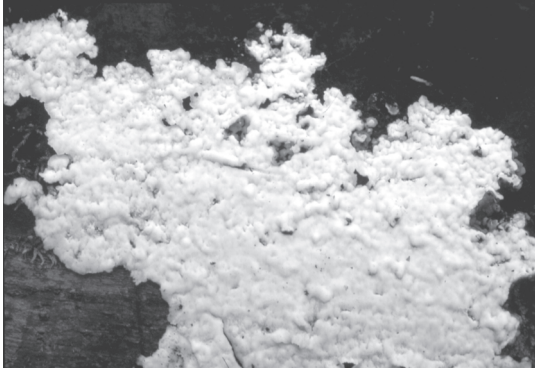


Fig. 1. *Rigidoporus eminens* Y. C. Dai. A fresh basidiocarp (Dai 2505),  $\times 0.25$

and the spore dimensions of these species are included in the keys.

Most of the material examined for the present study is deposited in the Botanical Museum of the University of Helsinki (H), and duplicates of the Chinese collections are kept in the author's personal herbarium (Y. C. Dai), and these duplicates will finally be deposited in some public herbarium in China. Some specimens from other herbaria are cited in the following text. The microscopical routine used in the study is as presented by Dai (1996). In the text, the following abbreviations are used: L = mean spore length (arithmetical mean of all spores), W = mean spore width (arithmetical mean of all spores), Q = quotient of the mean spore length and the mean spore width (L/W ratio), ( $n = x/y$ )  $x$  measurements of spores (basidia, basidioles, cystidia, hyphae and pores) from  $y$  specimens. In presenting the variation in the size of the spores (basidia, basidioles, cystidia, hyphae and pores), 5% of the measurements were excluded from each end of the range, and are given in parentheses. IKI stands for Melzer's reagent and KOH for 5% potassium hydroxide; CB+ means cyanophilous and CB- acyanophilous; IKI- means inamyloid and indextrinoid.

## RESULTS

*Rigidoporus eminens* Y. C. Dai, *sp. nov.* (Figs. 1 and 2)

*Carpophorum annuum*, *resupinatum*, *contextum cremeum*. *Facies pororum cremea vel bubalina*;

*pori* 5–8 per mm. *Systema hypharum monomiticum*, *hyphae septatae sine fibulis*, *hyphae subiculi* 4–5.8  $\mu\text{m}$  in diam. *Sporae hyalinae, globosae*, 4.2–6  $\times$  3.9–5.2  $\mu\text{m}$ .

Holotype: China. Jilin Prov., Huadian County, Dongxing, on rotten wood of *Tilia*, 19.X.1993 Dai 1728 (H; isotype, Y. C. Dai). — Representative paratype with slightly smaller spores: China. Antu County, Changbaishan Nat. Res., on rotten wood of *Tilia*, 15.VIII.1997 Dai 2505 (H).

*Basidiocarps* annual, resupinate, soft, more or less watery, easily separated from substrate, up to a few metres long, 60 cm wide, and 5 mm thick, without odour or taste, when dry strongly shrunken, and then soft corky to fragile. Margin very narrow, usually pores extend to the very edge. Fresh poroid surface white to cream, becoming pale brown when bruised, cream to buff and cracking upon drying, pores angular, in parts irregular, 7–8 per mm ( $n = 60/5$ ), dissepiments thin, lacerate to dentate. Section: subiculum very thin, 0.1–0.3 mm thick, soft corky, cream; tube layer cream to pale buff, fragile, tubes up to 4 mm long.

*Hyphal system* monomitic, hyphae simple-septate, IKI-, CB+, unchanged in KOH.

*Subiculum*. — Subicular hyphae subparallel next to the substrate, interwoven close to tube bottoms, hyphae thin- to thick-walled, frequently simple-septate, occasionally branched, (3.6–)4–5.8(–6)  $\mu\text{m}$  in diam ( $n = 31/2$ ).

*Tubes*. — Tramal hyphae parallel along tubes, more or less agglutinated, frequently simple-septate, thin- to fairly thick-walled, unbranched, straight, (2.4–)3.1–4.6(–4.8)  $\mu\text{m}$  in diam ( $n = 30/2$ ). Hyphoid cystidia abundant, clavate, arising from trama, distinctly penetrating above the hymenial surface, rooting deep from the trama, thick to very thick-walled in the bending section, strongly CB+, apically encrusted with fine or coarse crystals, 5–9(–11)  $\mu\text{m}$  in diam ( $n = 100/6$ ); fusoid cystidioles frequent, thin-walled, hyaline, (12–)13–17(–18)  $\times$  5–7.5(–8)  $\mu\text{m}$  ( $n = 30/2$ ). Basidia broadly clavate to barrel-shaped, with four sterigmata and a basal simple septum, 11–15(–17)  $\times$  (5–)6–8(–8.5)  $\mu\text{m}$  ( $n = 30/2$ ), basidioles mostly barrel-shaped, slightly smaller than basidia.

*Spores*. — Basidiospores globose, thin-walled, hyaline, smooth, bearing a guttule, IKI-, weakly CB+, (4–)4.2–6(–6.5)  $\times$  (3.7–)3.9–5.2(–6)  $\mu\text{m}$ , L = 5.07  $\mu\text{m}$ , W = 4.51  $\mu\text{m}$ , Q = 1.11–1.16 ( $n = 210/7$ ).

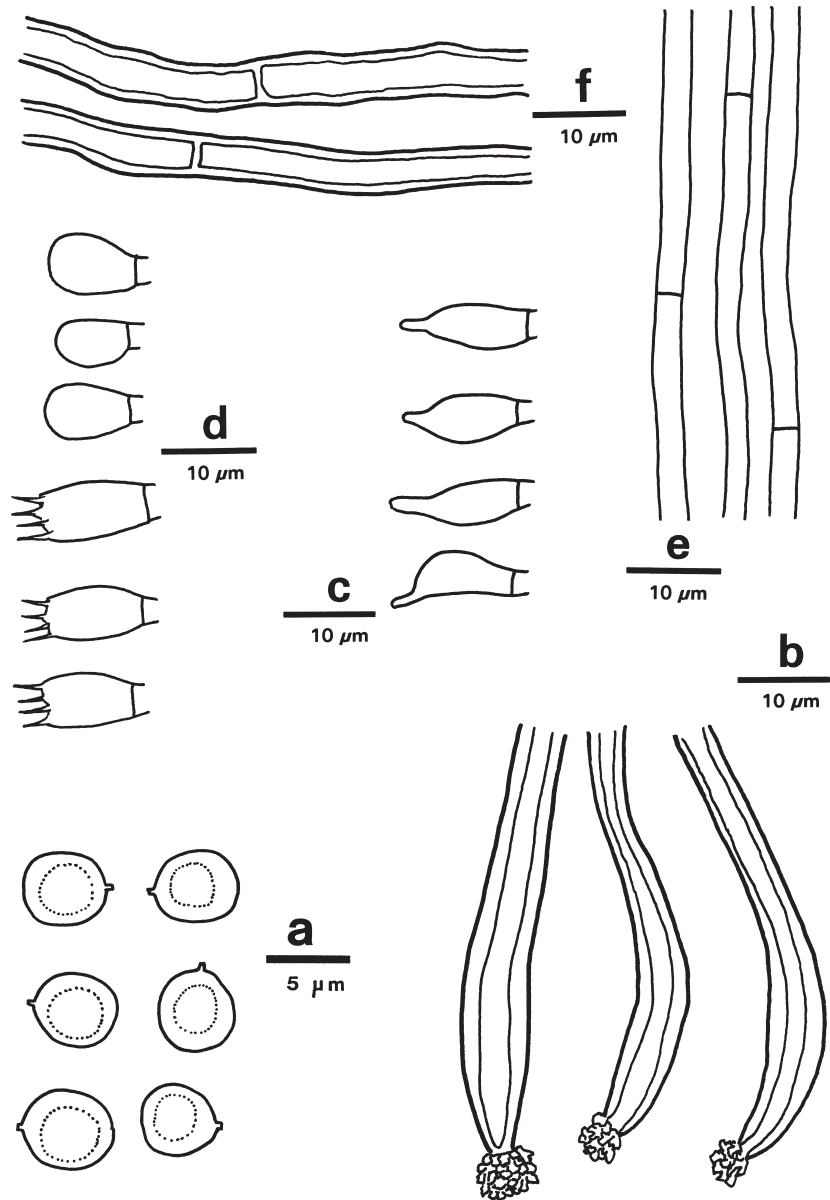


Fig. 2. Anatomical details of *Rigidoporus eminens* Y. C. Dai (drawn from the holotype). — a: Basidiospores. — b: Cystidia. — c: Cystidioles. — d: Basidia and basidioles. — e: Tramal hyphae. — f: Subicular hyphae.

*Etymology.* — *Eminens* (Lat., part.), projecting, referring to the cystidia that project out of the hymenium.

*Additional specimens examined (paratypes).* — China. Jilin Prov., Antu County, Baoma, on fallen trunk of *Quercus*, 8.IX.1995 Dai 1991; Changbaishan Nat. Res., on rotten wood of *Populus*, 9.IX.1995 Dai 2019, on rotten wood of *Tilia*, 15.VIII.1997 Dai 2474 & 2501. Huadian County, Dongxing, on rotten wood of *Fraxinus*, 17.X.1993 Dai 1652, on rotten wood of *Juglans*, 17.X.1993 Dai 1645, on rotten wood of *Populus*, 17.X.1993 Dai 1641, on rotten stump of *Quercus*, 16.X.1993 Dai 1635 & 1666. Huinan County,

Hongqi, on fallen decorticated trunk of *Fraxinus*, 11.VII.1993 Dai 389, on rotten wood of *Populus*, 11.X.1993 Dai 1512 and 13.X.1993 Dai 1603, on fallen trunk of *Tilia*, 12.VII.1993 Dai 470, on stump of *Ulmus*, 13.X.1993 Dai 1590. Liaoning Prov., Kuandian County, Guanshui, on fallen trunk of *Acer*, 26.IX.1995 Dai 2199, on fallen trunk of *Fraxinus*, 26.IX.1995 Dai 2193 & 2197, on stump of *Juglans*, 26.IX.1995 Dai 2200. All in H.

*Rigidoporus eminens* is closely related to *R. undatus* (Pers.: Fr.) Donk, and I treated it in my earlier paper as *R. cf. undatus* (Dai 1996). After carefully studying the Chinese material and speci-

mens of the European *R. undatus*, I found my collections to be different from *R. undatus* in several important characters. In the summer of 1997, additional characters in fresh material were noticed and photographs were taken during the field trip in China, and I am now assured that the Chinese collections are not *R. undatus*. The differences between *R. eminens* and *R. undatus* are summarized in Table 1.

*Rigidoporus eminens* and *R. lineatus* (Pers.: Fr.) Ryvar den have similar spores and cystidia. However, the latter species has pileate and very hard basidiocarps, distinctly thick-walled tramal hyphae, and its contextual hyphae are rarely septate. In China *R. lineatus* is found in subtropical areas.

Fresh basidiocarps of *Rigidoporus eminens* somehow resemble *Physisporinus vitreus* (Pers.: Fr.) P. Karst., but the latter species lacks the thick-walled hyphoid cystidia. Pores of *R. eminens* become pale brownish when bruised, and its dry basidiocarps are soft corky to fragile. Even though these macrocharacters are more close to *Physisporinus*, I place the new species in *Rigidoporus* because it has abundant thick-walled hyphoid cystidia, which are absent in *Physisporinus*. Anyhow, *R. eminens* shares characters of both the genera, and it is somehow a link between the two.

For comparison the following specimens were examined. — *Physisporinus vitreus*: **China**. Jilin Prov., Dunhua County, Huangnihe, on rotten wood of *Tilia*, 8.VIII.1997 Dai 2299. **Finland**. Perä-Pohjanmaa, Rovaniemi, Pisavaara National Park, on rotten wood of *Pinus*, 16.IX.1997 Dai 2668 & Niemelä. — *Rigidoporus lineatus*: **China**. Hainan prov., Yenhsien, 22.VI.1934 Teng 3614 (BPI 226524). **Hungary**. Budapest, on *Robinia*, 1918 Magoczy-Dietz (PRM

487591, holotype of *Leptoporus moeszii* Pilát). **Japan**. Minamizaki, Hahajima Mts., 28.XI.1990 Hattori (TFM 15942). — *R. undatus*: **Croatia**. Plitvicka Jezera Nat. Park, on trunk of *Acer*, 18.VII.1977 Tortiá 5877 (H). **Germany**. Berlin, Palmenhaus, ex Herb. Bresadola (H); Palmenhaus im Botanischen Garten, 25.X.1879 Magnus (H).

**Key to the Chinese species of *Leucophellinus*, *Oxyporus*, *Rigidoporus* and *Physisporinus***  
(after each species, spore dimensions are given)

1. Pore surface changes to buff, reddish, orange, beige or dark grey and basidiocarps become hard or fragile when dry; mammillate cystidioles present, cystidia, if present, arising from trama ..... *Rigidoporus* group 10
1. Pore surface unchanged in colours of white, cream or yellowish and basidiocarps remain corky when drying; mammillate cystidioles absent, cystidia present, arising from subhymenium or trama ..... *Oxyporus* group 2
2. Spores distinctly thick-walled, cystidia with septa ..... *L. irpicoides* (Pilát) Bondartsev & Singer  
(5.5–)6.2–8.5(–9) × (4.5–)4.8–6(–6.5) µm,  
L = 7.46 µm, W = 5.36 µm, Q = 1.30–1.47 (n = 240/8)
2. Spores thin- to fairly thick-walled, cystidia without septa ..... 3
3. Pore surface yellowish, spores cylindrical ..... *O. cervinogilvus* (Jungh.) Ryvar den  
(5.8–)6.1–7.3(–9) × (2.8–)2.9–3.4(–3.5) µm,  
L = 6.80 µm, W = 3.02 µm, Q = 2.25 (n = 30/1)
3. Pore surface white or cream, spores ellipsoid or subglobose ..... 4
4. Basidiocarps distinctly pileate ..... 8
4. Basidiocarps resupinate to more or less effused-reflexed ..... 5
5. Pores 4–6 per mm, hyphoid cystidia arising from trama ..... *O. obducens* (Pers.: Fr.) Donk  
(3.3–)3.5–4.6(–5) × (2.5–)2.7–3.5(–3.8) µm,  
L = 4.08 µm, W = 3.10 µm, Q = 1.26–1.38 (n = 60/2)

Table 1. A comparison of *Rigidoporus eminens* Y. C. Dai and *R. undatus* (Pers.: Fr.) Donk.

<i>R. eminens</i>	<i>R. undatus</i>
Basidiocarps soft when fresh, becoming soft corky to fragile when dry.	Basidiocarps tough when fresh, becoming hard and cartilaginous when dry.
Pore surface cream to buff, cracking upon drying, pore mouths lacerate to dentate, pores 5–8 per mm.	Pore surface isabelline to dull pinkish, very dense and not cracking when drying, pore mouths even, pores 7–9 per mm.
Cystidia prominently penetrating out of hymenium, 5–9 µm in diam.	Cystidia embedded in trama or bending into hymenium, but not above hymenium, 4.5–5.5 µm in diam.
Tramal hyphae more or less agglutinated, thin- to fairly thick-walled.	Tramal hyphae strongly agglutinated, distinctly thick-walled.
Living on angiosperms only.	Living on both angiosperms and gymnosperms.

5. Pores 2–4 per mm, hymenial cystidia originating from subhymenium ..... 6
6. Spores subglobose, < 5 µm in diam .....  
..... *O. cuneatus* (Murrill) Aoshima  
(3.9–)4–4.8(–5) × (3–)3.1–3.6(–4) µm,  
L = 4.10 µm, W = 3.25 µm, Q = 1.26 (n = 30/1)
6. Spores broadly ellipsoid, > 5 µm in length ..... 7
7. Encrusted and smooth cystidia present, subicular hyphae 3–5 µm in diam ..... *O. corticola* (Fr.) Donk  
(4.5–)4.9–6.2(–7) × (2.9–)3–4(–4.1) µm,  
L = 5.53 µm, W = 3.37 µm, Q = 1.60–1.74 (n = 120/4)
7. Only encrusted cystidia present, subicular hyphae 5–7 µm in diam .....  
*O. cf. latemarginatus* (Dur. & Mont. ex Mont.) Donk  
(4.2–)4.3–5(–5.1) × (2.6–)2.7–3(–3.2) µm,  
L = 4.81 µm, W = 2.90 µm, Q = 1.66 (n = 23/1)
8. Cystidia thin-walled, arising from subhymenium, contextual hyphae rarely septate ..... *O. bucholtzii* (Bondartsev & Ljub.) Y. C. Dai & Niemelä  
(4–)4.9–6.5(–7.2) × (3–)3.3–5(–5.5) µm,  
L = 5.71 µm, W = 4.14 µm, Q = 1.30–1.48 (n = 60/2)
8. Cystidia thick-walled, originating from trama, contextual hyphae frequently septate ..... 9
9. Pores 6–8 per mm, spores subglobose, < 5 µm in diam .....  
..... *O. populinus* (Schumach.: Fr.) Donk  
(3–)3.2–4(–4.4) × (2.9–)3–3.6(–3.9) µm,  
L = 3.69 µm, W = 3.22 µm, Q = 1.14–1.15 (n = 68/2)
9. Pores 4–5 per mm, spores broadly ellipsoid, > 5 µm in length .....  
..... *O. sinensis* X. L. Zeng  
(4.7–)5.2–6.6(–7) × (3.8–)4–5(–6) µm,  
L = 5.89 µm, W = 4.54 µm, Q = 1.25–1.36 (n = 120/4)
10. Basidiocarps resupinate ..... 13
10. Basidiocarps pileate ..... 11
11. Cystidia present, contextual hyphae rarely septate ...  
..... *R. lineatus* (Pers.: Fr.) Ryvardeen  
(4.1–)4.7–5.5(–6) × (3.8–)4–5(–5.1) µm,  
L = 5.07 µm, W = 4.43 µm, Q = 1.09–1.19 (n = 90/3)
11. Cystidia absent, contextual hyphae frequently septate ..... 12
12. Basidiocarps perennial, up to 8 cm thick when mature, upper surface azonate, spores > 5.5 µm in diam .... *R. ulmarius* (Sow.: Fr.) Imazeki  
(5.5–)6–7.5(–8.2) × (5–)5.1–6.3(–7) µm,  
L = 6.71 µm, W = 5.73 µm, Q = 1.17–1.18 (n = 61/2)
12. Basidiocarps annual to biennial, up to 2 cm thick when mature, upper surface zonate, spores < 5.5 µm in diam .....  
..... *R. microporus* (Fr.) Overeem  
(3.4–)3.8–5.1(–5.5) × (2.9–)3.1–4.8(–5) µm,  
L = 4.50 µm, W = 4.10 µm, Q = 1.08–1.13 (n = 60/2)
13. Thick-walled cystidia from trama absent; thin-walled hyphoid cystidia may be present at dissepiment edges ..... 15
13. Thick-walled cystidia from trama present ..... 14
14. Basidiocarps annual to perennial, cystidia embedded in trama or only penetrating into the hymenial layer, subicular hyphae rarely septate, subtropical species ... *R. vinctus* (Berk.) Ryvardeen  
(3.8–)3.9–4.5(–4.7) × (3–)3.1–3.9(–4) µm,  
L = 4.13 µm, W = 3.40 µm, Q = 1.21 (n = 30/1)
14. Basidiocarps distinctly annual, cystidia penetrating far above the hymenial surface, subicular hyphae frequently septate ..... *R. eminentis* Y. C. Dai  
(4–)4.2–6(–6.5) × (3.7–)3.9–5.2(–6) µm,  
L = 5.07 µm, W = 4.51 µm, Q = 1.11–1.16 (n = 210/7)
15. Basidiocarps perennial, tramal hyphae distinctly thick-walled ..... *R. crocatus* (Pat.) Ryvardeen  
(3.9–)4–5.2(–5.6) × (2.9–)3–4.5(–5) µm,  
L = 4.75 µm, W = 3.71 µm, Q = 1.23–1.33 (n = 120/4)
15. Basidiocarps annual, tramal hyphae thin-walled .. 16
16. Hyphae with clamps .....  
..... *P. rivulosus* (Berk. & M. A. Curtis) Ryvardeen  
(4.2–)4.8–5.8(–6) × (3.8–)3.9–4.9(–5) µm,  
L = 5.12 µm, W = 4.36 µm, Q = 1.18 (n = 30/1)
16. Hyphae with simple septa ..... 17
17. Pore surface cream to pale buff in dry basidiocarps, pores 4–5 per mm, spores < 5 µm in diam .....  
..... *P. xylostromatoides* (Berk.) Y. C. Dai  
(3.9–)4–5(–5.5) × (2.8–)3–4.5(–4.8) µm,  
L = 4.46 µm, W = 3.83 µm, Q = 1.15–1.18 (n = 53/2)
17. Pores surface pale brown to dark grey in dry basidiocarps, pores 6–8 per mm, spores > 5 µm in diam .. 18
18. Pore surface white, rapidly reddish when bruised, becoming dark grey upon drying .....  
..... *P. sanguinolentus* (Alb. & Schwein.: Fr.) Pilát  
(4.8–)5–6.8(–7) × (4–)4.2–6(–6.5) µm,  
L = 5.98 µm, W = 5.05 µm, Q = 1.15–1.23 (n = 90/3)
18. Pore surface white, unchanged when bruised, becoming cream to pale brownish upon drying .....  
..... *P. vitreus* (Pers.: Fr.) P. Karst.  
(4.8–)5.1–7(–7.2) × (3.7–)4–5.7(–5.9) µm,  
L = 5.81 µm, W = 4.78 µm, Q = 1.22 (n = 30/1)

## REMARKS

*Physisporinus xylostromatoides* (Berk.) Y. C. Dai, *comb. nov.* (Fig. 3)

Basionym: *Polyporus xylostromatoides* Berk., London J. Bot. 2: 637. 1843.

The species was earlier allocated in *Ceriporia* Donk (Ryvardeen & Johansen 1980, Gilbertson & Ryvardeen 1986–1987). The important characters in *Ceriporia* are: spores are cylindrical or allantoid, subicular hyphae are much thicker than those in the trama, and hyphae are usually constricted at their septa. Recent collections of *Physisporinus xylostromatoides* from China have been studied. Several characters of the species are alien to *Ceriporia*: pores change to pale buff when bruised, spores are subglobose, and usually bear a guttule, fusoid cystidioles are present in the hymenium, subicular hyphae are slightly thicker than tramal hyphae, and hyphae evenly thick throughout. These characters are more close to *Physisporinus*

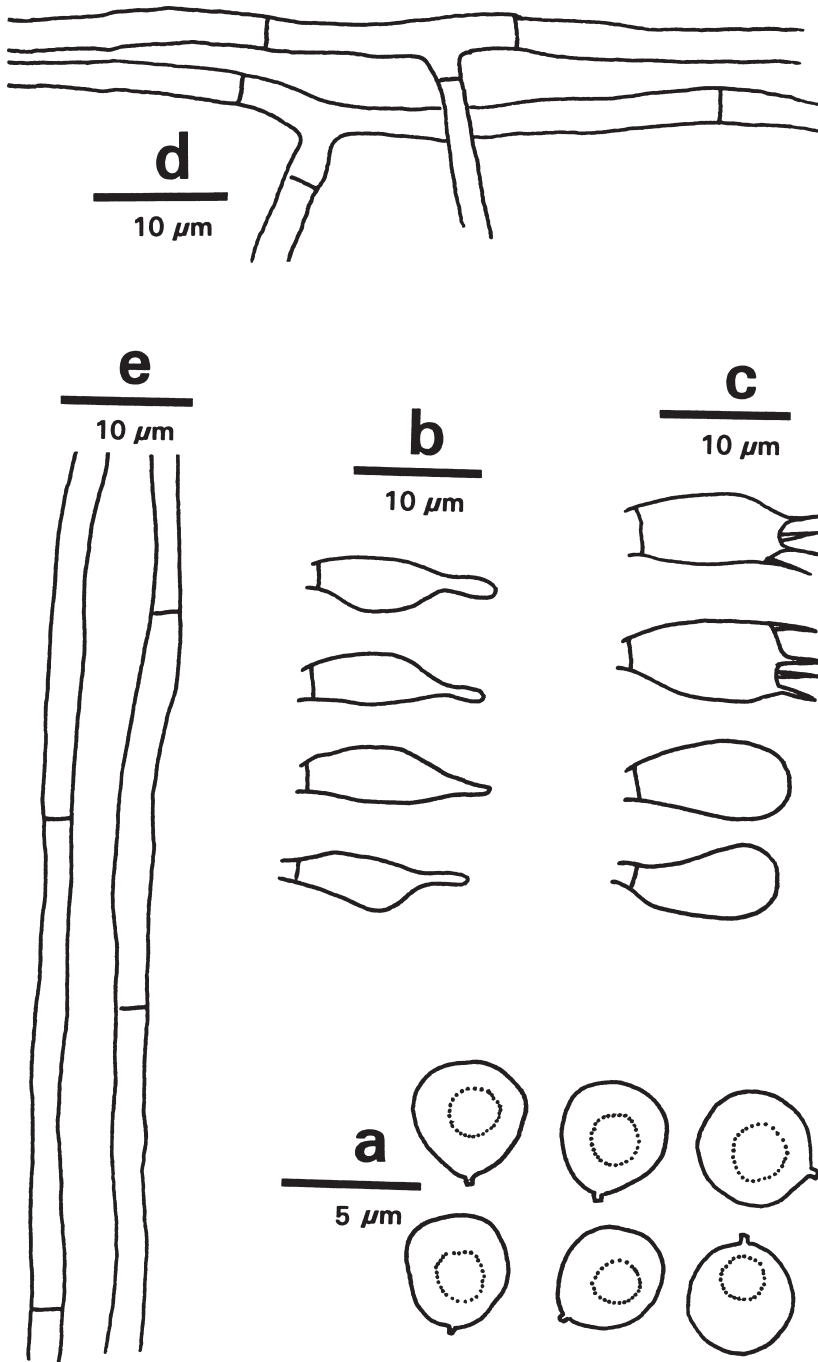


Fig. 3. Anatomical details of *Physisporinus xylostromatoides* (Berk.) Y. C. Dai (drawn from Dai 1413). — a: Basidiospores. — b: Cystidioles. — c: Basidia and basidioles. — d: Hyphae in subiculum. — e: Hyphae in trama.

than to *Ceriporia*. For these reasons I propose the new generic combination.

*Specimens examined.* — **China.** Beijing, Chinese Academy of Forestry, on *Thuja*, 25.IX.1993 Dai 1326, 1327 &

1330; Xiangshan, on wood of *Thuja*, 26.IX.1993 Dai 1361, on stump of an angiosperm, 26.IX.1993 Dai 1364; Yihe-yuan, on *Thuja*, 29.IX.1993 Dai 1413. Tianjin, Baodi, on *Salix*, 12.VIII.1993 Dai 882. **U.S.A.** Florida, Delray, on hardwood, 11.IX.1950 Lowe 4700.



Fig. 4. *Skeletocutis subvulgaris* Y. C. Dai, holotype,  $\times 2$ .

*Skeletocutis subvulgaris* Y. C. Dai, *sp. nov.* (Figs. 4 and 5)

*Carpophorum annuum, resupinatum, contextum cremeum. Facies pororum alba vel cremea; pori 5–8 per mm. Systema hypharum dimiticum, hyphae generatoriae fibulatae, hyphae skeletales subiculi 3.1–3.9  $\mu\text{m}$  in diam. Sporae hyalinae, lunatae, 3.1–4.1  $\times$  1.1–1.6  $\mu\text{m}$ .*

Holotype: China. Jilin Prov., Huinan County, Hongqi, on rotten wood of *Pinus koraiensis*, 10.X.1993 Dai 1470 (H; isotype, Y. C. Dai).

*Basidiocarps* annual, resupinate, soft, when dry soft corky, making up narrow ellipsoid patches, 3–6 cm long, 1–2 cm wide, sometimes larger by fusion of patches, 1–2 mm thick, usually very thin. Margin very thin to almost lacking. Pore surface white or creamy white, yellowish cream and cracking upon drying; pores round to slightly sinuous, 6–8 per mm ( $n = 60/2$ ), dissepiment edge even to slightly lacerate. Section: white throughout, subiculum extremely thin (ca. 0.1–0.2 mm); tube consistency soft corky.

*Hyphal system* dimitic in all parts, generative hyphae with clamp connections, skeletal hyphae IKI–, CB–, unchanged in KOH.

*Subiculum.* — Hyphal structure homogeneous, hyphae interwoven. Generative hyphae hyaline, thin-walled, occasionally branched, some covered by fine, sharp-pointed encrustations, (1.5–)1.7–3.4(–3.5)  $\mu\text{m}$  in diam ( $n = 42/2$ ). Skeletal hyphae dominant, strongly winding, unbranched, thick-walled with a distinct lumen, (2.9–)3.1–3.9(–4.2)  $\mu\text{m}$  in diam ( $n = 50/2$ ).

*Tubes.* — Hyphae loosely interwoven. Generative hyphae thin-walled, occasionally branched, some encrusted by fine crystals, 2–3.1  $\mu\text{m}$  in diam ( $n = 30/1$ ). Skeletal hyphae thick-walled, mostly with a distinct lumen, hyaline, winding, 2.8–3.6  $\mu\text{m}$  ( $n = 27/2$ ). Dissepiment edge with both generative and skeletal hyphae, generative hyphae strongly winding, covered by fine, sharp-pointed encrustations. Subhymenium indistinct. Cystidioles occasionally present, fusoid, smooth, thin-walled, up to 14  $\mu\text{m}$  long; hyphal pegs infrequent. Basidia broadly clavate to barrel-shaped, (7–)8–11 (–11.5)  $\times$  (3.5–)4–5.5(–6)  $\mu\text{m}$  ( $n = 63/2$ ), basidioles in shape similar to basidia, 7–9(–9.5)  $\times$  (3.5–)3.8–5  $\mu\text{m}$  ( $n = 30/2$ ).

*Spores.* — Basidiospores narrowly cylindrical, slightly thicker in the middle, moderately curved, thin-walled, hyaline, bearing one or two guttules, IKI–, CB–, (3–)3.1–4.1(–4.4)  $\times$  (1–)1.1–

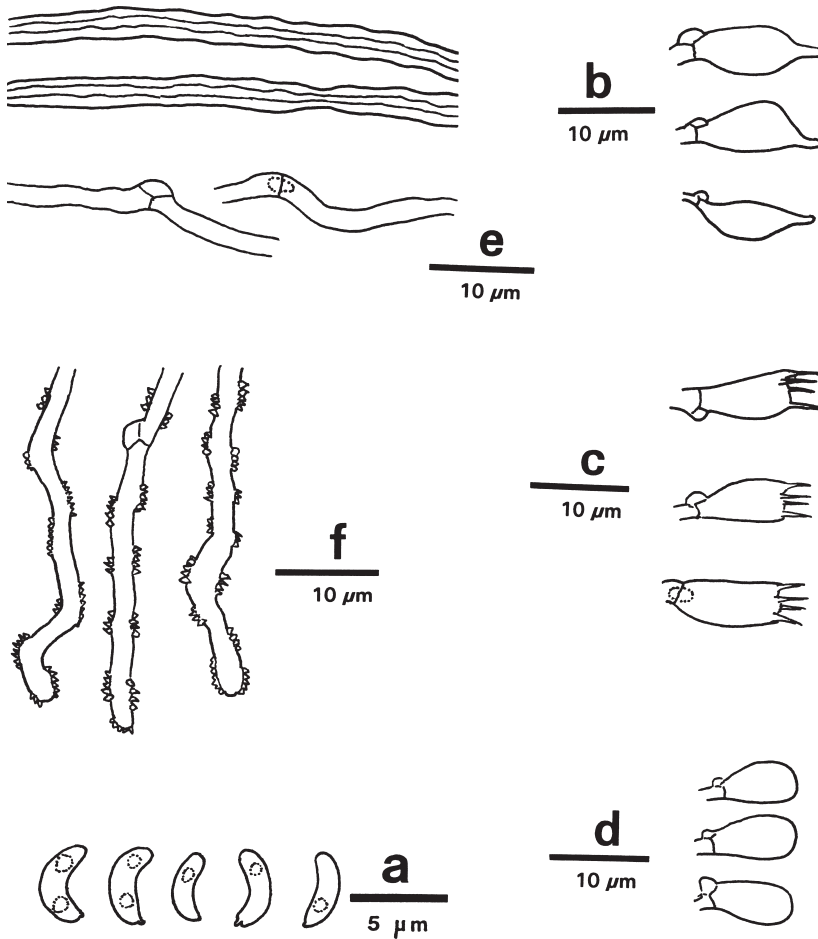


Fig. 5. Anatomical details of *Skeletocutis subvulgaris* Y. C. Dai (drawn from the holotype). — a: Basidiospores. — b: Cystidioles. — c: Basidia. — d: Basidioles. — e: Hyphae in subiculum. — f: Encrusted hyphae at dissepiment edge.

1.6(–1.8)  $\mu\text{m}$ , L = 3.57  $\mu\text{m}$ , W = 1.26  $\mu\text{m}$ , Q = 2.76–2.94 ( $n = 120/2$ ).

*Etymology.* — *Subvulgaris*, reminding *Skeletocutis vulgaris*.

*Additional specimen examined (paratype).* — China. Jilin Prov., Antu County, Changbaishan Nat. Res., on rotten wood of *Pinus koraiensis*, 15.IX.1995 Dai 2128 (H).

I describe the new species on the basis of two collections: a comprehensive study on the species of *Skeletocutis* was published by Niemelä (1998), and no existing names in that paper fit with my collections. *Skeletocutis subvulgaris* is characterized by its white to cream and resupinate basidiocarps, small pores, cylindrical and moderately curved spores, and by its occurrence in dry localities.

*Skeletocutis vulgaris* (Romell) Niemelä & Y. C. Dai was recently recognized from the *S. lenis*

(P. Karst.) Niemelä complex (Niemelä & Dai 1997). Its ecology, morphology and spore shape are similar to those of the new species. However, *S. vulgaris* lacks the fine, sharp-pointed encrustations on its dissepiment hyphae, and stellate crystal clusters are found on some hyphae of the dissepiment edge. Furthermore, the tramal skeletals in *S. subvulgaris* have a distinct lumen, while they are mostly subsolid in *S. vulgaris*.

The shape of spores and the hyphal structure of *Skeletocutis carneogrisea* A. David are similar to those in *S. subvulgaris*. The former species is usually pileate, and it is mostly associated with *Trichaptum abietinum* (Pers.: Fr.) Ryvarden; its pores are pinkish grey, and its spores are narrower (0.9–1.1  $\mu\text{m}$  vs. 1.1–1.6  $\mu\text{m}$  in *S. subvulgaris*).

*For comparison the following specimens were examined.* — *Skeletocutis carneogrisea*: **China**. Jilin Prov., Antu County, Dongfanghong, on fallen wood of *Abies*, 12.VIII.1997



*Dai* 2400. **Estonia.** Pärnumaa, Koonga, Veelikse, on fallen trunk of *Picea*, 17.VI.1996 *Dai* 2218 & *Niemelä*. **Finland.** Etelä-Häme, Lammi, on fallen trunk of *Picea*, 6.X.1992 *Dai* 196 & *Niemelä*. — *S. vulgaris*: **China.** Jilin Prov., Changbaishan Nat. Res., on rotten wood of *Abies*, 29.VII.1993 *Dai* 827; on rotten wood of *Pinus*, 13.IX.1995 *Dai* 2076c. Neimenggu (Inner Mongolia) Auto. Reg., IX.1917 *Licent* 759 (PRM 501104). Jiangxi Prov., Sanqingshan, on wood of gymnosperm, 14.VII.1994 Hattori (TFM).

### Key to the Chinese species of *Skeletocutis*

(after each species, spore dimensions are given)

1. Pores white to cream, basidiocarps always resupinate ..... 4
1. Pores orange to pinkish buff or pinkish grey, or grey when dry, basidiocarps pileate, effused-reflexed or resupinate ..... 2
2. Fresh pores cream, tramal hyphae monomitic, spores < 1 µm in diam ..... *S. nivea* (Jungh.) Jean Keller  
3–3.8(–4) × 0.5–0.8 µm,  
L = 3.38 µm, W = 0.59 µm, Q = 5.74 (n = 32/1)
2. Fresh pores orange or pinkish grey, tramal hyphae dimitic, spores > 1 µm in diam ..... 3
3. Pores orange when fresh, spores > 1.2 µm in diam ...  
..... *S. amorpha* (Fr.) Kotl. & Pouzar  
(3.5–)3.6–4.4(–4.6) × 1.2–1.5(–1.6) µm,  
L = 3.87 µm, W = 1.34 µm, Q = 2.89 (n = 32/1)
3. Pores pinkish grey when fresh, spores < 1.2 µm in diam .....  
..... *S. carneogrisea* A. David  
(3–)3.2–4.2(–4.4) × 0.9–1.1(–1.2) µm,  
L = 3.63 µm, W = 1.03 µm, Q = 3.52 (n = 32/1)
4. Hyphae of the dissepiments edges covered with fine, sharp-pointed encrustation ..... 6
4. Hyphae of the dissepiments edges smooth or covered with stellate crystal clusters ..... 5
5. Basidiocarps usually perennial, pores 4–6 per mm, spores strongly curved, > 1.4 µm in diam .....  
..... *S. lenis* (P. Karst.) Niemelä  
(3.5–)3.9–4.9(–5) × (1.4–)1.5–1.9(–2) µm,  
L = 4.25 µm, W = 1.72 µm, Q = 2.32–2.74 (n = 90/3)
5. Basidiocarps usually annual, pores 6–8 per mm, spores moderately curved, < 1.4 µm in diam .....  
..... *S. vulgaris* (Fr.) Niemelä & Y. C. Dai  
(2.8–)2.9–3.5(–4) × (0.9–)1.1–1.2 µm,  
L = 3.12 µm, W = 1.06 µm, Q = 2.88–3.03 (n = 60/2)
6. Spores narrowly cylindrical or allantoid ..... 8
6. Spores ellipsoid ..... 7
7. Basidiocarps perennial, 1–2 cm thick, without rhizomorphs ..... *S. perennis* Ryvarden  
(2.8–)2.9–3.6(–3.9) × (1.5–)1.6–2.2(–2.4) µm,  
L = 3.18 µm, W = 1.89 µm, Q = 1.66–1.71 (n = 61/2)
7. Basidiocarps annual, < 1 cm thick, with strong rhizomorphs ..... *S. alutacea* (J. Lowe) Jean Keller  
(2.5–)2.9–3.3(–3.5) × (1.6–)1.7–2 µm,  
L = 3.11 µm, W = 1.83 µm, Q = 1.70 (n = 30/1)
8. Tramal hyphae monomitic; on angiosperms .....  
..... *S. nivea* (Jungh.) Jean Keller

8. Tramal hyphae dimitic; on gymnosperms ..... 9
9. Basidiocarps perennial, pore surface shining .....  
..... *S. stellae* (Pilát) Jean Keller  
(3.2–)3.3–4(–4.2) × 0.7–0.9(–1) µm,  
L = 3.68 µm, W = 0.81 µm, Q = 4.54 (n = 31/1)
9. Basidiocarps annual, pore surface not shining ..... 10
10. Dissepiment edge structure almost monomitic, fresh basidiocarps with smell ..... *S. odora* (Sacc.) Ginns  
(3.5–)4–4.6(–5) × 0.9–1.2(–1.3) µm,  
L = 4.30 µm, W = 1.07 µm, Q = 3.96–4.12 (n = 60/2)
10. Skeletals common at dissepiment edge, fresh basidiocarps without odour ..... 11
11. Spores < 1 µm in diam, pores 4–5 per mm .....  
..... *S. kuehneri* A. David  
(3.4–)3.5–4(–4.1) × 0.7–0.9 µm,  
L = 3.71 µm, W = 0.80 µm, Q = 4.63 (n = 30/1)
11. Spores > 1 µm in diam, pores 5–8 per mm ..... 12
12. Spores more or less straight, > 4.4 µm in length .....  
..... *S. biguttulata* (Romell) Niemelä  
(4.4–)4.5–5.3(–5.4) × (1.1–)1.2–1.3(–1.4) µm,  
L = 4.80 µm, W = 1.23 µm, Q = 3.90 (n = 30/1).
12. Spores moderately curved, < 4.4 µm in length .....  
..... *S. subvulgaris* Y. C. Dai  
(3–)3.1–4.1(–4.4) × (1–)1.1–1.6(–1.8) µm,  
L = 3.57 µm, W = 1.26 µm, Q = 2.76–2.94 (n = 120/2)

*Wolfiporia curvispora* Y. C. Dai, *sp. nov.* (Figs. 6 and 7)

*Carpophorum bienne, resupinatum. Facies pororum cremea vel bubalina; pori 6–8 per mm. Systema hypharum dimiticum, hyphae generatoriae septatae, hyphae skeletales subiculi 4–5.5 µm in diam. Sporae hyalinae, cylindricae, curvatae, 3.3–4.1 × 1.2–1.8 µm.*

Holotype: China. Jilin Prov., Huinan County, Hongqi, on rotten wood of *Pinus koraiensis*, 13.X.1993 *Dai* 1592 (H; isotype, Y. C. Dai).

*Basidiocarps* biennial, resupinate, soft, when dry soft corky and very light, up to three metres long, 70 cm wide, 1 cm thick. Margin very thin, usually pores extend to the very edge. Pore surface creamy white, when dry wood-coloured to pale buff, glancing; pores angular, (5–)6–8 per mm (n = 30/1), dissepiments thin and even. Subiculum very thin (ca. 0.1–0.2 mm), wood-coloured, soft corky; tubes distinctly stratified by a thin contextual layer in between, consistency soft corky to fibrous, yellowish cream, annual tubes up to 5 mm long.

*Hyphal system* dimitic in all parts, generative hyphae with simple septa, skeletal hyphae domi-

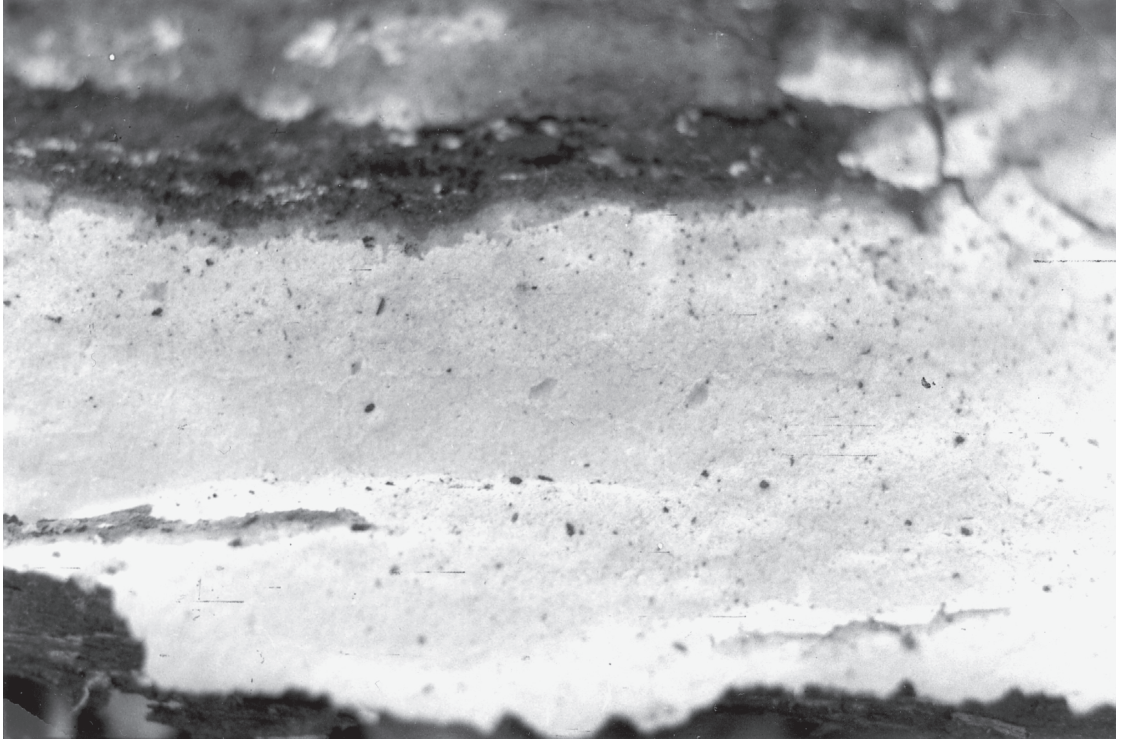


Fig. 6. *Wolfiporia curvispora* Y. C. Dai, holotype,  $\times 1.2$ .

nant, all hyphae IKI–, CB–, unchanged in KOH.

**Subiculum.** — Hyphal structure homogeneous, hyphae interwoven. Generative hyphae hyaline, thin to thick-walled, rarely branched, frequently with simple-septate, (2.5–)2.8–4.5(–4.7)  $\mu\text{m}$  in diam ( $n = 32/1$ ). Skeletal hyphae strongly winding, unbranched, hyaline, thick-walled with a distinct wide lumen, occasionally simple-septate, 4–5.5  $\mu\text{m}$  in diam ( $n = 30/1$ ).

**Tubes.** — Hyphae subparallel. Generative and skeletal hyphae similar as in subiculum, but slightly thinner. Subhymenium indistinct. Hymenium mostly collapsed. Basidia barrel-shaped, 7–9  $\times$  4.9–6.5  $\mu\text{m}$  ( $n = 9/1$ ), basidioles in shape similar to basidia, but slightly smaller.

**Spores.** — Basidiospores cylindrical, moderately curved, thin-walled, hyaline, IKI–, CB– or weakly CB+, (3.2–)3.3–4.1(–4.2)  $\times$  1.2–1.8(–2)  $\mu\text{m}$ ,  $L = 3.81 \mu\text{m}$ ,  $W = 1.43 \mu\text{m}$ ,  $Q = 2.67$  ( $n = 30/1$ ).

**Etymology.** — *Curvata* (Lat., part.), curved; *curvispora* referring to the shape of spores.

The new species is based on a single collec-

tion, and the hymenium in the specimen is almost collapsed, but good basidia with basidiospores attached are easily found. So the type material is in good condition.

*Wolfiporia curvispora* differs from the other species in the genus by its biennial habit, small pores, curved and cylindric spores, and uninflated or slightly inflated subicular hyphae. Large fruit bodies (ca. 3 metres long) made it a remarkable fungus, and it seems to be rare. It was collected on very rotten wood of *Pinus*, and it probably causes a white rot.

The basidiocarps of the new species somewhat resemble *Skeletocutis lenis*, but the latter species has larger spores (4–6 per mm), clamped generative hyphae, and narrower skeletals (2.8–3.4  $\mu\text{m}$  in diam). In contrast, *Wolfiporia curvispora* has small pores (6–8 per mm), simple-septate generative hyphae, and its skeletals are thicker (4–5.5  $\mu\text{m}$  in diam).

It is difficult to define the hyphal system of the genus *Wolfiporia*, because the thick-walled,

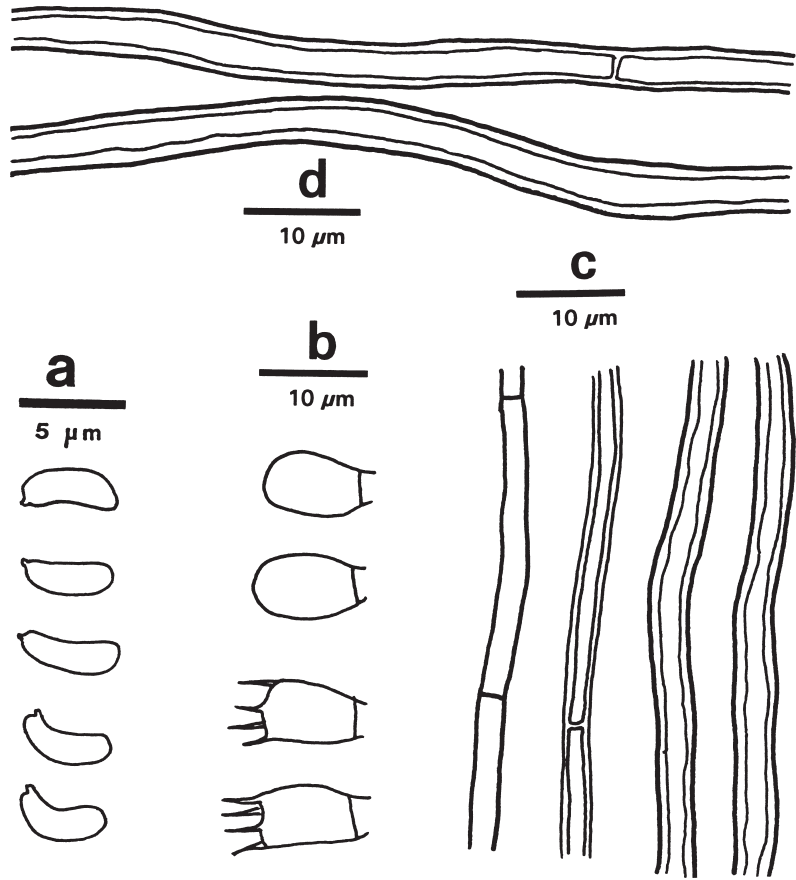


Fig. 7. Anatomical details of *Wolfiporia curvispora* Y. C. Dai (drawn from the holotype). — a: Basidiospores. — b: Basidia and basidioles. — c: Tramal hyphae. — d: Subicular hyphae.

skeletal-looking hyphae are occasionally simple-septate in *W. dilatohypha* Ryvar den & Gilb. and in the new species, and the transitions between generative hyphae and skeletal hyphae seem to be present. Lowe (1966) considered that the hyphal structure of *W. dilatohypha* to be monomitic. At the moment I follow the definition by Ryvar den and Gilbertson (1984).

For comparison the following specimens were examined. — *Wolfiporia dilatohypha*: **Canada**. Québec, Montreal, on stump of *Quercus*, 8.VIII.1966 Sirard (GB). **China**. Jilin Prov., Antu County, Baoma, on rotten wood of *Quercus*, 8.IX.1995 Dai 1974.

**Key to the Chinese species of *Wolfiporia***

(after each species, spore dimensions are given)

- 1. Basidiocarps on sclerotia, pores < 3 per mm, spores > 7 µm in length ..... *W. cocos* (Schw.) Ryvar den & Gilb. 7–8 × 3–3.5 µm (Zhao & Zhang 1992)

- 1. Basidiocarps not associated with sclerotia, pores > 3 per mm, spores < 7 µm in length ..... 2
- 2. Pores 4–5 per mm, spores ellipsoid, subicular hyphae inflated to up to 8 µm in diam ..... *W. dilatohypha* Ryvar den & Gilb. (3.7–)3.8–4.7(–5) × (2.8–)2.9–3.1(–3.6) µm, L = 4.10 µm, W = 3.60 µm, Q = 1.30 (n = 30/1)
- 2. Pores 6–8 per mm, spores cylindrical and curved, subicular hyphae 4–5.5 µm in diam ..... *W. curvispora* Y. C. Dai (3.2–)3.3–4.1(–4.2) × 1.2–1.8(–2) µm, L = 3.81 µm, W = 1.43 µm, Q = 2.67 (n = 30/1)

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