DOI: 10.3969/j.issn.1000-3142.2013.04.017
何双辉, 李海蛟. 中国锈革菌属研究. 5. 采自云南的两个新记录种[J]. 广西植物, 2013, 33(4):523-527
He SH, Li HJ. *Hymenochaete* in China. 5. Two new records from Yunnan Province[J]. Guihaia, 2013, 33(4):523-527

Hymenochaete in China. 5. Two new records from Yunnan Province

HE Shuang-Hui*, LI Hai-Jiao

(*Institute of Microbiology, Beijing Forestry University*, Beijing 100083, China)

Abstract: *Hymenochaete contiformis* and *H. rufomarginata*, collected from Yunnan Province, are newly recorded in China. While *Hymenochaete contiformis* is characterized by its anatomical structure (without a cortex and hyphal layer), long setae and large basidiospores; *H. rufomarginata* is distinguished by its presence of numerous hyphidia and both small setae and basidiospores. Illustrated descriptions of these two species based on the Chinese materials and an identification key to all the 30 *Hymenochaete* species in Yunnan Province are provided.

Key words: *Hymenochaete contiformis*; *H. rufomarginata*; Hymenochaetaceae; wood-inhabiting fungi; taxonomy
中图分类号: Q949 **文献标识码:** A **文章编号:** 1000-3142(2013)04-0523-05

中国锈革菌属研究. 5. 采自云南的两个新记录种

何双辉*, 李海蛟

(北京林业大学 微生物研究所, 北京 100083)

摘 要: 报道了采自云南省的锈革菌属(*Hymenochaete*) 2 个中国新记录种,即长矛锈革菌(*H. contiformis*) 和红边锈革菌(*H. rufomarginata*)。前者的主要特点是解剖结构中无皮层和菌丝层,刚毛长且孢子大;后者的主要特点是子实层具大量的侧丝,刚毛和孢子较小。提供了这两个种的野外标本照片、显微结构绘图以及详细的形态学描述,并给出了云南省锈革菌属 30 个种的检索表。

关键词: 长矛锈革菌; 红边锈革菌; 锈革孔菌科; 木生真菌; 分类

Wood-inhabiting fungi are very important in the forest ecosystem because of their ecological functions and economic values (Wei & Dai, 2004; Dai *et al.*, 2007; Dai & Yang, 2008). The diversity of wood-inhabiting fungi in Yunnan Province is extremely high, and many new species and Chinese new records of polypores have been found in this area (Cui *et al.*, 2011). The corticioid genus *Hymenochaete* (Basidiomycota, Hymenochaetales) in the province has also been studied by several authors (Xu *et al.*, 2003; Zhang & Dai, 2005), however, its diversity in this area is not well known. In 2011, two intensive surveys of *Hymenochaete* in Yunnan Province were carried out, and more than 200 specimens were collected. Two new species and three Chinese new records have been found and published from these specimens in previous studies (He & Li, 2011, He & Dai, 2012). Recently, two additional species, *Hymenochaete contiformis* and *H. rufomarginata* were identified as new to Chinese fungal flora, and till now, 30 species of *Hymenochaete* have been found in Yunnan Province. Illus-

收稿日期: 2012-11-22 **修回日期:** 2013-03-29
基金项目: 国家自然科学基金(31000006)
作者简介: 何双辉, 博士, 副教授, 主要从事木生真菌分类与分子系统学研究, (E-mail) shuanghuihe@yahoo.cn。
* **通讯作者** (Author for correspondence)

trated descriptions of the two species based on Chinese materials and an identification key to all the 30 *Hymenochaete* species in Yunnan Province are provided in the present paper.

1 Materials and Methods

Voucher specimens are deposited in the herbarium of Beijing Forestry University (BJFC), and the microscopic procedure follows Zhao & Cui (2011). In presenting the size range of spores and setae, 5% of the measurements were excluded from each end of the range, and the measurements were given in parentheses. In the text the following abbreviations were used: L = mean spore length, W = mean spore width, Q = variation in the L/W ratios between the specimens studied, n = the number of spores measured from given number of specimens. IKI stands for Melzer's reagent, KOH for 5% potassium hydroxide, and CB is the abbreviation of Cotton Blue in lactic acid. IKI– = inamyloid and indextrinoid, CB– = acyanophilous.

2 Results and Analysis

Hymenochaete contiformis G. Cunn., Trans. Roy. Soc. N. Z. 85: 41, 1957. (Fig. 1–2)

Fruitbody. —Basidiocarps annual, effused, closely adnate, coriaceous, first as small colonies, later confluent up to 8 cm or more in longest dimension, 80–200 μm thick in section. Hymenophore smooth, grayish brown to clay-buff, usually not cracked; margin thinning out, distinct, fimbriate, paler than hymenophore surface, cinnamon to yellowish brown when juvenile, becoming indistinct, concolorous with age.

Hyphal structure. —Hyphal system monomitic; generative hyphae without clamp connections; tissue darkening but otherwise unchanged in KOH.

Subiculum. —Tomentum, cortex and hyphal layer absent.

Stratified hymenium. —Generative hyphae hyaline to yellowish brown, thick-walled, agglutinated, 2–3 μm in diam. Setal layer composed of 1–3 rows of overlapping setae. Agglomerates of crystals frequently present in the setal layer and subhymenium, up to 40 μm in diam. Setae numerous, subulate, reddish brown, with acute tips,

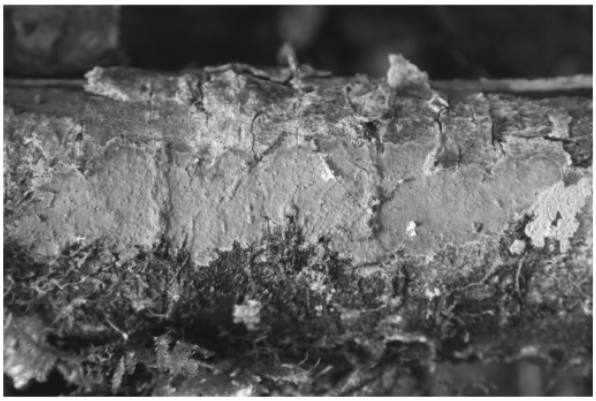

Fig. 1 A basidiocarp of *Hymenochaete contiformis* (He 1166)

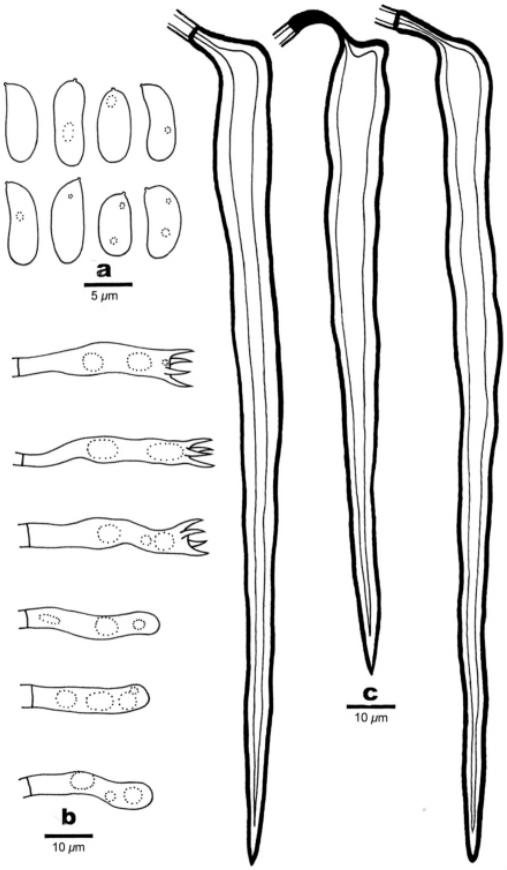

Fig. 2 Microscopic structures of *Hymenochaete contiformis* (drawn from He 1166)
a. Basidiospores; **b**. Basidia and basidioles; **c**. Setae.

usually enmeshed with a thin hyphal sheath, projecting up to 120 μm above the hymenium, (70–) 90–160 μm × (7–) 9–14 (–15) μm. Cystidia absent, simple hyphidia present, not numerous. Basidia clavate, with four sterig–

mata and a simple septum at base, 18–22 μm×4–6 μm; basidioles in shape similar to basidia, but smaller.

Spores. —Basidiospores ellipsoid to cylindrical, hyaline, thin-walled, smooth, IKI–, CB–, (7.6–) 7.8–9.5 (–10) μm×(3.2–) 3.5–4.2 μm, L = 8.68 μm, W = 3.83 μm, Q = 2.18–2.36 (n = 60/2).

Specimens examined. —China. Yunnan Prov., Chuxiong, Zixishan Forest Park, on fallen angiosperm twig, 16. IX. 2011 He 1083; Weixi County, Pantiange, on fallen angiosperm trunk, 22. IX. 2011 He 1166.

Remarks. —Previously, *Hymenochaete contiformis* was reported in Brazil, Costa Rica, Jamaica, New Zealand, Réunion and Venezuela (Léger, 1998). It is characterized by its anatomical structure (without a cortex and hyphal layer), long setae and large basidiospores (Cunningham, 1957; Léger, 1998). *H. contiformis* is very similar to *H. longispora* Parmasto, but the latter has paler basidiocarps and lacks agglomerates of crystals in the setal layer and subhymenium (Léger, 1998; He & Li, 2012).

Hymenochaete rufomarginata Imazeki, Bull. Tokyo Sci. Mus. 2: 9, 1940. (Fig. 3-4)

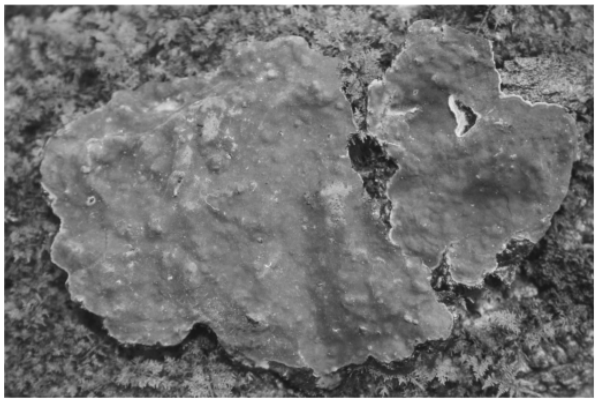

Fig. 3　Basidiocarps of *Hymenochaete rufomarginata* (He 619)

Fruitbody. —Basidiocarps annual, effused or effused-reflexed with slightly elevated margins, loosely adnate, easily detachable from the substrates, coriaceous to woody hard, brittle, reflexed part projecting up to 0.2 cm, resupinate part up to 10 cm or more in longest dimension, up to more than 1 mm thick in section. Hymenophore smooth, fawn to cinnamon, not cracked; margin thinning out, paler than hymenophore surface, cinnamon

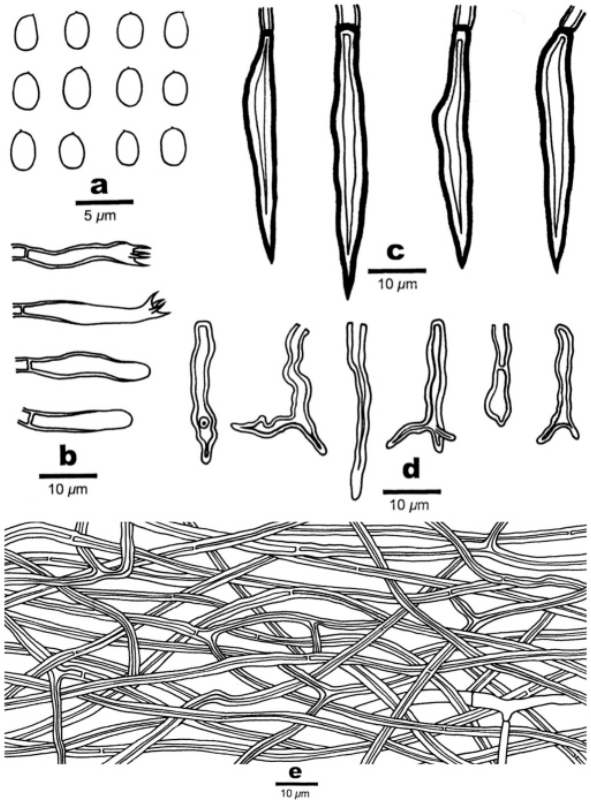

Fig. 4　Microscopic structures of *Hymenochaete rufomarginata* (drawn from He 619)
a. Basidiospores; **b**. Basidia and basidioles; **c**. Setae; **d**. Hyphidia; **e**. Hyphae from subiculum.

to cinnamon-buff, distinct, up to 1.5 mm wide, becoming concolorous, indistinct with age.

Hyphal structure. —Hyphal system subdimitic; generative hyphae without clamp connections; tissue darkening but otherwise unchanged in KOH.

Subiculum. —Tomentum, cortex and hyphal layer present. Cortex composed of strongly agglutinated hyphae, 50–80 μm thick. Generative hyphae hyaline to yellowish brown, thin-to thick-walled, septate, moderately branched, 2–3 μm in diam. Skeletal hyphae distinctly thick-walled with a narrow lumen, not branched, 2–2.8 μm in diam.

Stratified hymenium. —Hyphae in this layer similar to those in subiculum, yellowish brown, thick-walled, agglutinated, 2–2.5 μm in diam. Setal layer thickening, composed of several rows of overlapping setae. Setae numerous, subulate or fusoid, reddish brown, with acute tips, usually enmeshed with a thin hyphal sheath, projecting up to 25 μm above the hymenium, (25–50) μm×

(5–8) μm. Cystidia absent, hyphidia present, numerous, yellowish brown, with thickened walls, simple or branched, sinuous. Basidia clavate, with four sterigmata and a simple septum at base, (12–18) μm×(3–3.8) μm; basidioles in shape similar to basidia, but smaller.

Spores. —Basidiospores ellipsoid to ovoid, hyaline, thin-walled, smooth, IKI–, CB–, (2.5–) 2.8–3.5 (–3.8) μm×2–2.5 (–2.8) μm, L = 3.06 μm, W = 2.22 μm, Q = 1.38 (n = 30/1).

Specimens examined. —China. Yunnan Prov., Pu'er County, Caiyanghe Nat. Res., on fallen angiosperm trunk, 6. VI. 2011 He 619; Yingjiang County, Tongbiguan Nat. Res., on fallen angiosperm trunk, 29. X. 2012 He 1471, 30. X. 2012 He 1478 & He 1480; Longchuan County, Tongbiguan Nat. Res., on fallen angiosperm trunk, 31. X. 2012 He 1489 & He 1492. Japan, Mont Takatori-Yama, Naka-Gun, Kanagawa Pref., 13. XI. 1932 TNS-F 203362 (holotype).

Remarks. —Previously, *Hymenochaete rufomarginata* was only reported in Japan, and no basidiospore was observed from the types. The main characters distinguishing *H. rufomarginata* from other species of the genus are its anatomical structure (with a cortex and hyphal layer), small setae and presence of numerous hyphidia (Imazeki, 1940; Léger, 1998). The Chinese specimen has a few basidiospores and fits well the description of Imazeki (1940) and Léger (1998) except for the thicker basidiocarps. *H. rufomarginata* shares similar anatomical structures, small setae and simple or branched hyphidia with *H. dura* Berk. & M. A. Curtis, but the latter has slightly longer basidiospores (4–5 μm, Léger, 1998).

30 key species of *Hymenochaete* so far found in Yunnan Province

1. Hymenophore lamellate or poroid ····· 2
1. Hymenophore smooth ····· 3
2. Hymenophore lamellate ····· *H. cyclolamellata*
2. Hymenophore poroid ····· *H. xerantica*
3. Hyphidia numerous ····· 4
3. Hyphidia absent or rare ····· 10
4. Hyphidia acanthoid ····· *H. murina*
4. Hyphidia not acanthoid ····· 5
5. Hyphidia dendroid ····· 6
5. Hyphidia not dendroid ····· 7
6. Dendrohyphidia arbusculoid; tropical species ····· *H. floridea*
6. Dendrohyphidia not arbusculoid; temperate species ····· *H. sphaericola*
7. Hyphidia simple, never branched ····· 8
7. Hyphidia usually branched ····· 9
8. Basidiocarps resupinate; hyphidia smooth ····· *H. innexa*
8. Basidiocarps effused-reflexed or pileate; hyphidia encrusted ····· *H. luteobadia*
9. Cortex present, setae (25–50) μm×(5–8) μm; basidiospores (2.8–3.5) μm×(2–2.5) μm ····· *H. rufomarginata*
9. Cortex absent, setae (50–90) μm×(7–11) μm, basidiospores (3.2–5) μm×(1.8–2.8) μm ····· *H. tropica*
10. Basidiocarps effused-reflexed or pileate ····· 11
10. Basidiocarps strictly resupinate ····· 19
11. Cortex absent ····· 12
11. Cortex present ····· 15
12. Basidiospores < 3.5 μm long ····· 13
12. Basidiospores > 3.5 μm long ····· 14
13. Setal layer with horizontal agglutinated hyphae ····· *H. subferruginea*
13. Setal layer without horizontal agglutinated hyphae ····· *H. adusta*
14. Basidiocarps effused-reflexed, woody hard; setal layer thickening ····· *H. unicolor*
14. Basidiocarps pileate, coriaceous; setal layer not thickening ····· *H. rheicolor*
15. Setae encrusted with crystals; basidiospores > 7 μm long ····· *H. megaspora*
15. Setae smooth, basidiospores < 7 μm long ····· 16
16. Setal hyphae present; hyphae and hymenial cells encrusted ····· *H. yunnanensis*
16. Setal hyphae absent; hyphae and hymenial cells smooth ····· 17
17. Basidiospores > 4 μm long ····· *H. rubiginosa*
17. Basidiospores < 4 μm long ····· 18
18. Submonilioid hyphal ends present in hymenium ····· *H. villosa*
18. Submonilioid hyphal ends absent in hymenium ····· *H. ochromarginata*
19. Setae with 1–3 teeth ····· *H. separabilis*
19. Setae without teeth ····· 20
20. Setae blunt, spathulate ····· *H. spathulata*
20. Setae acute, not spathulate ····· 21
21. Setae with encrustation ····· 22
21. Setae smooth ····· 26
22. Setae encrusted with crystals ····· 23
22. Setae encrusted with yellowish brown resinous granules ····· 24

23. Basidiospores subglobose ····· *H. sphaerospora*
23. Basidiospores cylindrical ····· *H. legeri*
24. Hyphal layer absent; setae < 50 μm long; basidiospores < 4.5 μm long ····· *H. minor*
24. Hyphal layer present; setae > 50 μm long; basidiospores > 4.5 μm long ····· 25
25. Basidiospores (4.8-6) μm×(2.3-3.3) μm ····· ····· *H. rhabarbarina*
25. Basidiospores (6-7) μm×(4-5) μm ····· *H. rhododendricola*
26. Cortex present ····· *H. fulva*
26. Cortex absent ····· 27
27. Basidiospores > 7 μm long ····· 28
27. Basidiospores < 7 μm long ····· 29
28. Crystals present in setal layer and subhymenium ····· *H. contiformis*
28. Crystals absent ····· *H. longispora*
29. Setae (70-120) μm×(5-9) μm; basidiospores (4.5-6.5) μm×(1.8-2.8) μm ····· *H. cinnamomea*
29. Setae (30-45) μm×(5-7) μm; basidiospores (3.2-4) μm×(1.8-2.3) μm ····· *H. anomala*

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